Nijmegen Institute
for Cognition
and Information

FORMALIZED THEORY OF APPRAISIVE JUDGMENTS

A general methodology for questionnaire research integrating facet design, theory construction and psychometrics

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Nick Broers

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FORMALIZED THEORY OF APPRAISIVE JUDGMENTS

a general methodology for questionnaire research integrating facet design, theory construction and psychometrics

een wetenschappelijke proeve
op het gebied van de Sociale Wetenschappen

Proefschrift

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VOORWOORD

Gedurende de jaren dat ik aan mijn proefschrift heb gewerkt, heb ik verschillende malen een beroep moeten en mogen doen op de kennis van vrienden en collega's. Hierbij wil ik graag mijn erkentelijkheid uitspreken voor de door hun betoonde bereidwilligheid om mij op momenten dat het niet wilde vlotten weer op weg te helpen.

Zo heb ik op het vlak der psychometrie veel steun ondervonden van Koos Zwinderman van de vakgroep biomedische statistiek aan de R.U. te Leiden. De begeleiding van Koos is voor mij onmisbaar gebleken voor het verwerven van een elementair begrip op het gebied van de LLTM- en LRRM-modellen. Daarbij heeft Koos zich behalve een voortreffelijk psychometricus ook vaak een uitstekend psycholoog betoond: zijn vriendschappelijke aanmoedigingen hebben mijn zelfvertrouwen veel goed gedaan. Ook mijn promotor Eddy Roskam is een onmisbare steun gebleken voor het verwerven van een goed begrip van de psychometrie. Daarnaast heeft hij mij ingewijd in de facettheorie en heeft hij voor mij de kar weer vlot getrokken toen het onderzoek in de analysefase vast dreigde te lopen. Waardevolle suggesties met betrekking tot de Raschanalyses heb ik mogen ontvangen van Arnold van den Wollenberg. Zowel waar de data zich opvallend goed aan het model leken te conformeren, als waar de data in strijd met het model leken heeft Arnold mij wegen aangegeven om meer zekerheid te verkrijgen omtrent de geldigheid van het model.

Rogier Donders wil ik bedanken voor zijn hulp bij problemen van programmeertechnische aard, alsook voor zijn nimmer aflatende bereidwilligheid om bij te springen als ik ergens niet alleen kon uitkomen. Voor programmeerproblemen die betrekking hadden op de LLTM- en de LRRM-modellen heb ik altijd een beroep kunnen doen op Frans Gremmen, en ook de andere medewerkers van de GRD hebben mij altijd met raad en daad terzijde gestaan. Yvonne Schouten wil ik graag bedanken voor haar immer motiverende en opbeurende opmerkingen, alsook voor haar hulp bij het maken van de figuren. De esthetisch fraaiere figuren in dit proefschrift zijn alle door haar verzorgd.

In het kader van mijn onderzoek heb ik assistentie gehad van verschillende studentassistenten die voor mij de vragenlijsten bij inwoners van Nijmegen hebben afgenomen. Graag wil ik deze mensen hartelijk danken voor hun inzet en voor de suggesties die zij mij als veldmedewerkers wisten door te spelen. Anton Beguin wil ik bedanken voor zijn nauwkeurige arbeid aan de constructie van de vele databestanden, en voor de nauwgezette uitvoering van verschillende analysewerkzaamheden.

Last but not least wil ik mijn vrouw Juanita bedanken voor haar steun en aanmoediging op de lange weg naar de promotie.

Contents

1 INTRODUCTION

Researchers working in any of the social sciences, usually approach their field of interest following either of two major research methodologies. The first is referred to as the qualitative or interpretative research methodology. This approach to research considers human and social phenomena as incomparable to the phenomena that form the interest of the natural sciences. Social reality, in this view, is actively constructed by its participants, and theoretical explanations of social reality should therefore involve the perspective of the social actors (Wester, 1984). Within the qualitative research methodology, explanations of social phenomena are usually intentional explanations, i.e. they explain the behavior of social participants in terms of their perspectives, interpretations, goals and ensuing intentions (Swanborn, 1981).

The other major research methodology is referred to as the quantitative research methodology. From this perspective, the phenomena that are of interest to social scientists should be described and understood in a way that does not differ from the way that natural scientists attempt to explain the phenomena that capture their interest. Principally, this means that explanations of individual and collective behavior should be cast in a deductive nomological form. In other words, specific events should be explained by referring to a general law that covers it. For example, the event that Turks are refused entrance into a discotheque in some western country might be explained by a general law that states that members of ethnic minority groups will be discriminated against (with a certain probability).

As Swanborn (1981) maintains, the deductive nomological explanatory model is the only type of explanation that will permit the development of a cumulative body of knowledge. Once we have established a general law, this law may itself become the starting point for further research which in turn will lead to the uncovering of a yet more general law, which in its turn will give rise to attempts at explanations of even greater generality. By this gradual reduction of isolated events onto general laws, an ever increasing domain of behavioral phenomena will be understood and may therefore be (partially) predicted and manipulated.

It is well known that this quantitative research methodology has been extremely fruitful for the natural sciences. Barely 500 years ago, physics - or natural philosophy as it was then called - still followed a more qualitative research methodology, in which for example motion was understood with reference to intentional explanations. The Greeks had maintained that all natural objects and entities were made up out of just four elements: earth, water, air and fire. Each element had its natural place: earth at the center of the universe, water at the rim of the earth, air at the rim of water, and fire at the rim of air. By postulating a natural tendency of elements to seek up its natural place, motion could be explained. Thus, a material object, led loose in midair, will move towards its natural place. Likewise, rain will fall to its natural place, just as fire flickers upward (see Dijksterhuis, 1950).

As the making of precise empirical observations became more established practice, physical laws were formulated that provided a clear starting point for further research (among the first natural laws were those of Kepler in astronomy and those of Galileo in the study of motion). It is generally accepted that modern science reached maturity when Isaac Newton formulated his laws of motion and his law of universal gravitation, which laid the foundation for classical mechanics. From that moment on, physical science - now firmly rooted in a quantitative research methodology and relying solely on explanations of the deductive nomological type[1] progressively developed at an ever increasing pace, yielding laws of ever increasing generality and at an increasingly higher level of abstraction.

Several conservation principles and constants were uncovered that helped to direct further research (Feynman, 1992). For example, the first law of thermodynamics, which states that the total amount of energy in the universe remains constant (i.e. energy will always be conserved), gave rise to the postulation of a particle now known as neutrino, to account for an unexplained disappearance of energy in some phenomena studied in the context of high energy physics (see Clay, 1942). By postulating the existing of a particle with certain specific characteristics, the seemingly spontaneous loss of energy could be accounted for, and the conservation of energy principle would not be violated. The neutrino has later been discovered in the laboratory.

The enormous success of the physical sciences stimulated social scientists to follow a similar, quantitative approach. However, although the majority of social scientists agree that the quantitative approach will eventually prove more fruitful than the qualitative research methodology, few general laws have as yet been uncovered in the social sciences, that provide a clear foundation for further research to build upon. Psychology, for instance, which originated as a scientific discipline in the laboratory of Wilhelm Wundt in 1879, has uncovered several laws in the context of learning theory (see Hilgard & Bower, 1975), and in psychonomic research (see Michon et al, 1976). However, in areas such as personality and social psychology there is a conspicuous lack of coordinated research effort, and the multitude of studies and publications do not add up to a cumulative body of knowledge.

It may be that this is due to the relative immaturity of psychology in comparison to physics. Perhaps psychology needs to await a theoretician whose theoretical and experimental approach will stimulate coordinated research effort, like Newton did in physics, and will establish a paradigm that does give rise to a cumulative body of knowledge (cf Kuhn, 1970). Alternatively, the stagnating progress of psychology may be (partly) due to deficiencies in the methodological approach followed by psychology. Although a quantitative research methodology is usually adopted, and attempts at formulating deductive nomological explanations are made, there are important differences between the way that natural scientists coordinate theory and research, and the way that social scientists like psychologists do.

[1] The term 'deductive nomological explanation' was coined in the twentieth century by Hempel and Oppenheim (1948).

1.1 Physical versus social science

For an examination of the differences between the physical and the social sciences, which may provide a methodological explanation of their varying success, it will be instructive to examine figures 1 1 and 1 2

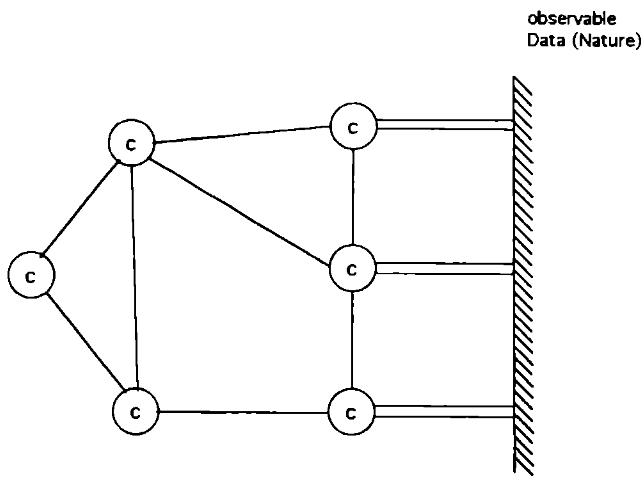

Figure 1.1. Margeneau's diagram illustrating the structure of a well developed science See text for further explanation (Taken from Torgerson, 1958, p 3)

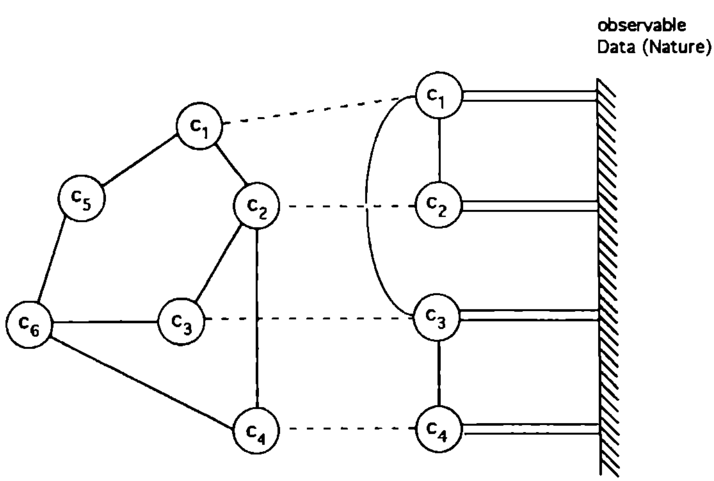

Figure 1.2. Torgerson's diagram illustrating the typical structure of social science The dotted lines connect the empirical concepts-as-determined to the theoretical concepts-as intended (Taken from Torgerson, 1958, p 5)

The diagram of figure 1 1 has originally been constructed and discussed by Margeneau (1950), and illustrates the structure of a well developed science Torgerson (1958) has adopted it in his discussion of the contrasts between the natural and the social sciences He presents the diagram of figure 1 2 as an illustration of the typical structure of social science In diagram 1 1, we see a number of theoretical constructs (denoted by an encircled 'C'), which are connected to each other by single lines Some of these theoretical constructs are connected to observable data with double lines The double lines are so-called rules of correspondence, test operations relating a construct to the data The single lines specify formal, logical relationships The left part of the diagram we may term the theoretical space, as opposed to the empirical space on the right (the vertical bar denoting observable data) The interrelationship of theoretical constructs forms a mathematical model, that becomes a theory as soon as some of the constructs are connected to the empirical world by rules of correspondence All theoretical constructs in this diagram possess what Margeneau (1950) has termed 'constitutive definition' they are defined in terms of each other by formal equations Force equals mass times acceleration provides an example of such a constitutive definition To overcome circularity, some theoretical constructs must also possess an operational or epistemic definition, that is, they must be defined in terms of observable data In such a scientific structure, any theoretical advance may be judged on its merits by tracing its necessary consequences at the level of observable data For the introduction of a new theoretical construct to be meaningful, it suffices that this construct has a constitutive definition The interrelationship of formal connections will always permit the deduction of consequences at the level of observable data, no matter how abstract and how far remote of the empirical world the new construct may be A mature scientific discipline contains large theoretical networks with all theoretical constructs possessing constitutive meaning and a great many of them epistemic meaning as well

As figure 1 2 pictures, the typical situation in a social scientific discipline shows a different structure Here we also find networks of related theoretical constructs, but in contrast to such a net work in the natural sciences the relations between these constructs are often not specified in formal equations, but in terms of loose, verbal statements The introduction of a new theoretical construct therefore cannot be used for the deduction of precise empirical consequences More serious than this lack of mathematical rigor, however, is the fact that there are no theoretical constructs that are directly related to the observed data with rules of correspondence Instead, these theoretical constructs are translated into their corresponding operationalizations (this translation process being denoted by the dotted lines in the diagram), which do have rules of correspondence and therefore permit the empirical verification of hypotheses The key problem is, of course, that refutation of such hypotheses might be either subscribed to flaws in the theory from which they were derived, or to the inadequacy of the translation of the original theoretical construct There is widespread disagreement on the adequacy of operationalizations of many constructs used in psychology As Torgerson (1958, p 8) concludes 'This, of course, is not a particularly happy state of affairs The concepts of theoretical interest tend to lack empirical meaning, whereas the corresponding concepts with precise empirical meaning often lack theoretical import One of the great problems in the development of a science is the discovery or invention of constructs that have, or are likely to have, both' As to the diversity of operationalizations for the same theoretical construct, Torgerson adds 'Unfortunately, there seems to be virtually an unlimited number of ways in which such rules of correspondence can be devised. Since each way *is* an operational definition of the explicated concept, and since different ways ordinarily lead to different results, it is clear that the problem of determining which way, if any, is likely to prove fruitful is a serious one' (Torgerson, 1958, p.8).

1.2 Operationism and operationalism

Compared to the natural sciences, we can see that the process of theory construction and testing in the social sciences differs in two important respects. First, social science theories are usually verbal theories and the links between the explanatory constructs figuring in those theories are formed by loose, verbal statements. Unlike the formalized theories of physics and related natural sciences, the introduction of new theoretical concepts does not permit the logical derivation of necessary consequences at the empirical level. Thus, it cannot be determined unequivocally whether a newly proposed explanatory construct operates the way it is expected to.

Second, social science translates its theoretical constructs into their proposed empirical realizations. Not every social scientist will necessarily agree on the appropriateness of the translation, making it hard to evaluate the outcome of research, whether the results support the research hypothesis or not. It is especially the use of disputable operationalizations that makes social science practice incomparable to research in the natural sciences. This is surprising, since the operationalization approach in social science is actually derived from the physical research tradition of operationism, first formulated by Bridgman (1927).

Bridgman, like many physicists of his day, was shocked to find that Einstein's theory of relativity had completely altered the meaning of concepts like mass, distance, and time, which until then had been considered as open to a natural interpretation, independent of any theory. In reaction, Bridgman worked out an interpretation of concepts that would render them immune for changes in theoretical perspective. According to his philosophy of operationism, a theoretical concept is completely defined by the test operations necessary for its determination. Concepts do not change as theories change, because there are no concepts independent of the theory in which they function. A seemingly generic concept that appears in two different theories, like mass in Newton's theory and mass in Einstein's theory, actually corresponds to two different test operations and therefore does not constitute a single concept, but forms two different concepts.

That it is actually impossible for a concept to figure generically in two entirely different theories, Bridgman argues by using the example of length. If length could be used as a generic concept, independent of any theory, it would be possible to define the concept of absolute distance. The notion of absolute distance seems plausible from our everyday sensory experience, but appears as untenable as soon as we apply it in circumstances well outside everyday experience. For instance, if we wish to determine the diameter of an electron, we would have to do so in terms of field equations of electrodynamics. However, as Bridgman observes: 'To find whether the field equations of electrodynamics are correct on a small scale, we must verify the relations demanded by the equations between the electric and magnetic forces and the space coordinates, to determine which involves measurements of lengths. But if these space coordinates cannot be given an independent meaning apart from the equations, not only is the attempted verification of the equations impossible, but the question itself is meaningless' (Bridgman, 1927, p.21, quoted by Dessens, Hox & Jansen, 1990). Independent use of the concept of length is therefore impossible, attempts to do so will end up in circular reasonings. So according to operationism, there is no generic concept of 'length'. Instead there are many different concepts of length, each defined by separate and different test operations.

By equating a concept with its test operations, science is freed of apriori concepts and concepts of a metaphysical nature. However, an unwanted consequence of the position taken by the operationists is a proliferation of theoretical concepts. For instance, instead of a single theoretical concept 'temperature', we now have separate temperature concepts corresponding to temperature as measured with a mercury thermometer and temperature as measured with an alcohol thermometer.

Although Bridgman's rigid operationism did not have much impact on the natural sciences, it did much to help develop the empirical tradition in sociology and psychology (for an elaborate overview of the influence of operationism on social science, see Dessens and Jansen, 1987). Operationism in its pure form was soon to be modified by the logical positivists of the Vienna Circle, however. In contrast to Bridgman's view, the logical positivists held that theoretical concepts do have an existence of their own, independent of any specific test operation. It were the logical positivists who introduced the network model of scientific theory, pictured in figure 1.1. An important difference between operationism and logical positivism is the view that the relationship between theoretical concepts and empirical observations is asymmetrical: although theoretical concepts derive their meaning from certain empirical test operations, they have a surplus meaning with regard to the specified operations, making it possible that the theoretical concepts in question may be determined by different test operations. Thus, in this view, temperature is determined by for instance measurement with a mercury thermometer, but it has a surplus meaning with regard to this specific test operation, making it possible that the same concept of temperature can also be measured with an alcohol thermometer.

In the view of the logical positivists, not all theoretical concepts need to be defined by rules of correspondence, linking each theoretical concept to a well defined test operation. Instead, to avoid metaphysical concepts, each theoretical concept must be defined in terms of other theoretical concepts, of which only a subset need to have a definition in empirical terms. This is the distinction between constitutive and epistemic definitions, discussed in the previous paragraph. A generic concept such as length, according to the positivists, and in contrast to the view held by the operationists, does have a meaning independent from any specific test operation. 'Length' is a concept which lacks epistemic definition, but it does have many constitutive definitions, linking different test operations to each other.

It was the influence of the logical positivists, which gave the impetus to the development of the operationalization approach in social science and psychology. Instead of equating a theoretical concept like 'intelligence' with a single test operation, the concept holds a surplus meaning which enables different researchers to make use of different test operations. Although the idea of multiple operationalizations for a single theoretical concept plays in natural as well as in social science, it is here that the two sciences begin to diverge. Whereas no physicist will nowadays dispute that by measunng the diameter of an electron the same concept of length is involved as in measuring interstellar distances (although the two measures involve entirely different test operations), two psychologists may very well disagree whether two tests used for determining a subject's intelligence really measure the same thing

How is it that disputes over the validity of operationalizations in the social sciences arise, whereas they do not arise in the natural sciences? Let us examine more closely the current practice of operationalization in social science, particularly in psychology

1.3 The conceptual entry approach

In psychological theories, a lot of explanatory concepts refer to dispositions of the individual Concepts such as intelligence, neuroticism, introversion, shyness, and so on are supposed to be intrapsychic characteristics They determine the behavior of the individual, but cannot be directly observed The postulated existence of such dispositions is theoretical, and as such can only be inferred To test the hypothetical operation of a theoretical disposition like 'intelligence', psychologists usually follow the methodological guidelines described in De Groot's influential textbook on methodology (De Groot, 1961)

In congruence with the philosophical position taken by logical positivism, a distinction is made between a theoretical concept-as-intended and an empirical concept-as-determined Depending on the abstraction level of the theoretical concept, a considerable gap between the two may exist Thus, for example, the operationalization of the theoretical concept 'gender' will be relatively straightforward and give rise to little controversy But operationalization of the aforementioned concept of intelligence, on the other hand, will be much less simple

Although there are various ways in which a theoretical concept can be operationalized, we will henceforth restrict ourselves to one of the most popular forms used in psychology the questionnaire Often, a researcher will proceed in the following manner Based on his definition of the theoretical concept, he will construct a pool of items, covering his domain of interest Next, the questionnaire is submitted to a sample of subjects, yielding data on the homogeneity of the item set Item means and variances, inter-item correlations, and item-total correlations are then examined to check on the dimensionality of the scale If possible, the researcher will attempt to arrive at a unidimensional scale by deleting items that clearly deviate from the overall pattern, and by adding items that will increase the reliability of the questionnaire without severely disrupting the homogeneity of the scale Of course, if the item set is clearly multidimensional, the researcher should not attempt to arrive at a unidimensional item set, but instead try to work on the construction of subscales The next step will be an investigation of the validity of the scale(s)

It will be obvious that the preliminary step in the procedure described above, the careful definition of the intented theoretical concept, is of crucial importance in determining how well a researcher is likely to succeed in obtaining an adequate operationalization This preliminary step is referred to as conceptualization, and has been given much thought by contributors to the methodology of social science (see e g Blalock, 1982, Hox, 1986, De Jong Gierveld, 1990)

Although no restrictions are placed on the way a researcher wishes to define his theoretical concept, the conceptualization should be both logically consistent and have empirical reference (Hox, 1986) For the demand of logical consistency to be met, conceptualizations should be worded in non-vague, unequivocal terms The demand of empirical reference requires the researcher to make explicit to which class of empirical phenomena his theoretical concept refers By careful delineating the empirical domain of content, the concept may be distinguished from related concepts and phenomena

After careful conceptualization, which may be rendered more systematic with help of techniques such as facet design and Kelly's repertory grid (see De Jong Gierveld, 1990, Hox, 1986), the researcher may proceed with the construction of his measurement instrument, usually a questionnaire With respect to this construction process, De Jong Gierveld (1990) stresses that in order to obtain a valid measurement instrument for the theoretical concept at hand, careful thought should be given to the actual terms that one is going to use in the questionnaire She states that 'when compiling a set of terms for certain empirical phenomena, the researcher must make sure that the terms fit the everyday language of those directly involved and that they are robust for the various subcategories of people involved' (De Jong Gierveld, 1990, p 216)

Once a reliable measurement instrument has been constructed (i e the set of items has been shown to be internally consistent, and/or high correlations have been established between the scores gathered by repeated administrations of the test), the researcher will have to find an answer to the cardinal question concerning the use of operationalizations can the instrument constructed really be considered as a valid operationalization of the intended theoretical concept? This validity question is usually approached from different angles First, the researcher will attempt to determine the content validity of his instrument Unlike the other assessments of validity, the question of content validity cannot be answered with help of statistics Content validity refers to the content of the questionnaire does it really cover the whole domain of relevant empirical phenomena, related to the theoretical concept? For example, although arithmetic ability might be considered as an indication of intelligence, we would not consider an intelligence test containing only tasks on arithmetic to have much content validity Intelligence behavior seems to have a multi-faceted structure, and an adequate operationalization of the concept should also contain questions and tasks pertaining to the other relevant aspects of intelligence

Content validity can only be assessed by checking whether the construct as conceptualized has been adequately represented in the questionnaire But, as Loevinger (1957) remarked, since we cannot be sure that we had delineated the domain of content adequately, the question of the content validity of a measurement instrument actually cannot be answered A good content coverage of the intended construct as conceptualized is a necessary but not sufficient condition for good content validity Therefore it is felt by some critics that instead of speaking of content validity, we had better spoken of content coverage Content validity as such cannot be determined (cf Messick, 1975)

Establishing the content validity of the questionnaire is considered as providing only a partial answer to the validity question Historically, the oldest way of providing an additional answer to the validity question is provided by the determination of criterion validity Criterion validity is determined by calculating the correlation between scores obtained on the measurement instrument and scores obtained on some criterion measure. For example, we might correlate intelligence test scores with some measure of academic success, or we might correlate scores obtained on a test for neuroticism with frequency of visiting a psychiatrist. However, the notion of criterion validity was considered dissatisfactory. An obvious and important objection to this type of validation procedure is the fact that many different criteria could be used, but they are not likely to yield similar correlations with the measurement instrument to be validated. How can we speak of the criterion validity of a measurement instrument, when the outcome depends on the specific criterion used?

The dissatisfaction with this atheoretical type of validation led to the introduction of construct validation, elaborated by Cronbach and Meehl (1955). The procedure of construct validation entails the formulation of a so-called nomological network, in which the theoretical concept that we have operationalized plays a central part. In a nomological network three types of relations should be specified:

- relations among theoretical concepts
- relations among observable characteristics;
- relations between theoretical concepts and observable characteristics;

For example, suppose that a researcher has constructed a measurement instrument for the theoretical concept of racism. Based on theory, he is able to specify the following relationships between racism and some other theoretical concepts:

- between racism and ethnocentricity: a strong positive relationship
- between racism and fascism: a strong positive relationship
- between racism and liberalism: a negative relationship
- between racism and IQ: a zero relationship

If validated measurement instruments for all of the other theoretical concepts in this nomological network exist, our researcher can proceed to administer his measurement instruments to a sample of subjects, and determine the construct validity for his operationalization of racism by studying the correlations between the various test scores. If the pattern of correlations between the various measurement instruments corresponds to the predicted pattern of relationships between the theoretical concepts, the operationalization for racism is shown to possess good construct validity. Of course, succesful construct validation will be more impressive as the number of relationships specified in the nomological network increases.

However, if the pattern of correlations does not resemble the pattern of predicted relationships, at least two different interpretations are possible either the measurement instrument under investigation does not constitute a valid operationalization of the intended theoretical concept, or the theory that generated the predicted relationships is incorrect. On the other hand, if the correlation matrix does reflect all the predicted patterns, we may still wonder what it actually means to say that our measurement instrument has good construct validity Mostly, relationships are specified ordinally, which means that a predicted positive relationship between A and B will be verified in all instances where the correlation coefficient between A and B exceeds the lowest positive value that significantly deviates from zero Can this be used as convincing evidence that our operationalization adequately captures the theoretical concept it is intended to measure?

Whether one wishes to answer this question in the affirmative or not, it is an undisputable fact that a great variety of different operationalizations will yield the expected correlation pattern Although strictly speaking, each of these different operationalizations of the same theoretical concept has good construct validity, when used in actual research the different operationalizations may give rise to different and sometimes conflicting results This seems to be one of the main reasons why psychology, and indeed social science in general, has not been able to establish a substantial amount of general laws, which may be used as foundations for cumulative research As a way out of this unwanted state of affairs, De Groot suggested that the scientific forum ('the forum of expert opinion to which in principal all scientific statements are at all times referred' - cf De Groot, 1969, p 27) should develop into an arbitration committee that must reach consensus on theories, definitions of theoretical concepts, and empirical realizations of those concepts Based on such consensus, more coordinated research effort could be developed which might eventually lead to a cumulative body of knowledge (for an overview of his ideas on the scientific forum, see De Groot, 1982)

1.4 The empirical entry approach

The question still has not been answered why the potential use of different operationalizations should not hamper the process of theoretical development in the natural sciences, whereas in the social sciences the lack of agreement on the use of operationalizations for intented theoretical concepts has obstructed progress in theoretical understanding The answer that will form the starting point for this thesis was formulated by methodologist and psychometrician Louis Guttman

Guttman pointed out that the traditional research practice of constructing a unidimensional measurement instrument for some intended theoretical concept was tantamount to a natural scientist setting out to gather evidence that the world is flat, and in the process of doing so ignoring all evidence to the contrary (Guttman, 1981a) The point that Guttman was trying to make is that we can create empirical illusions, if we are willing to distort empirical reality by making a conscious selection of data By postulating a certain collection of items to represent a unidimensional theoretical concept, and by deleting all items that do not fit a unidimensional pattern, this is precisely what social scientists are traditionally doing They start with an imaginary concept, and when the data do not support the empirical reality of the intended concept, they manipulate the data until at last the desired pictured emerges As this traditional approach starts with the postulation of the existence of an imaginary concept, we will refer to it as the conceptual entry approach

Guttman's view was that instead of trying to create empirical illusions, we should be aiming at the detection and prediction of lawful patterns in a given set of empirical observations We should not set out with the definition of a theoretical concept, but instead start with the definition of a domain of empirical phenomena A theory should aim to predict a lawful pattern in this domain of interest. This strategy of taking empirical, rather than conceptual phenomena as the starting point for research, we will refer to as the empirical entry approach, as a contrast to the traditional conceptual entry approach

Guttman pointed out that in physics all empirical observations are plotted in a coordinate system, representing distance and time (Guttman, 1981a) Theory construction in physics concerns lawful relationships that can be stated in terms of these three quantitative facets of empirical reality Likewise, Guttman felt that psychology should start with the formulation of a number of facets, in terms of which lawful relationships may be specified Contrary to physics, facets in psychology and social science are likely to be of a qualitative, rather than a quantitative nature But just like the space-time coordinate system in physics, such a system of observations can be used as a coordinate system for plotting empirical phenomena studied by social science Guttman referred to such coordinate systems as 'facet designs', and stressed that the way they are formulated is essentially free the definition of a domain of empirical observations is never correct or incorrect in itself, the value of a given facet design is determined by its fruitfulness in uncovering lawful patterns (Guttman, 1981a)

A theory in social science, according to Guttman, should not consist of verbal statements relating abstract theoretical concepts without clear empirical reference, but instead specify lawful relationships in terms of the facets of the chosen coordinate system To allow for corroboration or refutation of theoretical hypotheses, they should be cast in terms of the data analyses to be used For example, a theory on intelligence behavior might specify that a given set of empirical observations will yield a unidimensional scale Instead of deleting items that do not fit this pattern, Guttman would assert that either the datamatrix will show the triangular pattern corresponding to the scalogram model, in which case the hypothesis is corroborated, or it does not, in which case the hypothesis is refuted and there exists no unidimensionality in the domain of observations as defined[2)] In the latter case, the researcher will explore the possibility of multidimensional patterns

For some unclear reason, Guttman and his followers have elaborated this empirical entry approach in a single and rather restrictive direction Their methodological approach for coordinating theory construction and research has become known as facet theory, and almost exclusively involves the specification of hypotheses on patterns of correlations between stimuli (usually questionnaire items) that may be derived from a given facet design The testing of these hypotheses is performed with help of a multidimensional scaling technique known as smallest space analysis (SSA), and corroboration of the hypotheses amounts to the detection of a prespecified geometrical pattern in the SSA space When such a pattern repeatedly shows up in replications of the original study, lawfulness is said to have been established for a given domain of empirical observations (Levy, 1981)

2) This conclusion would be somewhat premature The data might conform to a probabilistic unidimensional scaling model

Since Guttman first began writing about his views on facet theory, his methodological ideas have attracted a following resulting in facet theoretical publications on such diverse topics as intelligence, quality of life, motivation for slimming, etc (see Canter, 1985a, Borg,1979) However, the methodological views of Guttman have not resulted in a new paradigm for social science, and as a methodological strategy, facet theory seems to have stopped developing shortly after its conception

One of the reasons why the facet theoretical approach has not gained any significant popularity within the social science community, seems to be the restrictive coupling of the use of facet design to the analyses with SSA As Schwager (1988) points out, the exclusive focus on patterns of correlations does not permit the uncovering of general laws in the sense of the deductive nomological explanatory model, and therefore no progressive theoretical understanding is possible Furthermore, as Roskam (1989a) has noted, the hypotheses formulated by facet theorists do not refer to the psychological or sociological process generating the data, but are derived from principles for the prediction of order relationships, that are independent of any substantive domain of interest Therefore the hypotheses of facet theorists do not attribute to psychological or sociological understanding of behavioral phenomena

What we may conclude is that the methodological recommendations underlying facet theory, which could in potential prove a viable alternative for the conceptual entry approach, have not born fruit because of its self imposed limitations and restrictions The question that we are faced with is whether an alternative elaboration of facet theory is possible, that will lead to a better fulfillment of Guttman's original ideas

1.1 Formalized theory of appraisive judgments

Guttman's view of the empirical entry approach to social science may be summarized by the following points

- a theory should always pertain to a well defined domain,
- such a domain of observations must be represented with a coordinate system, generally known as facet design,
- a theory predicts lawful relationships between elements of facets,
- a theory should be stated in terms of the data analyses to be used,
- corroboration of the theory amounts to retrieval of the predicted patterns in the data matrix

The lawful relationships that Guttman focussed on pertained to perceived similarities between combinations of facet elements, based on rationales like the contiguity principle (Foa, 1965) the more facet elements two stimuli have in common, the more they will be perceived as similar Such predictions are tested by analyzing correlations between stimuli (in facet theory, these are usually questionnaire items) However, as we noted above, such principles for predicting the relative sizes of correlations are not specific to any particular domain For example, a facet design specifying the domain of intelligence behavior might give rise to the same predictions of lawful patterns as a facet design specifying the domain of attitude behavior In other words, the form of lawfulness predicted by facet theory is not related to the psychological process underlying the fact that one person will solve a problem correctly, whereas another will not, or the process underlying the observations that one person displays a positive attitude toward some object whereas another person does not It are these data generating processes that a psychological theory seeks to understand, and therefore we agree with Roskam (1981) that predictions of lawful relationships between elements of facets should be derived from such a psychological theory on the data generating process

This, we feel, is the crucial point where Guttman's facet approach should take a different turn Because facet theoretical hypotheses always pertain to patterns of similarities between situations, the use of SSA as a means of data analysis is a logical strategy For a test of a substantive theory on the data generating process, an alternative strategy should be followed A substantive theory - just like traditional facet theory - pertains to relationships between elements of facets The different facets in the design pertain to characteristics of the subject (P), characteristics of the situation (S), and characteristics of the responses (R), respectively A psychological datum is the observation that a person (P) in confrontation with a situation (S) delivers a response (R) A theory predicts which combinations of elements (PxSxR) will occur, and which combinations will not occur In other words, a substantive theory describes the structure of the data matrix Therefore a fruitful strategy to follow will be to formalize the substantive theory into a mathematical model This means that 'we estimate a set of formal "things" (real number, parameters of a distribution, but also orderings, dimensionality, transitive closure, and other), which satisfy the restrictions of a theory, and into which the data are mapped with the least possible distortion If this succeeds, we conclude that the data fit the model, and vice versa, and as a consequence, the data correspond to the theory of which the model and its estimated "things" is a realization Conversely, the data can be seen as a realization of the theory' (Roskam, 1990, p 194)

The model parameters that govern the distribution of the data are linked to certain aspects of the data Since the model is the formalization of the substantive theory, these parameters have substantive meaning As such they constitute theoretical concepts Concepts that have not been measured in advance in order to test the theory in which they function, but which have been proved to exist empirically, and as a consequence yield measurements

Although these concepts are not operationalized in advance, as in the operationalization approach, they are operationally defined - i e they derive their meaning from specific test operations which have empirically been shown to yield measurements Therefore, in the empirical entry approach as here proposed we return to an operational definition of concepts in the sense of Bridgman's original operationism, and contrary to the strategy of operationalism as it evolved in later years Adhering to the view that a distinction exists between theoretical concepts and empirical operations (as maintained by the logical positivists), we believe that formalized theorizing in social science and psychology will permit the development of a cumulative body of knowledge, represented by a theoretical structure as in figure 1 1

The idea of formalized theory for psychology is considered by some as impossible, since the subject matter of psychology is supposed to be too complex However, as Coombs noted 'The same people who perceive a relationship between mathematics and psychology as a contradiction will discriminate between two books in selecting a gift for a friend or will recommend a movie to one friend but not to another This indicates that they perceive some kind of consistency in the behavior of each of their friends which they have abstracted, generalized, and applied to new situations But such a capacity on their part requires a belief in rules and principles and reason, and this differs from mathematical psychology only in form and self-awareness (Coombs, 1983, p 3)

The formalization of a psychological theory requires that the theory pertains to a well defined domain, which we (following Roskam, 1989b) believe is best achieved with help of a facet design Basically, all psychological theories pertain to choice behavior, in that a response made by a subject can always be considered as a choice (or a judgement) out of a set of possible choices (or judgements) Roughly, Roskam (1989a,b, 1991) discerns three different types of choice behavior First, there is the class of studies that deal with response behavior that may be objectively classified as either correct or incorrect Examples are tasks of stimulus recognition, problem solving tasks and memorizing tasks In each of these cases the subject is to infer the correct response and hence one might call this class of choice behavior inferential choice behavior (alternatively, we might speak of inferential judgements) Second, there is choice behavior that reflects the preference of a subject for one stimulus over another Hence, one might refer to this type of behavior as preferential choice behavior Third and finally, there are statements of individuals concerning their feeling and thinking states A subject ventilates a certain opinion on some issue, whereas another subject appraises the same matter in a different way Alternatively, a person appraises himself as feeling lonely, angry or uncertain in a given situation, whereas another person does not In all such cases, one may say that the subject makes an appraisive choice, or alternatively one can say that he or she formulates an appraisive judgement

Formalized theories in mathematical psychology and psychonomics usually deal with domains of either inferential choice behavior or preferential choice behavior The domains of appraisive choices or judgements[3)] have so far been almost exclusively approached within the conceptual entry tradition, however One of the objectives of the present research is to investigate whether an empirical entry approach to the study of appraisive judgements is feasible To this end we wish to study a domain that has already been extensively investigated within the conceptual entry tradition namely the domain of the appraisal of loneliness

Although the methodology we wish to unfold and test on its merits is not restricted to any particular type of data collection, we will make use of the questionnaire (as was also customary in facet theory) Oosterveld (1993) reviewed the various methods of questionnaire construction in social science, and roughly identified three different approaches The first he referred to as the rational

3) Because in ordinary speech an appraisal connotes a judgement rather than a choice, we will henceforth speak of appraisive judgements

intuitive method of questionnaire construction. Researchers employing this method seek to construct a questionnaire for the measurement of some concept by following one's intuition as to what kind of items should be in the questionnaire The main endeavour is to optimize the face validity of the ques tionnaire, and for this purpose judges are used to determine whether a given item is or is not indicative for the trait to be measured The explorative method forms a second major method of questionnaire construction Following this approach, researchers rely on techniques such as factor analysis or multidimensional scaling for the identification of possible scales In subsequent cross-validation research, the empirical meaningfulness of the scales is determined The third method Oosterveld mentions he calls the deductive method of questionnaire construction The principal variant of this deductive method is formed by the approach in which the researcher attempts to establish the construct validity of his questionnaire by testing a nomological network, as outlined in section 1 3

All the methods of questionnaire construction that Oosterveld mentions follow what we have called the conceptual entry approach The purpose of constructing a questionnaire is to obtain a measurement instrument for some intended concept. After construction, a process of validation (whether this be cross-validation, face validation, construct validation, or some other form of determining validity) must determine whether the researcher has obtained an acceptable measurement instrument In the empirical entry approach that we wish to advocate, questionnaires are not used as measurement instruments, but as *research instruments* The items of the questionnaire are symbolical situations and the responses to these items form observations that may, but need not constitute measurements The questionnaire contains the observations we need to make in order to test a theory on our domain of interest Our theory may predict a structure in the data matrix that allows for an ordering of subjects and situations Empirical research must subsequently determine whether the structure in the data matrix conforms to the structure predicted, and hence whether the empirical domain of interest permits some sort of scaling

The questions that we wish to answer in the present research can be distinguished as either methodological or substantive (pertaining to the domain of loneliness) questions As we just stated, the basic research problem is of a methodological nature, namely to examine whether an empirical entry approach as outlined above is feasible for a domain of appraissive judgements Is it possible to construct a formalized theory pertaining to a well defined system of observations, such that the approach may be qualified as a fruitful alternative to the traditional conceptual entry approach? A further methodological objective will be to investigate how a facet design should ideally be constructed so as to fulfil its function as a coordinate system in the most fruitful way The literature on facet design is rarely very explicit about this Furthermore, the important question will have to be addressed of how to translate the possible combinations of facet elements (known in the literature as structuples) into readable questionnaire items The question of how to formalize a substantive theory into a mathematical model will also be examined For this purpose, use will be made of Coombs' theory of data (cf Coombs, 1964) Connected to the question of how to formalize a substantive theory, is the question of how to analyze the theory, once formalized

Apart from methodological questions, a number of substantive questions will be addressed The first question we will consider is can the proneness of individuals to judge themselves as lonely, and the potential of situations to elicit loneliness in individuals both be referred to a unidimensional latent trait? Secondly, we will study what characteristics of a situation determine its potential to elicit loneliness, and what characteristics of individuals determine their proneness to appraise themselves as lonely

The plan of the thesis is as follows In chapter 2, we will examine in depth the merits and potential of Guttman's facet theory and facet design, as well as its shortcomings In chapter 3, our alternative elaboration of Guttman's facet approach will be outlined In chapter 4, an overview of research on loneliness within the conceptual entry tradition will be given In chapter 5, our research plan for an empirical entry approach to the study of loneliness will be presented In this chapter, an overview will be given of the steps we have taken to construct an appropriate facet design, and the process of translating structuples into questionnaire items will be reviewed In chapter 6, the results of a pilot study, conducted to check on the comprehensibility of the questionnaire items that were constructed and to select appropriate response alternatives to be used in the main studies, will be presented Chapter 7 discusses the steps taken to analyze the data, and presents the results of the first main study Chapter 8 presents the results of the second main study, which was meant to calibrate results found in the first In the final chapter, an overview will be given of the conclusions to be drawn out of this research The conclusions will be evaluated in the light of the research problems, and some suggestions for follow-up research will be made

2 FACET THEORY AND FACET DESIGN

2.1 Introduction

Although not everybody will agree that the operationalization approach constitutes a dead end for psychology, it cannot be denied that at present academic psychology constitutes a collection of research efforts that are badly coordinated and have so far failed to produce a cumulative body of knowledge. At the very least, the shortcomings of the operationalization approach contributed to this defect.

Among those who sought a methodological remedy for this unwanted state of affairs, which may be seen as a sign of scientific immaturity, was Louis Guttman. Out of his philosophical preoccupation with issues concerning scaling and measurement grew the methodology of facet theory. This general methodology for investigations in the social sciences 'comprises a) a technique for the design of studies, b) a set of more or less general principles for the prediction of structure in the actual empirical observations (metatheory), and c) a philosophical theory about the nature of empirical research in the social sciences' (see Borg, 1979, p.65). The techniques provided by the methodology of facet theory enables the facilitation of 'theory construction by establishing lawfulness under a variety of conditions' (Levy, 1990). The implication is that theory construction within the framework of facet theory will be of a cumulative nature.

To understand the logic behind facet theory, we will have to trace its origins. These origins may be found in Guttman's early methodological development. Philosophically aligned to positivism, Guttman felt dissatisfaction with the practice of scale construction. His alternative in the form of scale analysis eventually evolved into facet theory. Guttman's methodological views and their relation with facet theory will be examined in section 2.

Actually, the methodology of facet theory may be seen as a recipe for doing research (Brown, 1985, Canter, 1985b). Those undertaking research within the framework of facet theory, will be proceeding along a number of prespecified steps. First, they will construct a definitional system of observations. Such a definitional system is called a facet design, and will be discussed in section 3. Second, a number of hypotheses will be formulated. For a facet theorist, hypothesis formation is guided by considerations of order among facets and among facet elements. For a significant part, the hypothesized order relations are derived from the so-called principle of contiguity. This issue, along with related issues concerning the formation of hypotheses in facet theory will be discussed in section 4. After the specification of hypotheses, the facet theorist proceeds with the collection of data. To this end, combinations of facet elements - called structuples - are usually translated into readable questionnaire items. Data collection within the context of facet theory will be reviewed in section 5. After the collection of data, association among items is usually determined with help of some similarity coefficient. The resulting matrix is then analyzed with help of SSA or with some MDS-programme, which should reveal a geometric structure that is in congruence with the hypothesized order relations

Data analysis within facet theory will be discussed in section 6 This chapter will conclude with an assessment of the extent to which the facet approach provides a genuine improvement in the shortcomings which are inherent in the traditional operationalization approach

2.2 Origin and logic of facet theory

The origins of facet theory may be traced to Guttman's work on the development of scalogram analysis (Schwager, 1988) Guttman was dissatisfied with traditional scaling methods, where items were deleted from or added to an original sample until at last a unidimensional structure emerged To this practice of scale construction Guttman objected that 'scalability is not to be desired or constructed' (Guttman, 1981a) He compared such deliberate construction of a scale to the deliberate construction of a (non-existent) empirical fact

'To say that one "wants to construct' a scale of attitude towards something, or of achievement in some field, is almost analogous to saying that one "wants" the world to be flat ( ) To throw away items that do not "fit" unidimensionality is like throwing away evidence that the world is round' (Guttman, 1981a, p 39)

As an alternative to the practice of scale construction, Guttman proposes scale analysis (Guttman, 1971) Guttman defines a scale as a one-dimensional structure The structure of the data is an empirical fact which may be either uni- or multidimensional Scalability - or unidimensionality - is an hypothesis to be put to the test Analysis will show whether or not a scale actually exists

Apart from his objections against scale construction, Guttman also objected to the traditional approach in which a constructed unidimensional scale was validated by correlating scores of subjects with external criteria Guttman's alternative approach consisted of formulating a definition of the universe of content that he was concerned with Such a definition constituted 'a delimited totality of behavior with respect to something' (Guttman, 1950) If analysis shows this universe of content to possess a unidimensional structure, than a scale exists and measurement becomes possible Validation is irrelevant the content of the scale has been defined apriori by the researcher

This approach to scaling as an hypothesis rather than as a construction technique brings it automatically into the realm of theory formation Scalability as an hypothesis makes it the offspring of a theory concerning a universe of content Thus, Guttman's approach to scaling naturally evolved into a general approach towards theory construction The specific shape into which this general approach eventually developed is now known as facet theory

At the basis of Guttman's approach to theory construction lies his definition of theory

'A theory is an hypothesis of a correspondence between a definitional system for a universe of observations and an aspect of the empirical structure of those observations, together with a rationale for such an hypothesis' (Guttman, 1981b)

Schwager (1988) denotes Guttman as a radical positivist. He rejects theoretical concepts and wishes to deal exclusively with manifest relationships among observables. These observables are specified in the definitional system A particularly useful and reliable type of definitional system forms the facet design in its form of a mapping sentence:

'A strategy for attaining reliability is to make a list of related concepts which might be confused with the one intended, and then to define all the concepts simultaneously in one facet framework. Such a mapping helps to make explicit what the target concept has in common with the others, and how it differs from them' (Guttman, 1971, p.329)

As an example of this type of definition, Guttman employs it to define 'measurement'. The problem of what exactly constitutes measurement is one that occupied Guttman ever since his student days He eventually concluded that all too often scientists are attempting to specify what 'measurement' oughts to mean, rather than attempting to specify in what context the term 'measurement' is used. Using his strategy of a faceted definition, Guttman attempts to define measurement theory by contrasting it with the related but slightly different topics of statistical and probability theory (Guttman, 1971)[1]

TABLE 2.1: EXAMPLE OF A FACETED DEFINITION

Measurement			hypothesis construction
Statistical	theory ——>	a theory of	inference from samples
Probability			functions

for aspects of a universe of observations recorded in terms of

unordered		with	
ordered	sets of categories,		special reference to
numerical		without	

regression estimates.

The example given in table 2.1 is one of a variety of possible 'mapping sentences', containing a

[1] Note that Guttman is defining measurement theory rather than 'measurement' However, as he puts it, there can be no measurement without an underlying theory of measurement So when we are speaking of measurement, we are implying a theory of measurement (Guttman, 1971)

domain in the form of a simple set, and a range in the form of a Cartesian product set. Component sets of this Cartesian product set define the three related but different forms of theory (see tables 2.2 - 2.4)[2].

TABLE 2.2: A FACETED DEFINITION OF MEASUREMENT THEORY

```
Measurement theory ——> a theory of (hypothesis construction)

for aspects of a universe of observations recorded in terms of

   unordered
   ordered      sets of categories, (with) special reference to
   numerical

regression estimates.
```

In a similar vein, a researcher may employ the mapping sentence technique to define a content universe, pertaining to his domain of interest. Studying attitudes, for example, one could define ones universe of content as shown in table 2.5 (taken from Guttman in Gratch, 1973).
Mapping sentences function as coordinate systems just like the one employed in physics. As Guttman notes, one of the reasons for the success of physics may be the fact that relevant observations may be defined with help of only three basic facets: distance, mass, and time (Guttman, 1981b, p.61). These three facets are numerical. In contrast, social science deals with observations that need to be defined in many more than just three facets. In addition, most of the facets that are the objective of social science are qualitative.

The physicists' decision to focus on distance, mass and time rather than on some other facet is purely motivated by the fact that these facets are powerful in the elucidation of natural laws. They would have been free to focus on other facets, but these would have been less fruitful in yielding valuable insights into the workings of nature. Likewise, the facets that a social scientist chooses to focus on can only be motivated by his expectation that these facets, rather than some other facets, will prove fruitful in the identification of empirical regularities. Other researchers may criticize his choice of particular facets, but only on the grounds that other facets might have been more fruitful for theory construction. No choice of facets is ever inherently right or wrong.

[2] In this example, facet designs are used to define meta concepts. They are also frequently used for the definition of theoretical concepts, and we will primarily use facet design for the definition of empirical domains.

TABLE 2.3: A FACETED DEFINITION OF STATISTICAL THEORY

```
Statistical theory ——>  a theory of (inference from samples)

for aspects of a universe of observations recorded in terms of

   unordered
   ordered     sets of categories, (without) special reference to
   numerical

regression estimates.
```

TABLE 2.4: A FACETED DEFINITION OF PROBABILITY THEORY

```
Probability theory ——>  a theory of (functions)

for aspects of a universe of observations recorded in terms of

   unordered
   ordered     sets of categories, (without) special reference to
   numerical

regression estimates.
```

This is an interesting point of view that shows how strongly Guttman's approach to theory formation differs from that of the operationalists, and how it is much more aligned with physical science. We have seen in the previous chapter that one of the major shortcomings in social science theories is the fact that it is not clear to what domain these theories pertain. This fuzzyness is partly enhanced by the practice of operationalization, where the same theoretical concepts are often translated into

TABLE 2.5· A FACETED DEFINITION OF THE UNIVERSE OF ATTITUDE ITEMS

An item belongs to the universe of attitude items if and only if its

domain asks about behavior in a	cognitive affective instrumental	modality toward an
object, and its range is ordered from	very positive to very negative	towards that

object.

different concepts-as-determined This is a direct outcome of the fact that there is no one-to-one correspondence between the concept-as-intended and the concept-as-determined Theoretical concepts have a surplus meaning that allows for different operationalizations of it The result is that some of these may corroborate hypotheses that were derived from the theory, whereas others may refute them

This problem does not exist in the physical sciences because there theoretical assertions directly refer to the facets that specify their domain of interest Guttman believes that cumulative social science will only be possible if social scientists, like their physicist colleagues, take as a starting point a faceted definition of their domain of interest Theories, like they do in the physical sciences, should then pertain to the role of the facets in the domain Theories are not about metaphysical entities that should somehow be grasped by an (to some extent arbitrary) operationalization, they are about relations between observable phenomena Observable phenomena, that are characterized by the facets of the definitional system

The relations predicted by the theory should be retrieved empirically if the theory is to be proved valid However, before a test of the theory is possible, observations must first be made, and it must be decided upon which aspect of the empirical structure should be studied Most facet theorists make observations with help of a questionnaire This means that nonverbal behavior is determined in a verbal fashion Although this has been extensively criticized (see e g Dessens & Jansen, 1987) Guttman asserts 'Nonverbal behavior need not be more predictable from nonverbal behavior than it is from verbal behavior' (Guttman, 1981b), thereby justifying the use of questionnaires The empirical structure studied within facet theory is the correlational structure of the domain of content The rationale behind this choice and its shortcomings will be dealt with in a later section

When dealing with observable phenomena, whether in a verbal or in a nonverbal form, the establishing of empirical regularities, i e of lawfulness, becomes possible The already established first and second laws (see section 2 4) attest to this fact That lawfulness may be established within facet theory is a direct result of working with clearly defined domains of interest, and of directly translating the hypotheses concerning the domain of interest in terms of the data analysis to be used The establishment of lawfulness seems to be a prerequisite for cumulative theory construction to become possible It appears then, that the facet approach does indeed hold a promise for the future of social science research

2.3 The definitional system in facet theory

2 3 1 Facet design and mapping sentence

As was stated in the previous section, the faceted definition of relevant observations may be viewed as a coordinate system, similar to the one employed in physics, but with different facets In social science research, we are studying the confrontation of a population P with a set of stimuli S leading to a set of responses R We may express this formally as a mapping of the Cartesian product PS into R

$$PS \longrightarrow R$$

The set of stimuli S forms the universe of content, and may be specified with help of a number of facets Such facets collectively define the universe of content Suppose we have a universe of content that is specified by two situation facets A and B Facet A has i number of elements, and facet B j number of elements The Cartesian product AB then specifies all the observations that pertain to the universe of content under consideration Each potential observation constitutes an element s(i,j) from the set S, with coordinates a(i) and b(j) In facet theory, such coordinates are called structs and the combinations of structs yielded by the Cartesian product of facets, in other words, the elements s(i,j) of S, are termed structuples

Just like the universe of content may be specified by a number of facets, the population may also be specified by one or more facets Some very general facets characterizing a population are age and sex, but many more and less general facets may be taken up Often however, the population is left unspecified Suppose that our population is characterized by two facets A and B, and our universe of content is characterized by three facets C, D and E, then our domain of observations PS is given by the Cartesian product ABCDE A given element from P (that is, a subject) will in confrontation with a given element from S deliver a response, which forms an element from the set R, the response range

Like the P and S sets, the set of responses R may also be described by one or more (response) facets Responses to intelligence items, for example, could be classified as either correct or incorrect (R1), and as either delivered fast or delivered slow (R2) In the latter case, the set of responses R may be defined as the Cartesian product R1R2 This Cartesian product forms the range into which the elements of the domain are mapped Different subjects may give the same response, but a single subject in confrontation with a single situation delivers only a single response, and therefore this mapping is of the many-to-one type (see Borg, 1979, for an extended formal discussion of facet design)

A facet design may thus consist of three types of facets population, situation, and response facets Runkel & McGrath (1972) have laid down a number of principles of classification in choosing facets and facet elements that should be followed in order to obtain a maximally useful facet design

- Every observation derived from the facet design should be classifiable by reference to all the facets in the domain,

- Elements of a facet should be exhaustive, i e every observation must be classifiable in one of the elements,

- Elements of a facet should be mutually exclusive,

- The logical relations among facets should be specified (this is done by formulating the facet design as a mapping sentence, see below),

- Taken together, the facets should exhaustively describe the domain of interest,

The requirement that facet elements should be exhaustive cannot always be easily met Sometimes a researcher wishes to include a facet which constitutes an open set of elements For instance, suppose a researcher is interested in formulating a faceted definition of discrimination behavior One of the facets he will probably wish to include in his design, is one specifying the group characteristics that may form the basis for discrimination behavior In principle, this facet could be extended with new elements indefinitely We could include 'colour of hair', 'colour of eyes', 'size of shoes', etc , but will refrain from doing so because we do not believe that such characteristics are likely to form a basis for discrimination behavior Instead, we will limit ourselves to group characteristics that experience and/or theoretical considerations tell us will possibly lead to such behavior In the case of discrimination behavior, relevant group characteristics would be race, sex, sexual orientation, etc Exhaustion of elements in this facet means that we have included all the elements that our personal judgement believes to be of relevance Another researcher may of course suggest the inclusion of still more elements Therefore this type of facet may best be called an 'open' facet, in contrast with 'closed' facets which have a natural boundary, like sex ('male' vs 'female')

Sometimes it will be possible to close an open facet by making use of more generic categories than one originally had in mind For example, in the facet design of discrimination behavior we may also wish to include a facet specifying the 'discrimination act' At the most concrete level, this constitutes an open facet with elements such as 'hitting someone', 'denying someone a job', 'insulting someone', etc By choosing more generic categories like 'verbal' vs 'physical' (act of discrimination), we turn this open facet into a closed one, since all discrimination acts are necessarily either verbal or physical

Meeting the requirement that logical relations among facets should be specified, means that we turn our facet design, a loose collection of population, situation, and response facets, into a mapping sentence which relates the various facets with help of verbal connectives. An example of a faceted definition in the form of a mapping sentence is given in table 2.6 (taken from Borg, 1979).

TABLE 2.6: MAPPING SENTENCE ON 'QUALITY OF LIFE'

The satisfaction of a	18-24 25-35 36+	years old respondent (X) who associates

himself with the	republican democratic independent	party and has a (college) education with

a state of resources for	his activities in area of life	education economics residence spare time family health work general

→	very positive positive negative very negative	satisfaction.

We see how in this mapping sentence the logical relations between the various facets are specified. The range of this mapping sentence may be termed a common response range, since for all items in the domain it is categorized, and categorized in the same sense. A common response range does not imply a common response format for all items; it merely means that each response to any item may be categorized in terms of the common response range of the faceted definition.

The mapping sentence has been described by Guttman (1981a) as a generalization of Fisher's experimental design Careful design of observations is necessary to allow for statistical inferences, but quite often sampling of items for the construction of some psychological test is done very loosely The mapping sentence provides a stratified sampling theory for constructing variables for a universe of content, thus bringing systematization in this important research phase

According to Levy (cited in Brown, 1985) 'Guttman's mapping sentence idea is intended to promote these two purposes (as well as many more) (a) definition of the universe of observations, and (b) in a form that aids perception of systematic relationships with the data' This latter point is stressed by Guttman himself by saying that 'definitions without hypotheses in mind may merely lead to sterility' (Guttman, 1981b) He illustrates this by pointing to Mendeleef who had various uniformities of compounds of elements in mind when he classified the elements Likewise, his definition of attitude is inspired by the first and second laws that he had in mind

Where Guttman's view should be taken to imply that one should choose facets (that is coordinates) that may reveal interesting interrelationships (and thus lead the way to theory formation), we fully subscribe it Focussing on space and time coordinates has proved extremely fruitful in uncovering all kinds of lawful interrelationships The choice of this definitional system does not imply particular kinds of lawfulness, but where Guttman states that his definitional system for attitudes was motivated by the first and second laws that he had in the back of his mind, such an implication does seem to exist In facet theory lawfulness is deduced from the principle of contiguity (which will be examined in the next section), which says that structuples that are more alike in the definitional system will correspond to observations that are more similar empirically This kind of lawfulness is therefore implied by the particular design of the definitional system, whereas physical laws are in no way implied by the adoption of the space-time coordinate system This is a point of criticism raised by Roskam (1989a), who speaks of a contamination of the definitional system with the theory According to Roskam, theories refer to a definitional system, but the latter should not presuppose the former A theory refers to a definitional system, but observations derived from the latter should make it possible to refute the theory In the sense that a particular theory requires particular observations to be able to test it, we subscribe Guttman's point that definitions should be formulated with an eye on the hypotheses that one entertains We should not blindly adopt facets with the subsequent aim to analyze data haphazardly and see what possible structures may emerge (Guttman rightly argues that this practice - especially manifest in the application of factor analysis - fails to produce empirical lawfulness, see Guttman, 1981a) However, we reject the contamination of definitional systems with theory that seems to be common in facet theory We will further elaborate on our objections in this regard in section 2 5

Apart from structuring the observations to be made apriori with help of facet design, it is also possible to structure an already existing body of observations by inferring the underlying facets Such an approach is called facet analysis and has proved useful in bringing order in an existing research field, where it is frequently not uncommon for different researchers to use the same concepts to denote different events, and to use different concepts to denote the same events (see e.g. Payne et al, 1976). It has also proved its use in clarifying to what universe of content a particular questionnaire refers. Van Breukelen (1989) clarified the universe of content of a popular achievement motivation test with help of facet analysis, and was able to conclude that neither did the test measure what it was intended to measure, nor did the collection of items represent an adequate sample of the universe of content. Van de Wurff (1987) has provided some useful guidelines for inferring facets underlying the collection of items of a (body of) questionnaire(s).

2.3.3 Facet design as domain definition or research design

Reading research reports in which use of some sort of facet design is described, one is immediately struck by the apparently immense diversity of forms in which mapping sentences occur. Some, like the example taken from Guttman (see Levy, 1981), presented in table 2.7, employ only generic facets, others, like the example shown in table 2.8 (taken from Gough, 1985), make use of facets that are so specific that taken together they yield an immediately recognizable real life situation.

TABLE 2.7: MAPPING SENTENCE ON THE UNIVERSE OF INTELLIGENCE ITEMS

```
An item belongs to the universe of intelligence items if and only if

                               logical
its domain asks about a        factual     objective rule, and its range is
                               semantic

                             very right
ordered from     ------->        to        with respect to that rule.
                             very wrong
```

Also, where some facet designs are very articulate, with use of a great number of facets that are split up into many elements, others are so global in their formulation that they seemingly embrace an almost endless variety of different situations. For those who wish to employ the technique of facet design, little explanation or justification is given for the specific form chosen, thus providing the interested researcher little clues as to how to proceed in his own study. This lack of clarity in the way facet design is employed, may be the cause of much unwanted confusion. We feel that this confusion actually arises from the existence of a distinction in the functional use of facet design that is left

TABLE 2.8: MAPPING SENTENCE ON MOTIVATION FOR SLIMMING

```
                                             her own experience
                                             her husband
To what extent does person (X) feel that                          led her
                                             her doctor
                                             the media

                                  feel healthier
                                  feel fitter
                                  be more physically attractive
to be believe that she would      have fewer clothing problems
                                  suffer less social stigma
                                  be less anxious in social situations
                                  feel less depressed

                                        not really at all
                                        not very much
                                        to a slight degree
if she lost weight, as rated ——→        to a fair degree
                                        quite a lot
                                        very much
                                        very much indeed

where (X) are married women attending slimming groups.
```

implicit Facet design is employed in two different ways first, as a technique for defining domains, and second, as an elaborated research design In a less complicated form, the latter use of facet design amounts to employing facet design as an observation scheme

In its role as domain definition, a facet design aims to demarcate the phenomena that the researcher considers relevant to his subject under consideration from those phenomena that are considered irrelevant, i e he aims to define his domain of interest Use of facet design as research design (or observation scheme) comes only at a later stage in the activities of the researcher, namely when he has developed a theory concerning his subject of interest which he aims to put to the test With the distinction between domain definition and research design at hand, it becomes possible to formulate a number of general guidelines for the construction of a domain definition. When constructing a domain definition one should only make use of so-called necessary facets. Necessary facets are those whose omission in the facet design would lead to the exclusion from our domain of interest of a number of phenomena that we do consider as really belonging to our domain. A second important rule is that these necessary facets should only be split up into constitutive elements if these elements serve to demarcate the behavior of interest from irrelevant behavior that would be included into our domain had the full set of elements constituting the necessary facet in question been taken up. What this means is that only in case a mere subset of elements constituting a given facet applies to our behavior of interest, should the facet in question be split up into its relevant elements. If the entire set of possible elements applies to the relevant phenomena, the facet should not be split up into constitutive elements. To make the logic of these two rules for domain definitions more comprehensive, we shall present an example of a facet design used as a domain definition (taken from Roskam, 1989b, with some minor modifications).

TABLE 2.9: A DOMAIN DEFINITION OF INTELLIGENCE BEHAVIOR

Behavior belongs to the domain of intelligence behavior

	application	
when the situation evokes the		of a
	inference	

factual		very correct
semantic	rule and the response is ordered as	to
logical		very incorrect

with respect to facet A.

We see in this domain definition two necessary content facets, and one response range that may also be considered as playing a constitutive role for the phenomena under investigation. That the chosen response range is necessary to be able to speak of intelligent behavior becomes apparent when we consider an alternative response set in its place: 'fast vs slow'. Ignoring the correctness of the response, a speedily delivered response based on the inference of an objective rule may perhaps indicate something like attentiveness, but it no longer has any bearing on intelligence. The latter sort of behavior only comes into focus when we consider the correctness of the response. We see, that the common response range forms an integral part of the definition. If the common response range did not constitute a necessary facet, it would not be taken up into the design, but as any type of behavior automatically implies some sort of response, any domain definition will contain a common response range that forms a necessary facet. Likewise, intelligent behavior always involves the presence of an objective rule that may be applied or inferred. That these two facets are split up into their constitutive elements, is because the set of objective rules contains elements that do not apply to intelligent behavior. For example, the application of moral rules. Likewise, apart from the application or inference of rules, there exists also the possible recitation of rules, which has no bearing on intelligent behavior.

The second rule we have given concerning domain definitions, sheds a critical light on one of the most often cited examples of domain definitions, namely the one that Guttman formulated on the universe of attitude items (see Levy, 1981), reproduced in table 2.10 below.

TABLE 2.10: GUTTMAN'S DOMAIN DEFINITION OF ATTITUDE ITEMS

An item belongs to the universe of attitude items if and only if its

domain asks about behavior in a {cognitive / affective / instrumental} modality toward an

object, and its range is ordered from {very positive / to / very negative} towards that

object.

We see here a splitting up of the modality facet into its constituent elements cognitive, affective, and instrumental. These elements are meant to be mutually exclusive and exhaustive, which means that there are no other elements belonging to the set of behavioral modalities. As we have stated, this means that the splitting up of the modality facet does not further the object of demarcation, but only serves to complicate the facet design in an unnecessary way. Since any given response is automatically expressed in some sort of modality, this facet may not even be considered a necessary one, and can be left out altogether. An appropriate rephrasing of this domain definition will show that all behavioral phenomena that were captured by the original formulation are still represented by the new formulation (see table 2.11).

The second use of facet design is that of a research design, or an observation scheme. Whereas a domain definition uses necessary generic facets to demarcate the relevant field of observations, in a research design we make explicit exactly what observations are to be made as well as how they are to

TABLE 2.11: REVISED DOMAIN DEFINITION OF ATTITUDE ITEMS

An item belongs to the universe of attitude items, if and only if its domain asks about behavior toward an object, and its range is ordered

from { very positive / very negative } towards that object.

be made. In this form, with many more facets than necessary to demarcate a domain of interest, the facet design acts as a template for the formulation of questionnaire items. Gough's mapping sentence, which we earlier gave as an example of an articulated facet design, forms an example of an observation scheme. If she had elaborated the facet design with a specification of the methodological choices that she had made in the course of the research process, this facet design would have constituted a research design. In general, where one restricts the facet design to the specification of observations to be made, it does not function so much as a research design than as an observation scheme.

Exactly which facets to include in an observation scheme-type facet design depends on the theoretical hypotheses that one wishes to test. A domain definition makes explicit the boundaries of the interesting observations; an observation scheme explicates exactly what observations are to be made in order to test the hypotheses at hand. Faceted distinctions that are not called for in order to test the theory should not be made. This means that the articulation of the facet design as observation scheme is determined entirely by the theory that one wishes to test. The facet design makes explicit what the necessary observations are. After all, research designs are created to make possible the answers to research questions.

2.4 Hypothesis formation in facet theory

Let us recall Guttman's definition of theory ('A theory is an hypothesis of a correspondence between a definitional system of observations and an aspect of the empirical structure of those observations, together with a rationale for such an hypothesis') and his statement that theoretical hypotheses should be stated in terms of the data analyses to be used. From this it follows that the formulation of hypotheses will be dependent on whatever aspect of the empirical structure of observations one chooses to consider. Guttman, as well as subsequent facet theorists, have chosen to focus on the correlational structure of the set of variables that may be derived from the facet design. What rationale do facet theorists use to formulate hypotheses concerning the correlational structure of the observations? According to Borg (1979): 'In the end, only substantive theories can provide structural hypotheses (and the rationale for them)'. But, Borg goes on to say, there exist a number of fundamental psychological processes that provide more general rules for the hypothesis of empirical structure based on a given faceted definition. These general rules for predicting empirical structure have been worked out by Foa (1958,1962,1965) who presents them as a metatheory.

The most important of these rules is called the principle of contiguity. This principle states that variables which are more similar in their facet structure will also be more related empirically. For example, given three facets A, B, and C, made up of two elements each, we may compare the following four variables:

(1) A1 B1 C1
(2) A1 B1 C2
(3) A1 B2 C2
(4) A2 B2 C2

Based on the principle of contiguity we may predict that the relationship between (1) and (2) will be higher than that between (1) and (4). A second, more specific rule, for which the principle of contiguity is a necessary but not a sufficient condition, states that variables having more facet elements in common will be more related than variables having fewer facet elements in common. For this to be empirically true, the different facets must have equal weight in determining the relationship between the variables (Foa, 1965).

For the introduction of further metatheoretical considerations concerning order relations, let us first produce the complete set of eight variables that may be constructed from the three dichotomous facets A, B, and C:

(1) A1 B1 C1
(2) A1 B1 C2
(3) A1 B2 C2
(4) A1 B2 C1
(5) A2 B2 C1
(6) A2 B2 C2
(7) A2 B1 C2
(8) A2 B1 C1

If each of the three facets have equal weight in determining the relationship among the variables, than we obtain a partially ordered structure, as portrayed in figure 2.1. We see in this figure that for example variable (1) is equally related to variable (8) and variable (4), but that variable (8) and variable (4) cannot be compared. Likewise, we have a number of other variables that cannot be compared. What we do have is a number of ordered subsets of variables.

However, if the different facets play different roles in determining the relationships, then the facets themselves may be ordered and a circular correlational structure emerges that is commonly termed a circumplex In the ordering of the eight variables specified above, facet A changes in element only once, facet B changes its element twice, and facet C four times

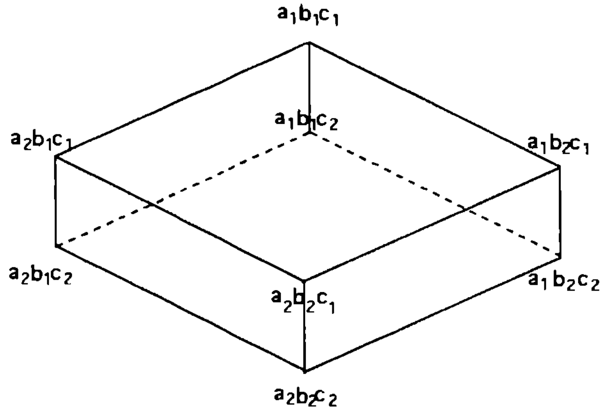

Figure 2.1. A partial order (taken from Brown, 1985, p 33)

Correspondingly, facet A is termed the first principal component, facet B the second principal component, and facet C the fourth (corresponding to four changes) principal component The question which of the three facets should play the part of the first principal component, and which that of the second and fourth components respectively, can only be answered on grounds of substantive considerations Even if facets may be ordered as to their relative importance in determining relationships, the circumplicial result that one will obtain as correlational structure will still not be unique For example, the ordering of the eight variables above may be changed by interchanging variables (1) and (2), variables (3) and (4), etc Only after a first structuple is defined will the order become unique The definition of a first structuple is, like the ordering of the facets, to be decided on substantive grounds

Foa's general rules for the prediction of empirical structure all pertain to the specification of order relations between variables The different facets each play a role in the ordering of the variables Translated to the portrayal of a correlational structure in a SSA-space, this means that each of the facets plays a role in partitioning the space Levy (1981) identifies a number of different ways in which facets may partition the SSA space These different ways she calls 'roles' that the facets may play If a facet is believed to be unordered, its role is supposed to be polar In that case, all elements of the facet correspond to different directions in the SSA-space, all emanating from a common origin The elements will divide the space in a number of wedgelike regions, as illustrated in figure 2 2

Ordered facets may play modular, axial, or joint roles, depending on their relationship to the other facets If a facet's role in partitioning the space is unrelated to that of the other facets, but its notion of order is the same of that of one or more of the other facets, it plays a joint role, and the result will be a partial order For example, the eight variables that we considered earlier were supposed to yield a partial order (refer back to figure 2 1), with the implication that all three facets were ordered and ordered in the same sense, but unrelated to each other (that is, that each played an independent role in partitioning the space) Where an ordered facet is unrelated to the other facets, and its notion of order is different from that of the other facets, its role in partitioning the space will be axial the space will be sliced in a number of (hyper)planes, equal to the number of elements in the facet Lastly, Levy mentions the modular role that a facet will play if it is related to one or more of the other facets, and if its notion of order has a correspondence with distance from the origin The partitioning resulting from polar, modular, axial, and joint roles are illustrated in figure 2 2

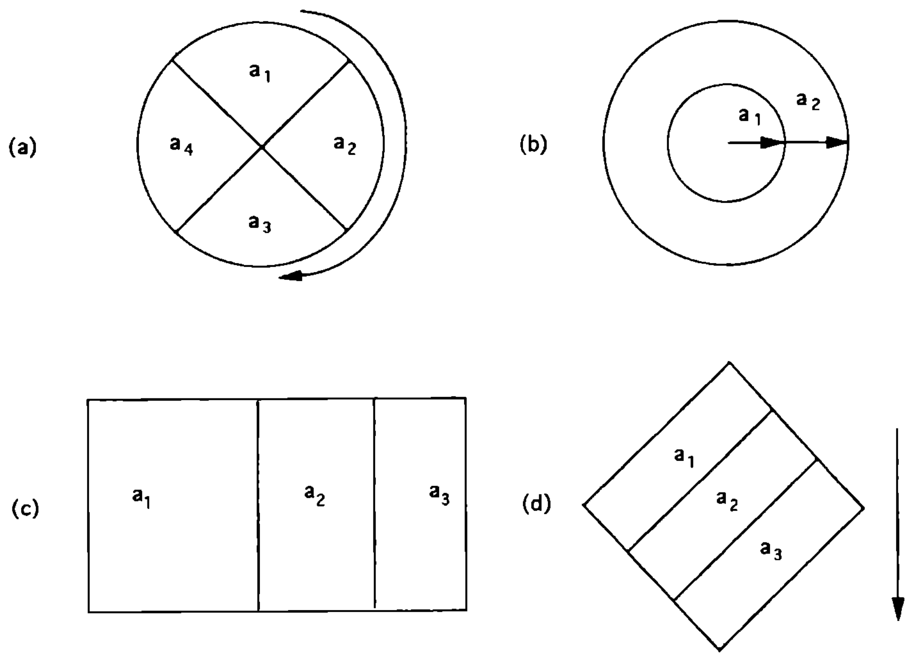

Figure 2.2. Partitioning of the SSA space due to a facet playing a polar role (a), a modular role (b), an axial role (c), or a joint role (d) (Taken from Levy, 1981, p 78)

Taken together, the different facets will transform the SSA-space into a geometric structure (cf section 2 6) For instance, if we have two facets, one of which plays a polar role, and one of which a modular role, we will obtain a structure called a radex (pictured in figure 2 3) If we supplement these two facets with a third facet playing an axial role, we will obtain a cylindrex (see also figure 2 3) The partial order resulting from the joint roles of facets A,B, and C and pictured in figure 2 1, is sometimes called a cubex Likewise, all the other sorts of combinations of facets will each give rise to a characteristic geometrical structure The hypothesized roles of facets are called regional hypotheses They refer to the relative sizes of correlations in a correlation matrix When these regional hypo theses are repeatedly verified, the geometrical structures are said to be lawful This way, facet theorists have uncovered a number of laws (see Levy, 1981, for a number of examples)[3].

Although facet theorists claim that substantive considerations play an important part in the formulation of regional hypotheses, they appear to us very marginal in comparison to the metatheoretical considerations like the contiguity principle in determining the formulation of hypotheses.

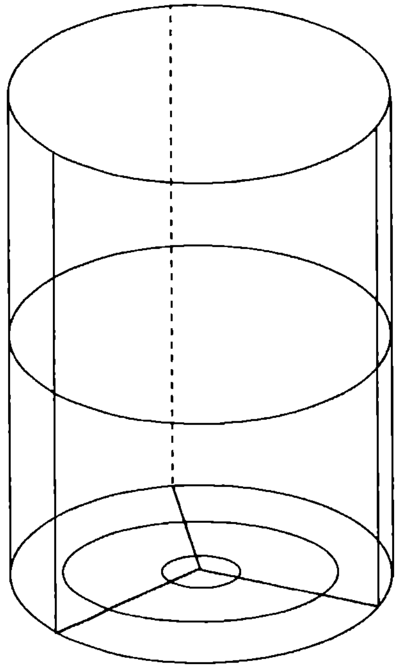

Figure 2.3 A cylindrex structure, resulting from two facets playing a polar and a modular role (resulting in the radex pictured at the base), and a third facet playing an axial role (resultinq into the three dimensional figure).

Regional hypotheses are about order relations. Substantive thinking gives rise to a particularly structured facet design, but once the facet design has been structured, it is the meta-theory concerning order relations that gives rise to the formulation of actual hypotheses. If the hypotheses are not born out, it means that the definitional system is not empirically meaningful. Since the definitional system reflects the theory, this implies that the theory is refuted.

As we noted in the previous section, Roskam has argued that this procedure implies a contamination of theory with the choice of a definitional system. We may recall that Guttman called the use of facet design the use of a coordinate system. Like the space-time coordinate system in physics, psychology too should order its observations by referring to basic coordinates, i.e. to the facets. However, in physics the coordinate system and the theory pertaining to it are clearly independent of each

[3] Laws pertaining to relative sizes of correlations are called 'second laws' So-called 'first laws' pertain to the sign of the correlations.

other A test of Newton's theory of gravity demands that certain observations be made These observations are hypothesized to show a certain functional relationship between the space and time coordinates Here, the definitional system - i e the space-time coordinates - does not depend on the content of the theory It merely states what the theory is about Facet theorists, however, construct their definitional systems so as to correspond with the content of the theory This means a contamination of theory with definitional system, which Roskam rejects (see Roskam, 1989a)

Apart from this unwanted contamination, Roskam is also critical of the scientific value of the regional hypotheses He states 'In general, it is not too difficult, if not trivial, to predict the order relations among correlation coefficients from a faceted domain', and '(SSA) merely returns what was present in the very definition of the universe of observations' (Roskam, 1981, p 214) Moreover, since the regional hypotheses can be formulated independent of the content of the facet design (based on metatheoretical considerations), they do not constitute a theory in the ordinary scientific understanding of what a theory is (see Roskam, 1989a)

A final point of criticism that Roskam has levelled against the regional hypotheses of facet theorists, is that they cannot account for ordered structures that may be found in the data and that may not be simply derived from order relations These structures need explanation in the form of a substantive theory Of course, the formation and testing of substantive theories is what science is all about, and the above points of criticism made by Roskam together clearly reveal the weakness of the facet theoretical enterprise in this respect A facet theorist bases the construction of his definitional system on substantive considerations, thereby contaminating his definitional framework with his theoretical assumptions, further proceeds to test the reality of the hypothesized order relations, which cannot form a critical test for his theory, and fails to put his substantive theory to a proper test by hypothesizing structure in the data that does not follow merely from contiguity and related notions of order

Another point of criticism that we may raise against the regional hypotheses of facet theory, is that they give rise to a type of lawfulness that, contrary to the objective of facet theory, does not seem particularly promising in providing a basis for cumulative theory construction The reason for this is that second laws cannot be interpreted as general principles from which specific events may be derived Instead they reveal the internal structure of a domain of content Some accumulation of knowledge is possible of course, in the sense that a domain characterized by two facets that have been repeatedly shown to give rise to a radex configuration may be elaborated with a further facet, that may e g be hypothesized to play an axial role In this fashion a researcher is working at cumulative theory construction, since an already established hypothesis (i e the radex) forms the starting point for a new hypothesis (a cylindrex) But this is the accumulation of knowledge in the sense of gaining insight into the internal structure of a domain of ever increasing complexity This kind of cumulative theory construction contrasts with the type of theories used in the physical sciences, where the attempt is to uncover ever more general principles that form a causal explanation for events of a less general nature It seems reasonable that cumulative theory construction in the social sciences would likewise aim to come to a causal understanding of phenomena, and in this sense the approach adopted by facet theorists is not likely to lead anywhere

2.5 Data collection in facet theory

Facet theorists commonly make use of questionnaires for the collection of data (though the logic of facet theory by no means dictates such an approach as the only means of data collection). In an earlier section we discussed Guttman's objective that the use of facet design should supply a (stratified) sampling theory for constructing variables for a universe of content, so that test or scale items might be constructed with equal care and formalization as is customary for the design of the population sample. The facet design permits the derivation of structuples which may act as templates for the construction of actual questionnaire items. Roid and Haladyna (1982) view this process of translating structuples into readable questionnaire items as a rather mechanical job: 'This part (...of the facet approach...) could be the most computerized or clerical of the (...different facet theoretical...) steps. It simply involves the selection of a combination of conditions from each facet...' (Roid & Haladyna, 1982, p.134). In some cases, like the facet design from Gough (1985) presented in section 2.4, translating structuples into items could indeed be left to a computer programme. Mostly, however, the translation process is not that simple.

For an example, let us look at a translation of a structuple taken from a facet design created by Stouthard (1989), defining the domain of 'Fear of the dentist' (see table 2.12).

TABLE 2.12: MAPPING SENTENCE ON FEAR OF DENTIST

```
                                                shortly
The extent to which person (X) worries                    in advance about the
                                                long


   introductory aspect of dental treatment
   interaction with the dentist                 as this shows up in his
   actual treatment


   sentiments                                    very little
   physical reactions                  ——→          to          fear of dentist
   defence and coping reactions                  extreme
```

Structuple A1B1C1 yields the generic sentence 'The extent to which subject (X) worries a short time (A1) in advance about the introductory aspects of the dental treatment (B1) as this is reflected by his sentiments (C1)'. Creativity on the part of the researcher is necessary to translate this generic sentence into a readable item Stouthard chose the following formulation 'I am getting nervous when the dentist tells me to sit down on the treatment chair' Although we recognize that this item may indeed be considered an offspring of the original structuple, we note also that we might just as well have opted for countless alternative formulations, that all pertain equally well to the original, generic formulation. This original formulation we might refer to as part of the depth structure of our domain of interest (the total depth structure being given by the entire mapping sentence), whereas the item formulation might be seen as representing part of the surface structure of our domain Any laws we might see fit to formulate pertain to the depth structure of our domain At the level of the surface structure these lawful relations may well be obscured by the chosen formulations of the items Some items may contain cultural bias, for example, and thereby attenuate the functional relations we might expect to find Of course, attenuation of functional relations at the surface level as the result of the specific wording of the items should be distinguished from genuine cultural differences at the depth level In this latter case, the lawful relations may be said to pertain to particular cultural groups only

The gap between depth structure and surface structure may be smaller or greater, depending on the abstraction level of the facets and their elements Where the gap is considerable, a check on the acceptability of the item formulation as a translation of the generic structuple formulation seems desirable There are two major ways in which this may be accomplished First, by seeking for the empirical structure in the correlation matrix that is hypothesized to correspond with the faceted definition of the domain, and second, by having a group of raters classify the items into their corresponding facet categories

We may recall that one of Roskam's objections against the regional hypotheses of facet theorists was that these are derived from a metatheory (on order relations) and not from a specific, substantive theory That is to say that the best one may expect from a test of regional hypotheses is an answer to the question of whether the chosen definition was empirically meaningful If we analyze the correlation matrix with SSA, then corroboration of the hypothesized structure will imply that the item formulations form correct translations of the underlying structuples However, a problem with this check on the acceptability of the item formulations is that when SSA fails to return the expected structure, it is not clear whether this is due to bad item formulations or to a faceted definition that is not meaningful to subjects Alternative data analytical procedures that may be applied to retrieve the posited facet structure, like confirmative factor analysis (see e g Stouthard, 1989) or LISREL (see Mellenbergh et al, 1979), do not obviate this problem Apart from this, there are also a few purely technical reasons that may be the cause of the failure of SSA to return the expected structure These will be briefly dealt with in the next section

A second method to check on the adequacy of the item formulations as translation of the underlying structuples is to have a group of raters categorize the items into their appropriate structuples Talsma et al (1992) examined sixteen questionnaires on achievement motivation and derived an underlying faceted definition of the concept Subsequently, they had four specialists on achievement motivation classify the items into the corresponding structuples This experiment yielded low inter-rater reliabilities the matching of items to structuples proved a difficult task The researchers next proceeded to construct a new questionnaire, based on the faceted definition of achievement motivation

The classification task with this new questionnaire proved to be successful: both the inter-rater reliability and the agreement with the test designer were high, implying, of course, that most items were classified correctly. The reason that the items of the second questionnaire were classified better than those of the first, seems to lie in the fact that the second items were explicitly formulated so as to be in accordance with the corresponding facet design. The facet structure was far more apparent for these items than for the original ones, implying that the gap between depth and surface structure was smaller for the items of the second study than for those of the first. We may expect that the closer the item formulations adhere to the generic formulations of the structuples, the better the classification task will be performed.

Apart from the translation problem, the facet approach often entails a second difficulty, and that is the fact that even moderately articulated facet designs will easily lead to a number of structuples that far exceeds the number of items one may reasonably confront a subject with. For example, Levy and Guttman (1975) did research on well-being for which they made use of a facet design containing 5824 potential structuples. They eventually selected 24 out of these for actual study. By what rules should one make a selection of a subset of possible items? The most obvious rule, which also formed the basis for Levy and Guttman's selection of the 24 items, is a preference for a study of certain relations between the facets and their elements defining the universe of content above other relations. Facet designs are formulated to permit the test of a set of hypotheses. Some of these hypotheses will be considered to be more interesting or revealing than others, and this points the way to a selection of facets and facet elements and to the exclusion of others, which may be deferred to later research.

Another way of dealing with too many structuples is to collapse one or more facets into fewer elements, a special case of this forming the collapsing of a facet into a single element, meaning that we keep this facet constant. For an example, we might think of a facet design on discrimination behavior, containing a facet specifying the ethnic minority group. Such a facet could contain a very large number of elements, ranging from 'Turks' to 'Americans'. We may considerably reduce the number of elements herein by resorting to more generic categories (e.g. 'Asiatic' vs 'African', etc.), a procedure that we mentioned earlier as a means of 'closing' an open facet (see section 2.3). Alternatively, we might wish to focus exclusively on discrimination behavior towards Turks, Moroccans, and Antillians, or we might leave the facet element unspecified by referring simply to 'a member of an ethnic minority group'.

Although formal selection or exclusion rules have not (yet) been developed, we see that there are a number of reasonable considerations for reducing the total number of potential structuples. Where a researcher decides to exclude a number of potential items from his questionnaire, he is compelled to do this in full awareness of the possible consequences of this exclusion. That is: he is aware that he is ignoring part of his domain of content, an awareness that is usually lacking where questionnaires are constructed without the use of a systematic method like facet design. As we mentioned earlier, Van Breukelen (1989) derived the facet design underlying the PMT-k (an achievement motivation test for children). Amongst other things, he found that most structuples were not represented as items in the questionnaire. A relative small amount of structuples were used to formulate the items for the questionnaire. No rationale was given for this lack of sampling adequacy, which was simply not apparent without the explicit faceted definition of the domain of content

2.6 Data analysis in facet theory

Although data generated by the facet approach have been analyzed with techniques as diverse as ANOVA (cf Stouthard, 1989), LISREL or confirmatory factor analysis (Mellenbergh et al, 1979, Stouthard, 1989), and latent trait models (Van der Vijver, 1988), in the overwhelming majority of cases data analysis is carried out with help of SSA Guttman's decision to concentrate on similarity indices as the aspect of the empirical structure of observations seemed to suggest SSA as the logical choice for creating a partnership with the definitional system of observations In his standard text on how to be a facet researcher, Canter (1985b) also mentions SSA as the most natural method of data analysis (although he does point out that alternative methods are conceivable)

SSA is a nonmetric form of MDS, where variables are represented as points x(i), x(j) in a metric space such that

$$s(i,j) < s(k,l) \Leftrightarrow d(x_i,x_j) > d(x_k,x_l)$$

where s(i,j) is a measure of similarity of variables i and j, and d(x(i),x(j)) is their distance in the representation (for a detailed discussion of SSA, see Guttman, 1968) The agreement in rank order between the magnitude of dissimilarities and the distances among the points in the configuration provides a criterion for the goodness of fit of the solution The attempt is to find a reasonable representation in as few dimensions as possible

In an earlier section we discussed the formation of hypotheses in facet theory Facets are supposed to subdivide the SSA-space into clearly identifiable regions The SSA now provides a test of those regional hypotheses In the solution returned by SSA, we should be able to discern clusters of items that suggest the type of partitioning that was predicted For instance, a modular facet of two elements should reveal itself by a clustering of the more general items in the centre of the configuration, and the recovery of the more specifically worded items in the periphery We should therefore be able to draw two concentric circles in the configuration of points, the first demarcating the more general items and the second capturing all the specific items Likewise, the other hypothesized roles of facets should also be retrievable as clearly discernable clusters of items, thus making apparent the overall geometrical structure that was predicted to emerge Although perfect partitionings (i e partitionings that correspond perfectly with the regional hypotheses) are rarely found, the literature on facet research provides many examples of SSA representations that suggest that the regional hypotheses were meaningful In such cases, not all the items belonging to a given facet element fall within the region specified, but on the whole the items concerned do tend to form a clearly discernable cluster, thus corroborating the hypothesis (for a number of examples, see Canter, 1985a)

Although the use of SSA can be defended as a logical choice, it has received criticism on diverse grounds Roskam (1981, 1989a) points out that the appropriateness of the use of SSA rests on the validity of two technical assumptions First, that the similarity index chosen is appropriate for the purpose, and second, that the similarities can be represented in a metric space with additive segments, particularly a euclidean space Concerning the first assumption Roskam notes that the use of any index implies the use of a loss function some information is highlighted at the expense of other information Different similarity indices imply different loss functions and as a result these various indices are not monotonically related Roskam then cites Beals, Krantz, and Tversky to argue that the choice of a similarity index should be based on substantive considerations '(if the similarity index) is logically incompatible with the data-generating process, it may suppress the more interesting aspects of the data and give a misleading impression' (Beals, Krantz, & Tversky, 1968, p 141) However, in spite of the fact that Canter states ' if inappropriate correlation coefficients are used for the particular data set then it is likely that the models that will be produced have spurious structures to them' (Canter, 1985a, p xiv), one rarely if ever finds a research report on facet theory in which the choice of one similarity index over another is motivated Indeed, Guttman himself considered the lack of a clear criterion for choosing a particular similarity index a lacuna in his work 'I still have no good answer to the question what correlation coefficient should I use - Pearson, monotone, or some other?' (Guttman, 1981b, p 63)

Closely related to this point of criticism is Roskam's second objection to the use of SSA The use of Euclidean geometry as the basis for multidimensional scaling takes a number of axioms for granted However, the assumptions underlying the use of Euclidean metric pose severe constraints on the structure of the data Constraints, that do not follow from the regional hypotheses concerning the relative sizes of the correlations As Roskam (1981) notes 'The assumption of a metric space is not necessary to verify order relations among similarity indices' So the use of SSA on a given pattern of correlations may lead to a refutation of the regional hypotheses, whereas an expression of the same structural hypotheses in terms of topological contiguity might have led to their corroboration (see Roskam, 1989a)

Quite a different objection against the use of SSA was raised by Ellis (1993) His criticism starts with the observation that as 'psychology is defined as the nomothetic study of the behavior of individual subjects, universal models are probably the only appropriate models by which pure psychological theories can be formulated' (Ellis, 1993) A universal model being a model that is valid for all the elements of a given population To qualify as a universal model, a SSA representation for a given population should be invariant over all the possible subpopulations However, Ellis proved the following two theorems (Ellis, 1993)

Theorem 1 If tests are experimentally independent then a nondegenerate unidimensional SSA representation of their covariances or correlations can not hold in every subpopulation

Theorem 2 A full SSA representation in IR^n with Minkowski metric, based on the covariances or correlations of experimentally independent tests, can not hold in every subpopulation

The conclusion is that SSA representations do not constitute universal models This being so, Ellis feels that they cannot be used as formal representations of psychological theories

We may recall, however, that the regional hypotheses of facet theory are not derived from a substantive (psychological) theory, but from the contiguity principle and related rationales for the specification of order relations In section 2 4 we discussed Roskam's objections to this fact Combining those objections with Ellis' theorems on the limitations of SSA, we may conclude that either the theories of facet theorists have little substantive (psychological) body, in which case they are of questionable scientific importance, or they cannot be adequately modelled by the chosen method of data representation Either way leads to the conclusion that traditional facet theory has limited usefulness

A final point of criticism on the use of SSA that deserves consideration is that this form of data analysis deals exclusively with the internal semantic structure of a given domain of observations Differences between subjects yielding the information concerning this structure are ignored Suppose that we are dealing with a collection of intelligence items We can administer these items to a sample of subjects and subsequently determine the internal structure of this domain of items We might find, as did Levy (1981), partitionings of the space due to different types of problems (verbal, numerical, or geometrical), or due to the different type of tasks posed to the testee (rule inference, rule application, rule learning), etc So the data we have gathered may reveal the predicted geometrical structure But what about our subjects? Theoretically, we may expect different subjects to possess different intellectual abilities It seems of basic interest to the psychologist to inquire into the systematic differences between our subjects in relation to the different kinds of tasks posed to them Speculating on this relationship would mean substantive psychological theorizing, much more so than speculating on the internal structure of intelligence items, based on the contiguity principle and related rationales for the specification of order relations

However, facet theorists do sometimes seek to establish differences between subjects concerning a particular domain of interest, with data analytical procedures like MSA (multidimensional scalogram analysis) or POSA (partial order scalogram analysis) (see Canter, 1985b, Brown, 1985) To carry out a MSA, we must be able to assume that all the items were selected from a single, well defined domain If in addition all items have a common response range, then a POSA, which may be regarded as a special case of MSA, is permitted (see Shye, 1978) MSA and POSA were developed by Guttman as extensions of his unidimensional scalogram model (the perfect scale) Since it was found that perfect scales rarely occur empirically, multidimensional extensions were called for If a set of intelligence items would constitute a perfect scale, all subjects could be ordered from less to more intelligent But if the set of items cannot be ordered along a single dimension, then a number of so-called profiles emerge, each constituting a perfect scale, but being mutually incomparable Two subjects belonging to two different intelligence profiles are then considered to possess a different kind of intelligence Within one profile however, subjects may be ordered from less to more intelligent along that particular dimension of intelligence

As to the general usefulness of POSA, Shye notes 'inasmuch as the partial order dimensionality is substantially smaller then the number of observed items, a considerable parsimony in data presentation is attained Furthermore, the contents attributable to those directions are likely to point out more fundamental notions than those represented by the specific items' (Shye, 1978, p 278) And thus 'it may become possible to hypothesize the existence of certain partial order configurations on the basis of substantive considerations of the material under study' (Shye, 1978, p 278)

But how does POSA relate to the SSA revealing the internal structure of the domain? As it happens, the two data analytical procedures seem to lead a dissociated existence A facet researcher begins with formulating a definitional mapping sentence (that is, $PS \longrightarrow R$) and carrying out an SSA to investigate the internal structure of this domain Subsequently, he may formulate a categorical mapping sentence, with the population as its domain, and the content and response facets of the original definitional mapping sentence as its range ($P \longrightarrow SR$) The population is now characterized by a number of facets, the Cartesian product of which is mapped into the range, consisting of the Cartesian product of the situation and response facets of the original definitional mapping sentence Using this categorical mapping sentence the researcher tries to determine a number of profile structures If he finds these, their relationship to the internal structure of the content domain remains unclear As Dancer puts it 'The relationship between the partial order space for a set of items and the SSA space giving the structure of the content universe remains one of the unanswered questions of facet theory' (Dancer, 1989, p 4)

But is this problem really necessary? Suppose we had a mapping sentence specifying the domain of content of a certain ability We might theorize that this ability constitutes a unidimensional latent trait, ranging from no ability to very high ability, and that subjects will vary considerably to the extent in which they possess this ability At the same time, situations (items) vary to the extent in which they demand a certain level of this ability in order to evoke a correct response Our substantive theory may predict how facets characterizing the population will influence the ability of our subjects, and how facets characterizing the situations will determine the probability that a subject with a given level of ability will respond correctly to a given situation Our substantive hypothesis is that we may order both subjects and situations along a unidimensional latent trait, and also that we know how subjects (in terms of their facet profiles) and items (in terms of their facet profiles) will be ordered If we formalize our theoretical expectations in a deterministic latent trait model, we hypothesize a scalogram model as providing a correct description of our expected data matrix Suppose we carried out this research and found that our data do indeed conform to a scalogram structure, and that the ordering of subjects and items is as predicted We have then found corroboration for our substantive theory We might subsequently carry out a smallest space analysis on the correlational structure of the items, and (e g) find a simplex Do we have a problem in relating the simplex structure of the correlation matrix to the scalogram structure of our original data matrix? From the perspective of our original purpose, i e the attempt to arrive at a theoretical understanding of the ability under investigation, there is no problem, since the simplex structure of the correlation matrix has no bearing on our substantive theory The simplex structure was predicted on the basis of order principles All the answers concerning the usefulness of our theory are provided by the scalogram analysis

So the question whether it is a problem that we presently do not know how to relate the SSA structure to the POSA structure is substituted by a more fundamental question why carry out an SSA at all? Of course, SSA is the most natural method of data analysis were we are working with hypotheses on the relative sizes of correlations between the items But earlier on we argued that these regional hypotheses do not constitute substantive theory As we will see in the next chapter, hypotheses derived from substantive theory usually will not demand correlational analysis. With the abandonment of the traditional emphasis on the correlational structure, SSA seems no longer called for. Although POSA might be more compatible with substantive theorizing, we will argue in the next chapter that there are many alternative methods of data analysis that may be preferable.

2.7 Conclusion

Facet theory developed out of Guttman's dissatisfaction with the tradition of scale construction, and also as an alternative to factor analysis. His alternative consists of creating a partnership between a definitional system of observations and an aspect of the empirical structure of those observations, notably correlations. An approach which resembles the process of theory construction in the physical sciences. Where physical theories are about observations that may be described in terms of just a few quantitative facets (the space-time coordinate system), psychological theories, in the Guttmanian sense, are about observations that may be described in terms of a number of (usually) qualitative facets. The facet design, depicting the domain of observations to which a given theory pertains, then acts as a coordinate system for psychological theories.

This idea is most promising but we have reflected upon a number of criticisms that suggest that its elaboration should be reconsidered. The weak point of facet theory as it has been elaborated by Guttman and his followers seems to be the emphasis on ordinal patterns in correlation matrices. Guttman has once said that one should construct a faceted definition with a possible law in mind, and that his expectation of his first and second laws led to the actual formulation of his facet designs (Guttman, 1981b). The question Guttman did not answer, was why he was so preoccupied with order relations. Most of the regional hypotheses that led to the identification of lawful relationships in facet theory are based on metatheoretical principles of order, that apply to any given facet design containing certain types of facets, regardless of the substantive field to which they pertain. In the case of a psychological theory, this means that these regional hypotheses actually have little to say on the validity of the theory as such, instead they pertain to the meaningfulness of the chosen definition. But facet theory was not initiated as the study of meaningful definitions. Potentially, it could serve as an alternative methodological paradigm to the operationalization approach. Why then stick to these theoretically hollow order relations?

To seek corroboration of the proposed order relations, facet theorists analyze similarity indices with SSA. Although this method of data analysis appears as the logical choice to investigate the validity of the regional hypotheses, we have shown it to possess several weak points. First, different similarity indices may produce different results, and no rationale is given for the choice of one index over another. Second, the use of SSA rests on assumptions that are more restrictive than necessary for corroboration of the regional hypotheses. Third, SSA does not consider differences between subjects, but deals solely with the internal structure of a given domain of content. Since psychology is primarily concerned with individual differences, this would seem to disqualify the facet theoretical approach as a serious contender of the more traditional approaches followed by psychologists. This might well be the main reason why facet theory has not really caught on in psychology.

So, what looked like a promising alternative to the operationalization tradition may itself have reached a dead end owing to its unnecessary restrictive emphasis on similarity between items. However, there is no reason why we should not probe beyond these self imposed borders of facet theory. Using facet design as a coordinate system for plotting psychological observations still remains a fruitful idea. Let us see how a different elaboration of this basic idea overcomes the weak points of facet theory, and results into a methodology that resembles practice in the physical sciences more than either the operationalization or the Guttmanian approach.

3 FACET DESIGN AND FORMALIZED THEORY

3.1 Introduction

Guttman asserted that social science theories should pertain to a well defined system of observations. Guttman did not distinguish between theoretical and empirical concepts, and facet design was intended to specify the universe of observational content of any concept. It provides a way of plotting psychological observations, rather like the space-time coordinate system in physics. As we saw, however, Guttman's facet theory leads to a contamination of facet design and theoretical hypotheses: the regional hypotheses are dependent on the chosen structure of the facet design. An additional but independent criticism is that the assumptions underlying the use of SSA, the most traditional form of data analysis in facet theory, have not been given any theoretical justification, and neither are these assumptions tested on their tenability.

The need for theoretical justification of the assumptions underlying the use of any MDS-model was particularly stressed by Beals, Krantz, and Tversky (1968): 'In contrast to the theoretical importance and the numerous applications of MDS-models, their content and their justification have not been explored. It should be emphasized that the possibility of embedding ordinal similarity data in specific types of metric space is by no means assured. Such representations carry strong implications that should not be overlooked. Mathematical simplicity and computational convenience are not substitutes for theoretical justification.'

Any scaling of stimuli and/or subjects implies certain assumptions which may be considered as miniature behavioral theories. Coombs recognized this, and started to develop a formal system for describing these behavioral theories. He called this formal system the theory of data (Coombs, 1964). Data theory considers subjects and stimuli as points in a psychological space, and shows that different assumptions on the relation between these points and on the structure of the space lead to different formal models for the description and representation of the data. These formal models offer a foundation for a meaningful definition of theoretical concepts.

We may recall Guttman's defence of scale analysis in favor of scale construction. Scalability is an hypothesis, Guttman claimed, and its tenability should be tested. Scalogram analysis is one particular method of doing so, but different assumptions concerning the relationship between subjects and stimuli as points in a psychological space may suggest different data models. It should be recognized that the complementary use of facet design and data theory offers an alternative elaboration of Guttman's facet approach. Facet design provides a technique for defining domains of observations, and the implications of substantive theory on this domain may be translated into a theory of data, which suggests a formal model as description of the expected structure of the data matrix. Since the data model forms the formalization of the substantive theory, its acceptance as providing a correct description of the structure in the data implies corroboration of the substantive theory. The parameters of the model then receive a theoretical interpretation, and may be regarded as measurements.

This alternative elaboration of the facet approach has been advocated by Roskam, who defends it as an alternative methodology for social science that overcomes the problems inherent in the operationalization approach These methodological ideas and their background form the topic of section 2 of this chapter A key role in this methodology is played by the technique of facet design As its advocated use differs somewhat from that in facet theory, it will be extensively discussed in section 3 A global review of Coombs' theory of data will be presented in section 4, and in section 5 we will discuss some examples and further possibilities of this alternative methodological approach The final section contains concluding remarks

3.2 Conceptual or empirical entry

The new elaboration of the facet approach that we wish to advocate, is not actually a new sort of methodology, but rather constitutes the extension of a research tradition to fields where this methodological approach has not traditionally been followed, indeed, where this has usually been considered as inappropriate As a coherent research methodology, the approach to be outlined has largely been developed by Roskam (see for a general overview of his ideas, Roskam, 1979, 1981, 1983, 1989b, 1990) As an introduction to the possibility of following an empirical entry approach in fields that are dominated by research in the conceptual entry tradition, we will start with an example of such research

3 2 1 The empirical entry approach in social science

One of the research fields in which the use of operationalizations has figured prominently is that of intelligence Research on intelligence has typically started with a definition of the theoretical construct 'intelligence' Based on such a definition, a measurement instrument was developed that was taken to be the operationalization of intelligence Subsequent research then focusses on how intelligent people - as measured by the test - differ on several aspects from less intelligent people Van der Ven (1969) diverged from this traditional approach He did not start off with a definition of 'intelligence' as a theoretical construct, but with specifying a domain of empirical phenomena that he wanted to study The empirical domain of his interest was formed by responses to simple mental tasks These responses could objectively be classified as either right or wrong, and as either delivered or not delivered (in the case of time-limit tests), or they could be objectively classified as either right or wrong, and as fast or slow (in the case of tests without a time limit) Van der Ven hypothesized that different subjects each possessed a given 'accuracy', or probability of delivering a correct response, that he assumed to be constant for any given individual Assuming furthermore different subjects to work with different speed (that is, they vary in the number of responses delivered), Van der Ven hypothesized the data structure to conform to a simple stochastic model known as the binomial error model This model has the following formal structure

$$p(X_{ij} = x) = \binom{a_{ij}}{x} p_{ij}^{\,x}(1-p)^{a_{ij}-x} \tag{3 1}$$

where

X_{ij} = a stochastic variable, the value of which corresponds to the number of correct responses of subject i on test j,

a_{ij} = number of responses given within the time limit by subject i on test j,

p_{ij} = probability that subject i will respond correctly to an item of test j (interpreted as the subject's 'accuracy")

Although follow up research showed the individual probability of delivering a correct response not to be constant, initial results seemed to corroborate the model, which may be seen as an elementary theory on intelligence behavior The theory contains a theoretical construct - accuracy - that possesses an epistemic definition, that is, it is directly linked to observable data by a rule of correspondence There is no arbitrary translation of the theoretical construct 'accuracy' into an operationalization, and therefore questions of validity do not arise All we can say is that the corroboration of the model has turned accuracy into an empirically meaningful concept If the theory had been disproved, that is, if the model had not provided an adequate description of the data structure, then the theoretical construct 'accuracy' would have been meaningless

Similarly, Roskam (1982) mentions a number of other theoretical constructs in psychology that likewise derive their definition from their formal position in a model, describing a given data structure Two of the most widely known that he mentions are Thurstone's 'discriminal process' and Coombs' 'ideal point' Other examples are 'sensitivity' and 'bias' in signal detection theory[1] Like accuracy, such concepts are empirically meaningful only insofar as the model in which they form a parameter is shown to be empirically valid As Roskam emphasizes, such examples are few rather than many However, they do serve to illustrate that the structure of psychological theory need not necessarily be different from that of physical theory

Reflecting on the example of research on intelligence behavior just given, one of the most conspicuous differences of Van der Ven's research with that of more traditional research on intelligence, is that it seems somewhat unambitious, or modest in the choice of a goal of understanding Rather than attempting to differentiate intelligence into verbal intelligence, spatial ability, analytical ability, etc , and in defining and calculating an intelligence quotient that may be used as predictor for academic success, Van der Ven stays very close to what he observes and set out to describe what he sees in the most simple of terms - speed and accuracy We will see later how this fundamental research of Van der Ven formed the basis for the formulation of a more complex model It seems likely that one of the reasons that most psychological theories resort to the operationalization of vaguely defined concepts, is that they are overambitious Physical science did not start out with theorizing on the structure of the atom, but with formulating the laws of falling bodies It can be defended that psychology likewise should not begin by trying to answer the ambitious question of what 'intelligence' is, but by trying to formulate a very elementary theory that describes the structure in the data that

[1] Roskam personal communication

correspond to the domain of behavioral phenomena pertaining to right or wrong answers to simple questions or problems

Measurement of theoretical concepts

We may describe these two opposing approaches as respectively the conceptual entry and the empirical entry approach The conceptual entry approach yields a theoretical structure like in figure 1 2 (see chapter 1), whereas the empirical entry approach evolves into the structure of figure 1 1 (see chapter 1) Of course, the conceptual entry approach equals what we usually call the operationalization approach It starts with postulating an explanatory theoretical concept - e g intelligence - and proceeds to define and subsequently to operationalize this construct So the starting point of this approach is a concept - hence conceptual entry - which is supposed to have explanatory power Operationalizing the concept means translating the original concept-as-intended into a corresponding concept-as-determined (see De Groot, 1969) This latter concept-as-determined forms a measurement instrument

Several questions may be posed here First does this measurement instrument measure anything at all? Here we may recall Guttman's objection to scale construction (Guttman, 1981a) Rather than investigating whether a given set of stimuli (i c items) forms a scale, traditionally one adds and deletes items until at last one ends up with one Second does this measurement instrument really measure the concept-as-intended? This is the question of the validity of the concept-as-determined But, as Roskam notes critically ' the question appears to be impossible to answer In order to answer it, we would need some empirical definition of the concept-as-intended, so that we can, however crudely, find out whether or not the concept-as-intended and the concept-as-determined coincide ideally, they should be perfectly correlated, or show a pattern of relations with other variables which is the same for the concept-as-intended and the concept-as-determined However, *if* there is such an empirical definition of the concept-as-intended, there we have already its empirical definition, that is, its operational definition So why would we need another operationalization? And if there does not exist an empirical definition of the concept-as-intended, how would we ever be able to assess the validity of the concept-as-determined, that is assess that it is a valid operationalization? (Roskam, 1989b, p 241-242)

It is evident that Roskam does not consider operationalism a fruitful research methodology Elsewhere (Roskam, 1972, 1981, 1983) he argues that operationalism is actually a distorted variant of the original methodology of operationism, that was once defended as the solid methodological basis of the natural sciences (Bridgman, 1927) We may cite Feigl to bolster this opinion 'Operational analysis is to enable us to decide whether a given term, in the way it is used, has a "cash value", i e factual reference If it does have factual reference, operational analysis is to show us precisely what that factual reference is in terms, ultimately, of the data of direct observation' (Feigl, 1945) According to H Israel, the goal of operationism was '(to function) as a corrective for a condition in physics in which a given construct such as length had come to have different meanings, different quantitative values when measured by different methods ordinarily accepted as equivalent' (H Israel, 1945) As

Roskam rightly observes, this condition that operationism sought to remedy in physics is precisely the practical consequence of operationalism in psychology

What went wrong is probably due to confusion on the part of social scientists regarding the place of measurement in physics Physicists started out with measuring certain empirical phenomena, like the acceleration of falling bodies, and they abstracted theoretical principles (like gravity) to account for the observation of lawful regularities in empirical phenomena Some of these postulated theoretical principles - like air pressure - itself yielded measurements by virtue of their regular operation on certain observables In the case of air pressure, this measurement was yielded by the observation of the variation of the vacuum of Torricelli's tube In other words these theoretical constructs account for certain quantifiable variations, and in doing so provide measurements In contrast, psychologists assume some theoretical construct to account for the observation of an empirical regularity, and they proceed to measure this construct so that on subsequent experimentation it may be verified that this construct does indeed affect the empirical phenomena in the predicted direction In practice, as explanatory principles, many such theoretical constructs turn out to provide pseudo-explanations

Searching for general laws

According to Braithwaite (1953), 'to ask for the cause of an event is always to ask for a general law which applies to the event' So actually, theoretical principles do not really 'explain' specific events, but they form the necessary and sufficient conditions for the occurrence of specific events Upon closer inspection, many allegedly theoretical constructs in psychology turn out to be tautologies instead of general principles accounting for lawfulness As an example, Roskam (1989b) mentions intelligence, which supposedly explains why some people are more capable in solving problems than others However, since intelligence *is* the capacity to solve problems, this forms a pseudo-explanation Let us once more return to Van der Ven's research to show how explanation in the form of reduction onto general principles is possible in psychological research We described how Van der Ven focussed (amongst other things) on time-limit tests, the responses to which could be objectively classified as either right or wrong and as either delivered or not delivered In a later stage of his research project, Van der Ven asked subjects whose performance he had already screened, to work on some further similar tasks This time he asked his subjects to work as fast as they could, but without making more mistakes The expectation was that that an increase of speed would result into a lessening of accuracy, i e into a higher proportion of incorrect responses However, against this expectation, subjects proved to be able to work faster without a loss of accuracy So what he found was a speed increase without loss of accuracy To account for the speed difference between the two trials, the typical operationalistic strategy might be to hypothesize an increase of effort on the part of the subject, and to start thinking about constructing an operationalization to test this hypothesis However, hypothesizing an increase of effort to account for the observed speed increase would be providing a tautological explanation, because the speed increase (resulting from a request on the part of the researcher to work faster) *is* the manifestation of effort. Furthermore, effort needs not be operationalized, because the observed speed increase forms the operational definition of effort

The alternative strategy, which we denoted as the empirical entry approach, consists of reducing the observed phenomena to more general principles Theorizing along these lines, Pieters & Van der Ven (1982) sought to understand the fact that subjects could work faster without loss of accuracy by hypothesizing that the total amount of time it took a subject to deliver a response consisted of real processing time plus an amount of distraction time, i e time that was wasted on distractions Unto a certain limit, reduction of the distraction time will cause a subject to work faster without loss of accuracy Beyond his individual limit, a further increase of speed will be expected to reduce the accuracy of a subject This theory was formalized into a two stage non-stationary Markov model in real time, containing three parameters

a the real processing time,
1/d the expected value of the duration of a single distraction,
g the expected value of the number of distractions

In this model, the product g x 1/d forms the operational definition of concentration

With reference to this example, Roskam (1989b) sums up the essential characteristics of the empirical entry approach He points out that here

- We have a model expressing some rule which by hypothesis governs a subject's behavior vis-à-vis a certain task

- The model refers to observations which can be recorded in non-psychological terms (i e time and error-rate)

- The model contains parameters which can be interpreted, or rather which stand for theoretical constructs whose meaning is fully given by their role in the model

- These theoretical constructs do not need any external validation

- The model describes the structure of (the probability distribution of) observations which are cast in basically qualitative and non-psychological terms

- The structure of the data (their internal relationships) is explained by stating the lawful relation, or model, to which it conforms

(see Roskam, 1989b, p 249)

Points 2 and 6 make clear what makes this approach an empirical entry approach a theory is formalized into a model that is hypothesized to describe the structure in the data These data consist of observations which itself are theory-free (that is non-psychological), in the example above these are time and number of correct responses

Methodologically, psychological research within the empirical entry tradition resembles that in the physical sciences, and leads to a theoretical structure like that in figure 1 1 (see chapter 1) As was pointed out before, the examples of psychological research within this tradition are scarce in number Those examples that can be given are almost invariably derived from mathematical psychology or psychonomics (experimental psychology) The so-called softer branches of psychology, notably social and personality psychology, are rooted in the operationalization tradition, and it is generally thought that the empirical entry approach would be inappropriate for these fields

We would argue that the empirical entry approach is not inappropriate for those branches of psychology that until now have been almost exclusively developed within the operationalization tradition Adopting an empirical entry approach in fields where this approach has so far been neglected, implies that our level of aspiration regarding our goals of theoretical understanding has to be lowered Sound theoretical knowledge has to be build up from scratch, and this means that any initial research must consider only very elementary phenomena, that must be precisely defined Regarding many current psychological theories, Coombs noted 'It is not uncommon for a behavioral theory to be somewhat ambiguous about its domain The result is that there is usually an experiment that will support the theory, and another experiment that will disconfirm it The value of such experiments is to be found in the implications they may have for the boundaries of the domain, rather than for an overall acceptance or rejection of the theory' (Coombs, 1983, p 78)

The first step in any research should therefore be a careful delineation of its domain of concern What are we trying to investigate? To what behavioral phenomena will a potential theory pertain? In much that does develop along the lines of the empirical entry tradition, the specification of a domain of behavioral phenomena of interest is relatively simple As we have seen, Van der Ven concentrated upon the responses to simple mental tasks that could be objectively classified as either correct or incorrect, and as either delivered or not delivered Likewise, research on e g memory can also be defined as dealing with responses that can be objectively classified as either correct or incorrect (recall) At a later stage of development of such research, specification of the domain of interest may also contain characteristics of situations and of subjects A fairly complex definition of a domain of interest will contain subject, situation, as well as response characteristics As we have seen in the previous chapter, the technique of facet design provides a tool for defining such a domain It therefore comes as no surprise that both Coombs (1983) and Roskam (e g 1989b) have advocated the systematic definition of domains of interest with help of facet design In the next section, we will elaborate the specific potential of facet design for this purpose

We have seen how one of the weak points of facet theory was the lack of a theoretical rationale for the choice of a geometrical representation of the data To overcome this, Roskam states that 'we need theory for the data-generating process which justifies the analysis of the data and renders theoretical concepts meaningful as indicators of properties of the behavioral processes involved, which makes for lawfulness in S-R structures' (Roskam, 1981, p 226) Elsewhere, he adds 'I propose that "theory of psychological data" is the psychological theory (or rationale) about the structure of prototypical S-R relations and their formal (mathematical) representation. Thus, data theory establishes the first link between a definitional system of observations and the structure of those observations, upon which subsequently more specific theory is built' (Roskam, 1981, p.217).

Most observations derived from a facet design would constitute what Coombs (1964) termed single stimulus response behavior. Where such response behavior may be hypothesized to be governed by a unidimensional latent trait (be this an attitude, or an ability, or some arbitrary behavioral instance), the data structure should conform to one of the latent trait models. The dichotomous Rasch model forms a unidimensional latent trait model with monotonely increasing or decreasing ICC's. As the formal representation of a data theory, the model describes a certain structure in the data. A variety of different observational domains may yield the same data structure, in which case all these observational domains may be described by the same formal model. But it is wholly dependent on substantive considerations what interpretation the parameters of this model are given. Because the data theory is inspired by a substantive theory on the data generating process, this substantive theory on a clearly defined domain of observations determines the meaning of the parameters.

Summarizing the empirical entry approach so far, we start with defining a domain of behavioral phenomena of interest, i.e. with defining a class of observations in which we seek for lawful regularities. Guttman's facet design forms a useful tool for this purpose. Hypotheses on the data-generating process lead us to adopt a theory of psychological data. The formal model that corresponds to the data theory is then hypothesized to give an adequate description of the data structure. The psychological meaning of the model parameters determining the structure of the data is given by the substantive theory on the nature of the data-generating process, as it pertains to a well defined domain of observations. The parameters are theoretical constructs, that are not measured apriori but that yield measurements insofar as the theoretical model in which they are embedded is shown to be valid.

Higher order theories

The next stage in any research would be the refinement of the theory. How do the theoretical constructs that we have so far identified relate to characteristics of subjects and of situations? Experimentation in which we systematically vary such characteristics can provide the answer to this question. Again, facet design may be used as observation scheme or as research design with characteristics (facets) of subjects and situations as its domain, and the theoretical construct as its range. With the execution of such experiments, the substantive meaning of the parameters of the model can be more specifically determined, and the substantive theory as such will be refined.

In contrast to the operationalization tradition, the empirical entry approach permits cumulative theory construction, or an expansion of the theoretical space as depicted in diagram 3.1. A theoretical construct, once firmly established, may itself be taken up in the domain of a facet design, and together with non-theoretical observational categories, form the observational domain for more advanced research. Such a domain constitutes a higher level domain, and a theory describing such a domain a higher level theory. Just like Einstein's relativity theory develops a different perspective on both empirical and theoretical phenomena that were also covered by Newton's theory, higher order theories may revise lower order theories, or reinterpret them (cf Roskam, 1990)

We have seen that, like facet theory, the empirical entry approach provides an alternative for the conceptual entry or operationalist approach Just like facet theory, the empirical entry approach starts with the formulation of a facet design The subsequent elaboration of the facet approach is entirely different from what Guttman had in mind, however We shall now take a more closer look at just how the empirical entry approach forms a different elaboration of Guttman's facet approach We shall first turn our attention to what we consider the basic step in the process of research the definition of the domain, by means of facet design

3.3 Facet design as coordinate system for psychological observations

3 3 1 Basic observations in psychology

Physics may be said to be the most matured of all scientific disciplines Most of the theoretical constructs in physics are far removed from empirical reality, and are so abstract in nature as to defy any concrete visualization of their existence Yet, the basic observations upon which the elaborate and highly abstract body of knowledge of physics is built, are of a very simple nature The observations from which physicists derive their elaborate and abstract theories, are non-physical in nature Roskam (1983) tentatively defined the domain of physical phenomena with help of a facet design, formulated in table 3 1 below

The plotting of the behavior of objects or conditions in the space-time coordinate system can be done irrespective of any theory Such observations reveal a certain structural regularity, and the specification of the necessary and sufficient conditions for these structural regularities to occur, constitutes theoretical understanding The structural regularity thus revealed may itself be hypothesized to be the outflow of yet more general principles, and so a cumulative body of theoretical knowledge develops However, at any stage of this theoretical development, the observations to which these postulated principles refer and which ultimately decide upon their tenability are still the same basic non-physical phenomena, formulated in the facet design above

Just like physics, psychology too deals with a small class of basic observations, that are itself non psychological in nature What do psychologists study? They study the responses of subjects in confrontation with certain situations As these responses may vary over different subjects, a response by an individual subject may be designated a choice made by that subject The basic datum of psychology may therefore be said to be a choice Where a response cannot be seen as a choice made by the subject, we are dealing with involuntary reactions, and such reactions are of no interest to the psychologist, they do not constitute behavior If someone is hit on the head and as a result loses consciousness, such a response does not constitute a choice and therefore forms no psychological datum However, if the subject remains conscious, then any response delivered by him or her - fight, flight, or passive reception of what else is to come - forms a choice made by him or her, that may not be the choice of the next subject Such behavior is of interest to psychology

TABLE 3.1: FACET DESIGN OF PHYSICAL PHENOMENA

```
                                                        onset
A phenomenon is a physical phenomenon if the             ....
                                                      termination


          object                                           onset
of a(n)    or        (O)   in comparison with the          ....
          condition                                     termination


           object
of a(n)      or      (O)    is perceived by an observer in a
          condition


            (X)
   spatial  (Y)                                  before
            (Z)     sense as    ---------->      simultaneous
     or                                          after
   temporal (T)
```

The basic data of psychology may, like those of physics, be formulated in a facet design. This is done in table 3.2 below (adopted from Roskam, 1991).

As this facet design constitutes a domain definition, we could have omitted facet B, since this does not serve to demarcate psychologically relevant observations from psychologically nonrelevant observations. We have included it for clarity, however.

Choice sets

The basic observation of psychology is defined as a choice, and as the facet design shows, there are three different types of choices. Whenever we are confronted by a stimulus to which we give a response that may be objectively classified as either right or wrong, such a response - or such a choice - may be called inferential. We seek to infer the correct response to the stimulus in question. Examples of such responses are attempts to recall something, or to solve a problem. Often we will not be inferring any response, but make a preferential choice. I may choose to have a vacation in England rather than in France, I may order coffee rather than tea, prefer a gangster movie over a comedy, etc.

TABLE 3.2: FACET DESIGN PSYCHOLOGICAL DATA

A {P,S,R} triple belongs to the universe of psychological data if and only if a subject (P) makes a choice from a set of alternatives with respect to a situation (S) according to a

A:
rule
goal
criterion

and the response is ordered as

correct	and/or	approach
incorrect		avoidance

and/or

affirmative
negative

with respect to facet A, and as

fast
slow

All such choices constitute what we may call preferential responses: they express a positive or negative attitude towards some object, subject, situation, or statement[2].

Lastly, we have a third type of response, that we have called appraisive. Such responses constitute cognitive or emotional experiences like 'I think this problem is difficult', 'I feel lonesome', 'I feel afraid', etc. Such responses constitute neither an inference nor a preference, but an appraisal (of oneself) in confrontation with an object, a subject or a situation. Such an appraisal in itself does not express a preference, nor would it be meaningful to speak of the response as being right or wrong. If someone says he feels afraid in a given situation, we do not know whether this means he will either seek to approach or to avoid this situation. Many attractions in the fairground, for example, are designed to induce fright, and some people are willing to pay for this experience whereas others expressly seek to avoid it. The range of the appraisive response goes from 'very strong' to 'very weak', indicating that one may, for example, feel 'very afraid' in a certain situation, or 'very little afraid', and that one may hold a very strong opinion on some subject or a very mild one.

[2] Opinions may belong to the domain of preferential judgements, or they may pertain to the domain of appraisive judgements, depending on the content of the opinion. For instance, an opinion like 'I think this government is committed to an unscrupulously hard policy' forms an appraisive judgement: it is not possible to tell whether the person stating this opinion endorses the particular policy or not. However, the opinion 'I think this government has lost its credibility and should resign' reflects a negative attitude towards the government in question, and as such forms a preferential judgement

So the basic observation of the psychologist is the choice made by the subject in confrontation with a given stimulus We may say that subjects are continually choosing responses from choice sets In actual life, when the subject is confronted with a situation, he will choose from many different choice sets at once In the reality that is created and controlled by the researcher, however, the subject is asked to restrict himself to a single choice set This choice set is defined by the researcher and reflects his domain of interest

The important thing to note is that the basic datum of psychology - a choice made by a subject - is a purely objective phenomenon, free of any theoretical perspective We simply register that, for example, subject A delivers a response X in situation S, whereas subject B delivers a response Y in the same situation Ultimately, we hope to be able to formulate a theory that will predict that subject A responds with X in S and that subject B will respond with Y in S

3 3 2 Conceptualization

We may recall that Coombs (1983) stressed that one of the major weak points of many current psychological theories is that it is not clear what the boundaries of the domains are to which these theories refer The process of theorizing should therefore be logically preceded by the clear definition of the domain of interest This initial phase in research Roskam (1987) called the phase of conceptualization It involves the careful definition of a domain of interest with help of a facet design As we discussed in the previous chapter, a domain defining facet design should contain only those facets and facet elements, necessary for demarcating behavior of interest from behavior outside the domain of interest (see section 2 3)

A typical example of a domain definition that we discussed in chapter 2, is reproduced in table 3 3 below (taken from Roskam, 1989b, with some minor modifications)
With regard to this domain definition, Roskam notes the following

- First, I use the word intelligence and not intelligent, to express that it is not an operationalization of a hypothetical trait, but the definition of a class of behavioral events which is a domain for observation and research The domain is called 'intelligence behavior'

- Secondly, the most essential defining facet is the quality of the *response range* 'correct-wrong' by an objective criterion A behavioral event which can not or is not categorized as right or wrong can not, *by definition*, belong to the domain of intelligence behavior

- Thirdly, the facets and their elements (like 'factual', or 'application') are *observational* in the sense that they are *pre-behavioral* By this I mean that they are objectively given and defined or known independent from the behaving subject, usually through the format of the situation or task They are empirical categories, not inferences from behavior They *do not presume theory*, but are *the empirical referent of theory*

TABLE 3.3: DOMAIN DEFINITION OF INTELLIGENCE BEHAVIOR

A {person x stimulus x response} triple belongs to the domain of

intelligence when the situation evokes the	A:	application inference	of a

factual semantic logical	rule and the response is ordered as	very correct to very incorrect

with respect to facet A.

(see Roskam, 1989b, p 255)

The last point stresses an important difference between the facet approach as advocated here, and the facet approach as developed in the context of facet theory As was discussed in the previous chapter, one of the problems of facet theory is the contamination of theory and definitional system Facet theory is about the structure of the definitional system (i e the facet design), it says what the empirical structure will look like, given the hypothesized roles of the various facets But what roles the facets play is determined by the researcher, who constructs the design He develops a facet design with e g a polar, a modular, and an axial facet, and therefore his theory that these facets will partition the SSA-space so as to yield a cylindrex, is not independent of the way he chose to construct his definitional system On the contrary, theory and definitional system seem inextricably linked in facet theory, and this was noted earlier as a major divergence from methodological practice in the natural sciences, where theory and definitional system are logically independent The empirical entry approach follows the methodology of the natural sciences the definitional system merely says what the theory is about, without presuming the theory It acts as a coordinate system for making observations, without predetermining the structure of those observations

To use facet design as the empirical referent of theory, requires that all the categories in the design - that is, the facets and their corresponding elements - are observational, and objectively given This means, for example, that it should not be left to the interpretation of the individual researcher whether a response is correct or incorrect, and that there should be agreement on whether the solution to a problem requires the application of a factual or of a logical rule Sometimes, however, the definition of a domain requires the inclusion of a category that is not directly observable or strictly objective As an example, Roskam (1989b) discusses a domain definition of discrimination, reproduced (with some modifications) in table 3.4 below.

TABLE 3.4: DOMAIN DEFINITION DISCRIMINATION BEHAVIOR

```
A behavioral event belongs to the domain of discrimination if a person

(P) in confrontation with a member of group (Y) responds in a

   verbal
     ....         modality according to a prejudicial judgment and
   physical

affects the well-being of that person and the effect is ordered as

   very favorable
        .......
   very unfavorable
```

It can be defended that without 'prejudicial judgement' as defining characteristic, behavior can no longer be unambiguously qualified as discrimination behavior. But how may we decide whether a judgement is prejudicial or not? To relieve this observational category of its subjective element, we need an additional facet design defining prejudicial judgement. This is presented in table 3.5.
We see by this definition that 'prejudicial behavior' is a subclass of value behavior, which in its turn may be separately defined (see table 3.6).
By providing the necessary prior definitions, 'prejudicial judgement' is rendered an objectively observable category, that may itself be used for the definition of a more complex domain.

3.3.3 Facet design and theory construction

Initially, a theory will usually pertain to a rather general domain of interest. We saw how Van der Ven's initial model pertained to a very general class of phenomena: simple mental tasks that could be objectively classified as either right or wrong, and as fast or slow. The model contained two parameters, which can be considered as the operational definitions of speed and accuracy. The next step in research concerns the theoretical enrichment of the parameters by refinement of the domain and the theory. How do the parameters act under variation of observable characteristics of situations and/or

TABLE 3.5: FACET DESIGN ON PREJUDICE BEHAVIOR

A behavioral event belongs to the domain of prejudice behavior if the situation evokes a response to object (X) in a cognitive modality, and

is ordered from factually	very right to very wrong	and from	
very positively valuing to very negatively valuing	with respect to that object.		

subjects? Such experimental variations may be defined by a facet design. We might for example wish to investigate potential differences between males and females, and between various age levels. This means that our initial domain definition becomes more articulated: we now include two person facets, one specifying sex and the other the age group. Likewise, we may wish to examine the influence of situational characteristics. This will result in the inclusion of further facets. The articulated facet design that we so acquire forms an observation scheme or 'research design'. It permits the systematic plotting of the behavior of the parameters under experimental variation of research conditions (each structuple forming a separate research condition).

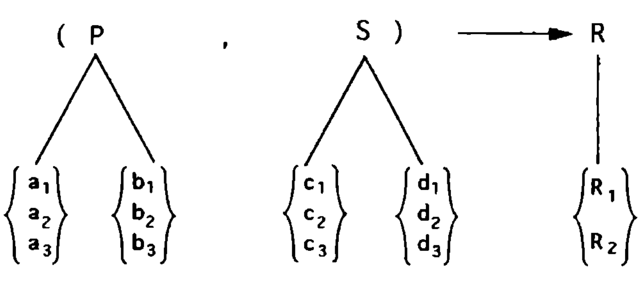

Figure 3.1. A facet design with two person facets of three elements each, two situation facets of three elements each, and one response facet with two elements, allows for 3 x 3 x 2 = 18 logically possible observations

TABLE 3.6: FACET DESIGN VALUE BEHAVIOR

A behavioral event belongs to the universe of value behavior when the situation asks for a (cognitive) assessment of the importance of a goal

in life area (Y), for { itself as a / a more primary } purpose in life area (Z), and

the response is ordered as expressing that it is

{ very important that it should / very important that it should not } exist for that purpose.

Suppose we have two person facets and two situation facets, each containing three elements, and a single response facet of two elements, as depicted in figure 3.1 above. We have a subject characterized by A1 and B2, who, in confrontation with a situation characterized by C1 and D3, may respond with either R1 or R2. Another subject, characterized by A1 and B3, can in confrontation with the same situation C1 and D3 also choose from R1 and R2. Any response made by a given subject to a given situation constitutes an observation. In total, 3x3x3x3x2, or 162 different observations are logically possible. However, a theory should state that only a subset of these possible observations will actually occur. It should state, for example, that subjects characterized by A1 and B2 will give response R1 to situation C1D3, but that subjects characterized by A1 and B3 will give response R2 to situation C1D3. In other words, the theory predicts lawful relationships. It predicts that only some of the logically possible observations will occur, and that others will not occur. In practice, most social science theories will be of a probalistic nature. They specify the likelihood that certain observations will be made. All the logically possible situations may actually occur, but the probability of the occurrence of some situations is greater than that of certain other situations. Such a probabilistic theory will be corroborated when the distribution of observed situations does not deviate significantly from the predicted distribution.

The theory predicts a certain structure in the data matrix. This permits a recasting of the theory in terms of data analysis. But which data analytical tool should we use, to put our theory to the test? This depends on our ideas concerning the data-generating process. These ideas constitute substantive theory on a very elementary level they constitute a theory of data

3.4 Data theory

Psychology has a rich variety of methods for the analysis of data Most of these methods have been developed within the context of a specific content area, which is often reflected by the terminology used For instance, the item parameters in the item response model for abilities is usually designated with 'ability' However, it is possible to use the outside the context of achievement testing Staalduinen (1986) used the Rasch model as a formalization of a theory on feelings of unsafety The item parameters derived their meaning from this particular theory, and could be designated 'proneness to feel (un)safe' However, despite the fact that these various methods have a wide range of applicability, their usefulness for alternative domains usually remains obscure 'Courses in the various methodologies are frequently content oriented and the student may not be aware of the identities and differences among them When such content-oriented models are cast in abstract form they are recognizable as miniature behavior theories, the scope of their applicability is broadened, and alternative theories immediately spring to mind There is perhaps less of a tendency to feel "this is the way to analyze that kind of data" ' (Coombs, 1960, p 141 - 142) Any method for analyzing data is based on certain assumptions concerning the way the data have been collected, concerning dimensionality, statistical properties, etc Coombs started out to create a general theory of data that would provide the

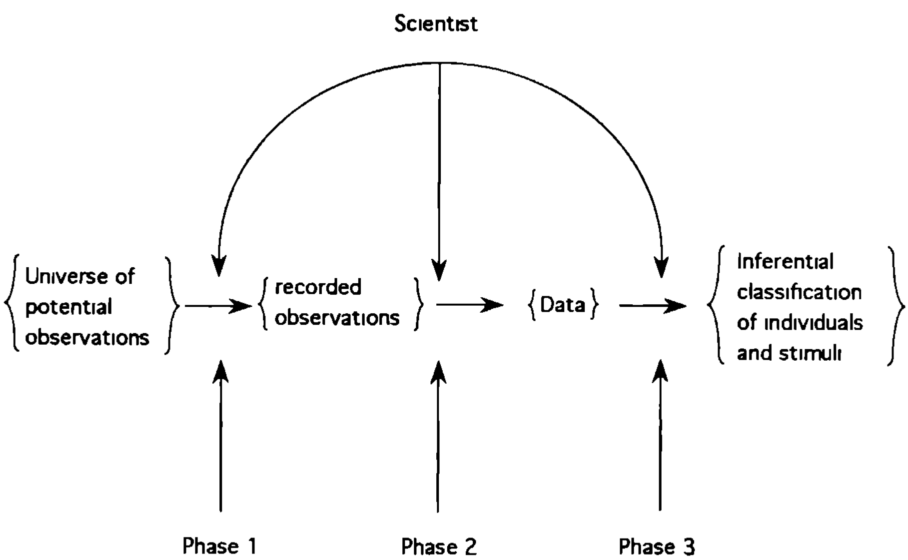

Figure 3.2. From potential observations to a classification of individuals and stimuli. (Taken from Coombs, 1964, p 4)

theoretical justification for making such assumptions (see Coombs, 1952, 1953, for an initial version of his data theory, and Coombs, 1960, 1964, for the final version)

Coombs pointed out that the real world outside does not contain any 'natural data' that simply await being picked up and processed by a scientist. The real world only presents a wealth of potential observations, that by active selection and a creative hypothesis on the part of the scientist yield data. For instance, if we study the motivation of travellers to take with them a certain amount of luggage, we could choose to focus on their consideration of use and weight. This choice leads us to adopt a stimulus compensatory model, since use and weight are attributes of the stimuli. For another example, if we study the ability of subjects to solve certain problem solving tasks, and if we suspect that these tasks require arithmetical and geometrical ability for their solution, we would choose to focus on these two abilities of our subjects. If we suspect that correct responses will follow from either sufficient geometrical or sufficient arithmetical ability then the appropriate data model would be a subject compensatory model, since the abilities that we suspect determine the performance of the subjects are attributes of the subjects. Figure 3.2 above shows how a scientist proceeds from potential observations in the real world to an eventual inferential classification of individuals and stimuli (taken from Coombs, 1964, p.4). In phase one, we might ask a subject a certain question, to which he may respond with either yes or no. This situation provides a number of potential observations that may be of interest. Most often, we will be interested simply in the verbal response the subject gives. But alternatively, we could be interested in his nonverbal behavior while he is trying to decide on a response, or we may be interested in the time it takes him to respond, etc. There are many potential observations that we can make, and we have to decide what observations we are actually going to record.

As Coombs points out, the actual recording of a response does not yet constitute a datum. For recorded observations to become data, we need to identify and label our subjects and stimuli, and to interpret the observations as some kind of a relationship between these two, or perhaps as a relation just between stimuli. The way we imagine such a particular relationship, constitutes a theory at a very fundamental level: it constitutes a theory of data.

Suppose we choose to concentrate on the verbal response the subject gives in reaction to the presentation of the stimulus. Stimulus and subject can both be considered as points in a psychological space. Our eventual purpose is to come to some sort of classification of our subjects and/or our stimuli. In other words, we seek to construct a psychological measurement model with the objective to 'associate with each object of interest, individual or stimulus, a point in a psychological space, and the purpose of the model is to construct a calculus which will permit the recovery of the space, given the observations and the preconceptions of the space' (Coombs, 1960, p.144). Another way of stating this is that we seek to construct a model that will capture the data generating process.

This data generating process determines the relationship of subjects and stimuli in the psychological space. The way we picture this relationship determines the nature of our data (phase two in the diagram), and it will lead to the choice of a model for describing these data (phase three).

In Coombs' theory of data, the elements in the psychological space may be drawn from either one or from two distinct sets. One set constitutes the population of subjects, the other set contains stimuli. The relationship we wish to determine may exist either on a pair of points, or on a pair of pair of points. For instance, we may be interested in determining which of two subjects is the taller. We are then comparing a pair of points drawn from a single set. Alternatively, we may wish to determine whether a subject is clever enough to solve an intelligence item, in which case we are comparing a pair of points drawn from two different sets. Where we are trying to determine which two out of three countries - for example Holland, England, and Germany - are perceived as more alike, we are examining a relation on pairs of pairs of points drawn from a single set. Relations may be either an order relation or a proximity relation. If we seek to determine which of two stimuli possesses more or less of some psychological attribute, we are focussing on an order relation. If we seek to find out which of two stimuli looks more alike to a third stimulus, we are considering a proximity relation. These then are the fundamental ingredients of Coombs' theory of data. A formal discussion of the basis of data theory can be found in Coombs (1964).

When combined, the three dichotomies just discussed yield eight different types of data. The distinctions may be pictured as in figure 3.3.

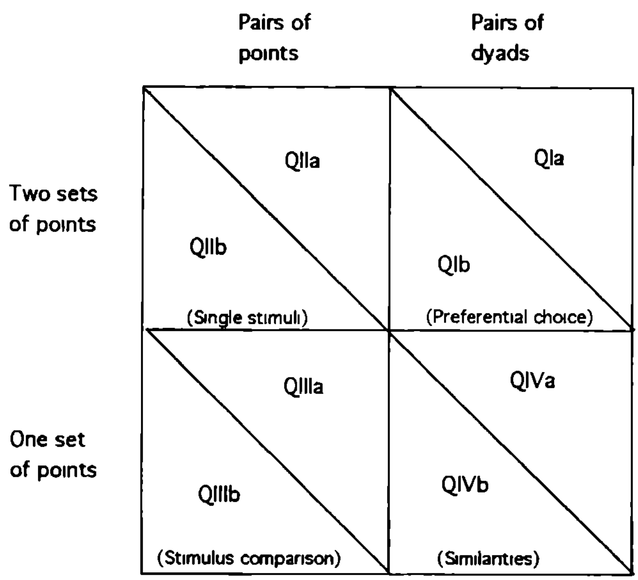

Figure 3.3. The eight kinds of data. (Taken from Coombs, 1964, p.21.)

Ignoring the distinction between proximity and dominance data, we are left with four different quadrants. The first quadrant yields so-called preferential choice data. We are dealing here with pairs of points from two distinct sets. For instance, subject A may be asked whether he would prefer a chocolate bar or an ice cream. The two pairs of points are then formed by John and the chocolate bar and John and the ice cream, respectively. If John prefers the chocolate bar over the ice cream, the distance between John and the chocolate bar is smaller than that between John and the ice cream.

The second quadrant presents single stimulus data. One of the points in the space is drawn from the set of subjects, and the other from the set of stimuli. Most of the questionnaire data fall into this quadrant. An attitude scale, for example, determines an order relation relation between subject and attitude item: does the subject dominate the item with regard to the attitude under investigation, in which case he will agree with the item statement, or does the item dominate the subject, in which case the subject will disagree.

The third quadrant yields stimulus comparison data. Both elements are drawn from the same set, i.e. the comparison is between stimuli. Whenever we ask a subject which of two stimuli possesses more of some attribute, we are gathering stimulus comparison data. For example: which of these two candy bars tastes sweeter? Which of these two signals has a higher pitch? Etc.

The fourth quadrant concerns pairs of pairs of points drawn from the same set. For example, we might present the subject with a reference stimulus A and ask him which of two other stimuli B and C most resembles the reference stimulus. The pairs of points are then A and B and A and C, respectively, and the judgement is on whether A and B are more similar then A and C, or vice versa. This type of data is therefore called similarity data.

The examples given of the data generated by the different quadrants were all of the dominance type, yielding an order relation between pairs of points, or between pairs of pairs of points. As becomes apparent from Coombs' overview of the different types of data, dominance data are generally of more interest to the psychologist than proximity data, and correspondingly more models have been developed for the former kind of data (Coombs, 1960).

Data models

To be able to construct a data model for the data of any of the quadrants, at least three basic assumptions must be made. First, it is postulated that subjects and stimuli can be pictured as points in a psychological space. Second, it is assumed that there is at least one dimension, along which subjects and/or stimuli may be arrayed, and third, it is assumed that observations lead to the determination of a sufficiently rich relation between two subjects, two stimuli, or between a subject and a stimulus as either one of dominance or one of proximity (there are assumed to be no indeterminate cases). For data to be considered as dominance data, two further assumptions are needed. One is that of a positive direction: this implies that the researcher knows which response is the 'right' one, the one that may be used to infer that subject A dominates stimulus i, for example. The other assumption is that of monotonicity.

The translation of observation into data requires, as we have seen, a miniature behavior theory. We picture data as relations on points in a psychological space. The next step involves the formulation of a data model that corresponds to the predicted structure in the data matrix. Which data model we will consider appropriate for the given data, depends on the additional assumptions we are willing to make An important assumption concerns the dimensionality of the psychological space In case of unidimensionality, we assume that the responses of the subjects to the stimuli are governed by a single attribute, and that both subjects and stimuli can be ordered vis à vis that attribute If we are dealing with dominance data, and feel justified in making the additional assumptions of the interchangeability of identical response patterns and a deterministic location of both subjects and stimuli, this would lead us to adopt Guttman's scalogram model If instead of a deterministic location we assume a probabilistic location, and in addition local stochastic independence of responses, we would consider a logistic model instead Which assumptions we wish to make, depends on our substantive theory concerning our domain of interest

Data theory in one versus two phase conceptions of social science

In much traditional research (that is, research carried out within the operationalization tradition), data theory is used as an intermediary step in the research process Data theory is used to select a scaling model (e g a Thurstone scale) for the development of some measurement instrument, which the researcher wants to use as an operationalization of some intended theoretical concept After having constructed the scale by a process of deletion and addition of items, the validity of the scale as operationalization of the concept-as-intended is determined If the validity of the scale is considered satisfactory, it is used in the traditional way for testing substantive theories Data theory no longer plays any part in this subsequent research

Schwager considered this process as indicative of a two phase conception of science (see Schwager, 1988) He pictured this as in figure 3 4

DATA → data theory measurement theory → MEASUREMENTS → theory construction → THEORY

Phase 1 | Phase 2

Figure 3 4. Two-phase conception of science (Taken from Schwager, 1988, p 206)

In contrast, in the empirical entry approach the distinction between data theory and substantive theory disappears, and theoretical development runs in accordance with a one phase conception of science (see figure 3 5, taken from Schwager, 1988) Theories are theories on the structure of the data matrix, in other words they are data theories As Roskam (1987) puts it 'Data theory does not tell why a subject chooses or responses the way he does, or which cognitive, motivational, or other processes have determined his responses, but it does theorize about properties of prototypical data systems as such, e g theories about comparative judgement, preferential choice, responses to attitude questions, intelligence items, etc The theory of data provides foundations for the meaningful definition of concepts In as much as psychological concepts refer to attributes of perceptions, responses and subjects, and to their organizing principles, the assessment of those attributes through empirical data depends on the identifiability of data structures and such lawfulness therein that permits of unequivocal inferences and generalizations'

In other words any substantive theory may be translated into a set of assumptions concerning the relation of points in the psychological space, and these assumptions will imply a certain data model

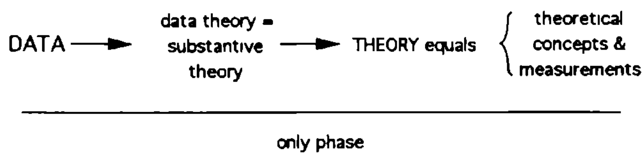

Figure 3 5. One-phase conception of science. (Taken from Schwager, p.207.)

Since the model forms a translation of substantive hypotheses concerning structure in the data, parameters of the model that govern the structure in the data will receive a clear substantive interpretation The model is therefore more than merely a measurement model, it constitutes the formalization of substantive theory

In much traditional research, the questionnaire is considered the operationalization of some theoretical concept, and as such is used as a measurement instrument. Data theory is used to provide a measurement model that will infer measurement from the data collected with the questionnaire In contrast, in the empirical entry approach the questionnaire functions as a research instrument The items are translated structuples, derived from the facet design (in its use as a research design) that specifies all the necessary observations in the domain of interest A data model is chosen or constructed that conforms to the structure assumed by the hypothesis If the model is shown to provide a good description of the predicted structure in the data matrix, we have not only derived measurements, but also corroborated our substantive theory This theory also determines what it is we are measuring

3.5 Examples and prospects of the empirical entry approach

3.5 1 An example of research within the empirical entry tradition

We have seen that the research methodology of the natural sciences, which we designated the empirical entry approach, is not totally alien to research in social science It is however primarily associated with the 'harder' fields of social science, like mathematical psychology or psychonomics We have outlined how the empirical entry approach could be used in fields where the questionnaire forms the most widely used method of data collection Instead of using questionnaires as measurement instruments, we have proposed to use them as research instruments An example of research carried out this way is provided by Staalduinen (1986), who did research on the appraisal of situations as safe or unsafe

Staalduinen's first step was a survey of existing research literature on the experience of (un)safety A number of different questionnaires were used to measure this experience, and Staalduinen used these to derive an underlying facet design This facet analysis revealed that a limited subset of structuples had been translated into many different items, whereas the majority of structuples did not appear as a single item in any of the questionnaires

A theory of the experience of (un)safety should relate personal and situational characteristics to the given responses Staalduinen found that the underlying facet design yielding the questionnaires was too poorly structured for this purpose, and created an improved version The improved version was fairly elaborate, and he reduced this to a facet design that could be used as an observation scheme in a pilot study (see table 3 7).

TABLE 3.7: FACET DESIGN ON FEELINGS OF (UN)SAFETY

```
                    a1:during daytime      b1:in your own house
Do you feel safe    a2:unspecified         b2:unspecified
                    a3:late at night       b3:in a small alley

   c1:when you are in the company of acquaintances?
   c2:unspecified
   c3:when a group of men.....(c31:rings your doorbell?)
                              (c32:approaches you?)
                              (c33:is coming towards you?)

                        yes
  ------------------>   ...
                        no
```

This facet design does not presuppose any theory It permits the occurrence of 3 x 3 x 3 logically possible observations[3] A theory should predict that only a subset of these possible observations will actually occur, or it should predict the probability of occurrence for different possible observations Staalduinen had a number of hypotheses that he wanted to test First, he believed that subjects would show a different proneness to appraise a situation as unsafe That is, some subjects would feel safe

[3] The three possible C3 versions were considered equivalent

easier and sooner than others Second, he believed that situations would differ to the extent that they would be perceived as unsafe Some situations would generally be considered as unsafe, whereas other situations would only be considered unsafe by those very prone to appraise situations as unsafe Staalduinen believed that the responses of the subjects to the situations would be governed by a unidimensional latent trait safety A given individual will have a certain proneness to feel (un)safe, and a given situation will have a certain potential of evoking an appraisal of it as unsafe If the potential unsafety of the situation exceeds the proneness of the individual to feel safe, than the subject will be likely to appraise the situation as unsafe Conversely, should the proneness of the individual to feel safe exceed the potential unsafety of the situation, than the subject will be likely to feel safe In terms of the quadrants of Coombs' data theory (pictured in figure 3 3), Staalduinen considered his observations as belonging to Quadrant IIa, i e he interpretes his observations as single stimulus dominance data

For single stimulus dominance data, we have an order relation on pairs of points drawn from two distinct sets For such data a variety of models exist, depending on whatever other assumptions we wish to make Assuming unidimensionality, local stochastic independence and a probability location of subjects and stimuli, Staalduinen arrived at the logistic model The two most widely used variants of this type of latent trait model are the one parameter and the two parameter logistic model, respectively The formal expression of the logistic model is as follows

$$p(+|v,i) = \frac{\exp\{D\alpha_i(\xi_v - \sigma_i)\}}{1+\exp\{D\alpha_i(\xi_v - \sigma_i)\}} \qquad (3\ 2)$$

where

$P(+|v,i)$ = the probability that a subject v responds correctly to item i,

D = a scaling factor

α_i = the item discrimination parameter

ξ_v = the subject parameter, indicating the subject's ability,

σ_i = the item parameter, indicating the difficulty of the item

If the discrimination parameters of the different ICC's are assumed to be equal, α_i may be put equal to one, in which case the more general two parameter model reduces to the one parameter logistic model, popularly known as the Rasch-model (see also Lord & Novick, 1968, Hambleton & Swaminathan, 1985)

Incorporation of hypotheses in the model

Staalduinen had a number of additional hypotheses concerning the situational characteristics, i e the situation facets, that he wished to test Specifically, he assumed that each facet would contribute independently to the experience of (un)safety This means that the item parameters of the logistic model should be decomposable into the sum of a number of basic parameters, corresponding to the different facets Furthermore, he believed that the different facet elements could be ordered in terms of the magnitude of the associated basic parameters for all facets, he hypothesized that the value of the basic parameter of the first element would be smaller than that of the second, and that the value of the second element would be smaller than that of the third For example, for facet A this amounts to the hypothesis that a situation taking place late at night will be appraised as unsafe sooner than a situation taking place during daytime In terms of data analysis, this hypothesis says that the data structure will conform to a particular variant of the logistic model known as the linear logistic test model (see Fischer, 1974)

A final hypothesis held by Staalduinen concerned the discrimination parameter of the different ICC's Every facet contained an 'unspecified' element, and Staalduinen hypothesized that items would discriminate better between those prone to feeling safe and those less prone to do so, the more structs it contained that were specified In other words, situations that were formulated in a very general sense (e g 'In general, do you feel safe?') would discriminate less well than situations that were specifically characterized (e g 'Do you feel safe when you are at home alone at night and a group of strangers rings your doorbell?') Staalduinen formulated no hypotheses concerning personal characteristics

Staalduinen tested his hypotheses by means of the logistic model Data analysis revealed that the alpha's were equal, so the hypothesis concerning the discrimination parameters was refuted For the rest, the data structure conformed fairly well to the one parameter logistic model Additional analyses also showed that the item parameters fitted reasonably well to an additive function of the facet elements, as hypothesized (Staalduinen, 1986)[4]

Conclusions from the study

Staalduinen's study reveals the interesting features of the empirical entry approach First, theoretical hypotheses are solely related to observations that can be plotted in a coordinate system the facet design Second, this coordinate system is itself pre-theoretical it allowes for making all the observations of the cartesian product PxSxR The theory specifies that only a subset of these will actually be made Theoretical hypotheses are then formalized into a data model, and corroboration of the theory then amounts to the model giving a reasonably good description of the structure of the data matrix, as indicated by some goodness-of-fit criterion The fact that Staalduinen's hypotheses were corroborated, means that he has derived a measure for his subjects' proneness to appraise situations as (un)safe The subject parameters of the logistic model provide a way of ordering the subjects from less to more prone to feeling (un)safe Likewise, the itemparameters provide us with a way of ordering situations as yielding more or less feelings of (un)safety Subject and item parameters therefore provide measurements If Staalduinen's hypotheses had been refuted, implying that the model would give an ill fitting description of the data structure, than the parameters of the model could not have been given an empirical interpretation, and so no measurements would have been obtained

[4] In a discussion of this study on the experience of safety, Roskam (1989a) notes that a SSA of these data would have yielded a degenerate solution, and thus the clear structure revealed by the present approach would have remained undetected

Note that no concepts have been operationalized The theory pertains to structure in the data, and the theoretical concepts - like proneness to appraise situations as unsafe - pertain solely to clearly specifiable and testable structures in the data The question of validity does not arise the corroboration of the theory has shown the theoretical concepts to be meaningful for the domain of observations under study This means that these concepts can now themselves be used as object of study They may be embedded in more elaborated theories, and as a possible result their meaning might change (cf the concept of gravity in Newton's and in Einstein's theory, respectively)

3 5 2 The empirical entry approach and the problem of social desirability

A recurrent problem in questionnaire research is that of social desirability a subject responding to an attitude item on the basis of what he considers to be a desirable response from a social point of view Since Edwards (1953) showed that the probability of a positive response to an attitude item correlated 87 with the perceived degree of social desirability of the item, all sorts of methods have been devised to overcome this contamination In line with the operationalization tradition, most of these methods consisted of the development of some instrument for measuring a respondent's tendency to give social desirable responses A well-known example of these instruments forms the social desirability scale developed by Crowne & Marlowe (1960) This scale contains 33 items, the endorsement of which is both highly social desirable and - from a realistic point of view - highly improbable For instance, an item might read 'I never lie' (endorsement being social desirable), or 'I sometimes gossip' (denial being social desirable) A high score on this scale is taken as an indication of an untrustworthy response pattern

Dessens & Jansen (1987) have expressed the view that social science should completely abandon all inventories of attitudes, desires, intentions, etc , because these are likely to extract social desirable responses Since it is really impossible to determine whether an endorsement of the item 'In case of X I will do Y' really means that this person will do Y in case of X, or that he merely says so because he feels the public would like him to react that way, Dessens and Jansen feel that such questionnaires yield unreliable and therefore useless information Nonetheless, their pledge for an exclusive focus on 'hard' data, i e data that can be objectively determined, would seem to rob psychology of much of its natural domain of interest (like attitudes, for instance)

The empirical entry approach suggests a different way of dealing with response sets like social desirability Rather than abandoning the questionnaire method, we should treat the possible operation of social desirable influences as an hypothesis, to be put to the test Let us for example return to the domain of observations that Staalduinen concentrated on He believed that subjects would respond to items like 'When at home alone late at night, I tend to feel unsafe when a group of strangers ring my doorbell' solely on the basis of their proneness to appraise situations as (un)safe Thus he hypothesized a unidimensional data structure We could conceive however, that items like the one above tend to extract social desirable responses A male subject may not like to admit that he feels unsafe in the specified situation, because he thinks that this would make him a coward in public opinion Because of this, someone who thinks he would actually feel unsafe in the specified situation, might instead respond that he would feel safe. His tendency to respond in a social desirable way may prove stronger than his tendency to give a truthful answer.

We may picture that all our subjects respond on the basis of these two psychological forces: their desire to give a truthful answer, and their desire to respond in a social desirable way. We are dealing with single stimulus data, and anticipate a two dimensional data structure. In fact we hypothesize the response to be the weighted sum of the two psychological forces, and this suggests the linear compensatory model (Coombs, 1964). As we discussed earlier in this chapter, there are two versions of the linear compensatory model, which are formally equivalent. We have a stimulus compensatory model in case the stimuli determine the weighting of the influence of the two psychological forces. An example related to that which we mentioned earlier in this chapter is that of an arithmetic test for which both skill in multiplication and skill in addition is required. The subject cannot determine how much skill of each he is going to use to solve the arithmetic problem, this is determined by the nature of the problem. Conversely, we have the individual compensatory model, where it is the subject who determines how much of each he is going to use. In the present case we are dealing with an individual compensatory model: the subject decides to be led predominantly by his desire to respond socially desirable, or to respond truthfully.

Graphically, the hypothesized individual compensatory model for Staalduinen's feelings-of-safety data would look as follows:

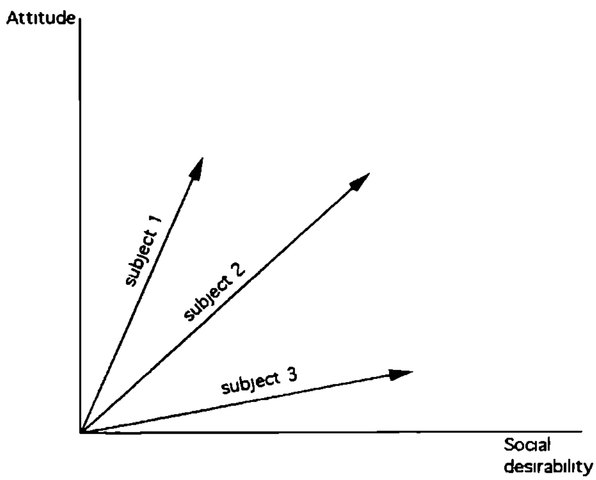

Figure 3.6. Individual compensatory model

The response of a subject to an attitude item is determined by two "forces", his attitude and his desire to appear in a socially acceptable way In the figure the subjects are represented as vectors in a two dimensional space. For each subject, the angle between the vector and the X-axis indicates the relative importance of the social desirability dimension. The responses of subject 3 are primarily determined by his desire to appear in a socially desirable way, the responses of subject 1 are primarily determined by his attitude. In the text, the substantive dimension is not formed by an attitude, but by a subject's proneness to feel (un)safe.

The angle between a vector and the X-axis indicates the relative importance of this dimension. The smaller the angle, the more important the role of this dimension in the decision making process of the subject So in the figure, subject 1 responds primarily on the basis of a truthful appraisal of his feelings in the situations portrayed, subject 3 responds primarily in a social desirable way The decision making process of subject 2 is equally determined by both forces

Formally, the decision making process may be represented as follows

$$Z_{vi} = \sum X_{ir} W_{vr} \tag{3 3}$$

$$R\ (+|v,i\ ) = \begin{cases} 0, \text{ indien } z_{vi} > c_v \\ 1, \text{ indien } z_{vi} < c_v \end{cases}$$

The product of stimulus vector X_{ir} and person vector W_{vr} determines the response of subject v on item i If this product exceeds C_v (the criterion value for the items as determined by the weighted sum of both dimensions), than the subject will respond positively to the item, and if the product falls below C_v the response will be negative Coombs (1964) discusses a procedure for determining the relative importance of both dimensions This procedure provides a test of the theory and, if proven valid, determines the relative importance of both dimensions for each individual subject

In this example, the linear compensatory model is the formalization of a theory on the data generating process Assuming the responses to be determined by both the substantive and the social desirability 'force', we may predict that the influence of social desirability will be situation dependent social desirability will play a lesser role under anonymous conditions than under conditions in which the subject has to reveal his identity Our hypothesis would therefore be that under general conditions the data will conform to a two dimensional linear compensatory model, and that the importance of the social desirability dimension would significantly diminish under conditions of anonimity

However, as we discussed in the previous section, Staalduinen's data showed a clear unidimensional structure that corresponded to his hypotheses Therefore, unless feelings of safety and social desirability are highly correlated, we may conclude that the influence of social desirability in the responses of the subjects was negligible

3 5 3 The empirical entry approach as a basis for cumulative research

What happens if we have a theory that successfully describes a domain of observational categories? Such a theory yields new observational categories in the form of theoretical concepts These theoretical concepts determine the structure of our initial domain of investigation Once clearly established, theoretical concepts may themselves be studied to see if general principles may be derived that account for their variation This process points the way to the hierarchical theoretical structure of figure 1 1 Roskam (1990) pictured this hierarchical structure of knowledge as in figure 3 8 below Our initial domain of phenomena consists purely of observational categories that do not presuppose any theory Once a successful theory has been established, its theoretical concepts may be taken up in a new domain of interest, that may be interpreted as a higher level domain because, next to pretheoretical observational categories, it also contains clearly defined theoretical concepts whose empirical meaningfulness has been established in previous research. This higher level domain is of a more abstract nature than the original one. If still more general principles can be derived, a higher order theory is established. It is not impossible that the successful establishment of such a higher order theory entails a reinterpretation of the concepts of the original (lower order) theory. The higher order theory, in its turn, will yield new theoretical concepts that may be used in the definition of a new (higher level) domain of interest. As theoretical development progresses, the definition of the domain of interest will become more and more abstract. At each stage of development however, any theoretical concept will have a firm empirical basis: it relates to structure in our domain of observations. Any higher order theory has a meaningful foundation and therefore constitutes genuine progress.

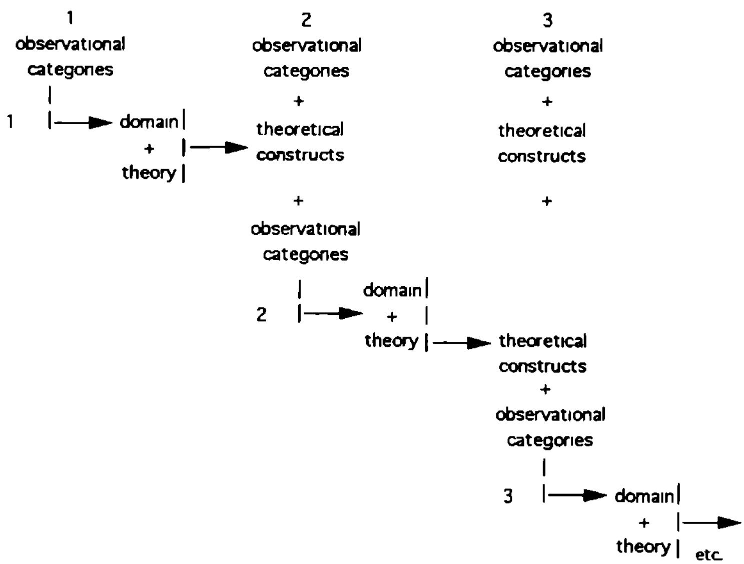

Figure 3.7. Hierarchical theoretical structure, defined with facet designs of increasingly higher order (suggested by Roskam, in an earlier version of Roskam, 1990. See text for explanation).

3.6 Conclusion

One of the roots of Guttman's facet theory was his defence of scale analysis over scale construction: scalability of subjects and stimuli along a single continuum forms a hypothesis, and as such should be put to the test. Logically prior to an hypothesis of scalability comes the definition of a domain of observations. It is this particular domain, which is hypothesized to possess a unidimensional structure, and which is assumed to yield a Guttman scale. This complementary use of facet design, data theory, and data analysis presents a methodology which is compatible with methodological practice in the natural sciences, and which might be equally fruitful for the social sciences as it has been for the natural sciences. It is surprising therefore, that Guttman did not develop his facet approach along these lines, but instead chose to concentrate on regional hypotheses and the analysis of similarity indices.

Although the empirical entry approach seems promising, it has so far rarely been used outside the so-called 'harder' fields of social science. A pilot study on feelings of safety does suggest its fruitfulness. However, more research is needed to get a clear impression of its potential value as an alternative for the operationalization approach. For this purpose, we have concentrated on a domain which has been extensively researched within the operationalization tradition: the domain of feelings of lonesomeness. Before giving an overview of our approach to the study of this domain, an overview of traditional research on lonesomeness will first have to be reviewed. This forms the content of the next chapter.

4 THEORIES AND RESEARCH ON LONELINESS

4.1 Introduction

As an object of empirical study, loneliness has come into serious focus only recently Peplau and Perlman (1982) noted that most of the important research on loneliness has started in the seventies One of the most prominent works on the topic, that did much to stimulate further research, was *Loneliness The experience of emotional and social isolation* by Weiss (1973) Since then, both empirical research and theorizing on loneliness has been flourishing In the Netherlands, much important work has been done by De Jong Gierveld and her associates, resulting in a validated Rasch-type measurement scale for the assessment of loneliness, a cognitive theory on causes and coping stragegies of loneliness experiences, and a typology of the lonely

The work by De Jong Gierveld, as that of the overall majority of loneliness researchers, has been firmly rooted in what we called the conceptual entry or operationalization tradition That the adoption of the conceptual entry approach is considered as self evident by many researchers, is reflected clearly by a discussion of Perlman and Peplau (1982) and Derlega and Margulis (1982) on the present stage of loneliness research and theory formation They characterize the development of loneliness research in terms of what they they view as a general framework for characterizing progress in a field of interest In this framework, scientific progress is translated in terms of the maturation of the concept of interest, which proceeds through three stages In the first stage, interest in a concept is justified by demonstrating its importance In the second stage this importance is accepted, and the concept is systematically explored with the aim of clear explication Attempts are made to distinguish the concept from other, related concepts In the final stage, the concept, which is now clearly defined, will function in a set of laws and lawlike statements, that together form a theory Both Perlman and Peplau (1982) and Derlega and Margulis (1982) agree that most of the work on loneliness is indicative of the second stage of development What is interesting, is that such a characterization of scientific maturity takes the conceptual entry approach for granted The philosophy is that concepts should logically precede theories And indeed, research on loneliness has for the better part focussed on attempts to define and measure the concept of loneliness, and to explore how it relates to other concepts

In this chapter, an overview will be given of attempts to define, measure, and further elaborate the concept of loneliness (section 4 2) This overview will be followed by a critical discussion of the use of loneliness as a theoretical, rather than as an empirical concept In section 4 3, an overview will be given of attempts at theorizing on the causes of loneliness A brief impression will be given of some of the older attempts to come to a theoretical understanding of loneliness, and a lengthy discussion will be devoted to the two major theoretical perspectives that are currently dominating research on loneliness the social needs approach and the cognitive approach The section on theories of loneliness will be followed by a critical discussion of present theoretical endeavours The chapter closes with some concluding remarks

4.2 Conceptualization of loneliness

According to De Jong Gierveld (1990), failure to produce a cumulative body of knowledge in social science is mainly due to a failing relationship between a theoretical concept and its empirical realization in the form of a measurement instrument. She feels that a remedy should be sought in the improvement of methods of conceptualization. There can be no adequate realization of a measurement instrument for a theoretical concept, if we have not even fully grasped the meaning and content of the concept we wish to measure.

De Jong Gierveld defines conceptualization as the 'manner in which concepts are formed and defined' (De Jong Gierveld, 1990, p.213). And she adds: 'This process entails, among other things, that a phenomenon or a set of phenomena which are more or less related and distinct from other phenomena, are defined with the aid of one or more characteristics' (De Jong Gierveld, 1990, p.213). Again, we recognize the adherence to the conceptual entry approach. No theoretical work on loneliness is considered possible, unless we have first formed and defined the concept of loneliness.

To this end, De Jong Gierveld and her associates analyzed 114 essays of lonely people, together with a number of transcripts of non-structured interviews. From these analyses emerged a multidimensional concept of loneliness. Three dimensions were identified:

- An evaluative dimension that points to the absence of positive feelings such as happiness and affection, and to the presence of such negative feelings as fear and uncertainty;

- A dimension labelled 'the nature and intensity of relationships', pointing to the deprivation of a partner or someone close to you. This dimension is also related to feelings of desperateness and emptyness, and is seen as the nucleus of the loneliness experience. Without a sense of being deprived of certain relationships, there can be no loneliness.

- A dimension relating to the time-perspective, differentiating between those who see loneliness as permanent and unchangeable, and those who see it as a more temporary condition.

4.2.1 Defining loneliness

Where other researchers disagree with De Jong Gierveld in considering loneliness a multidimensional concept, this seems to be because they focus exclusively on what De Jong Gierveld sees as the nucleus of the loneliness experience: the sense of being deprived of certain relationships. De Jong Gierveld defines loneliness in terms of this nucleic dimension: 'We define loneliness as: the experiencing of a lag between realized and desired interpersonal relationships as disagreeable or unacceptable' (De Jong Gierveld, 1978, p.221). Elsewhere, she equates loneliness with a sense of 'subjective social isolation' (De Jong Gierveld, 1984).

In this definition, the emphasis lies on the adjective 'subjective' De Jong Gierveld, as well as many other researchers on loneliness, has repeatedly stressed that loneliness cannot be equated with objective social isolation People differ in their social needs and their expectations concerning the fulfillment of those needs Only where the actual condition of social isolation is seen as clearly undesirable, will loneliness possibly be experienced The intuitive plausibility of this assumption has met with empirical corroboration in various studies (see for a discussion of some of these e g Perlman and Peplau, 1981)

According to Peplau and Perlman (1982) the notion of loneliness as a subjective experience is widely accepted Definitions of loneliness may differ somewhat, but they tend to agree on three points Apart from the subjective character of the experience, these are that loneliness is inextricably connected with the perceived absence of certain social relationships, and that loneliness is an unpleasant, undesirable experience

Within the conceptual entry approach, loneliness should obviously not be determined by simply counting the number of relationships that a person has, but by making use of a measurement instrument that clearly captures the subjective character of the isolated situation Two of the few researchers who approach research on loneliness within the empirical entry tradition, rather than within the conceptual entry tradition, are Dessens and Jansen (Dessens & Jansen, 1987, Jansen, Dessens, & Priem, 1990) They clearly disagree with the emphasis on subjective judgements, without favoring a naive equation of loneliness with objective social isolation Instead of starting with the concept of loneliness (i e with determining to what extent a given individual feels lonely as measured by some questionnaire), Dessens and Jansen started with observable phenomena, for instance a newspaper item like

'Man found dead in his house According to the police, a 35 year old inhabitant of Amsterdam was found dead in his house He had probably been there for several months ' (taken from Jansen, Dessens, & Priem, 1990, p 204)

Considering such phenomena, Dessens and Jansen hypothesized that they are the result of a problematic situation in the life of individuals, which turn them into undesirable partners for social interaction To be able to test this hypothesis, Dessens and Jansen first had to define their domain of relevant observations To this end they constructed the mapping sentence presented below (Jansen, Dessens & Priem, 1990, p 205)

They asked their subjects to name all their friends, relatives and acquaintances, and furthermore to indicate which of these people had a problem like a fatal disease, unemployment, widowhood, etc This information permitted them to estimate the proportion of people ($\hat{p}$) with e g coronary disease, unemployment, etc Dessens and Jansen expected that the proportion of people with severe problems thus determined, would prove to be an underestimation of the proportion of people with such problems in the general population The difference p-$\hat{p}$ they referred to as 'underrepresentation' Dessens and Jansen indicate that for all practical purposes this empirically derived concept may be compared to the concept of loneliness 'Just as in the operationalization tradition, it is in our approach possible to translate research findings for policy makers (e g recommendations for information and advice, aimed at specific groups in a society)' (Jansen, Dessens, & Priem, 1990, p 211) Elsewhere, they add

TABLE 4.1: DOMAIN OF OBSERVATIONS FOR RESEARCH ON LONELINESS

The number of available personal contacts that person (p) has with

his/her	primary secondary	environment with a	problematic unproblematic	situation

in life area	work health family	———>	high to low	number of personal contacts

with 'problematic' persons

'Does 'underrepresentation' correspond to 'loneliness'? We emphasize that we have no objection to labelling the relative lack of personal contacts as 'loneliness'. We only want to avoid an answer to the question 'Do we really measure loneliness?' This essentialistic question necessarily leads us back to the problems (...inherent...) in the operationalization approach.' (Jansen, Dessens & Priem, 1990, p.210-211).

The approach adopted by Dessens and Jansen does not require a prior definition of loneliness. Loneliness is not a hypothetical dependent variable that must first be proved to exist before any serious research is warranted (stage one in Derlega and Margulis' framework of concept development), it is a derivative from empirical lawfulness (people with serious problems becoming socially undesirable and thus isolated). Like we said before, the approach adopted by Dessens and Jansen is only a rare example in the field of loneliness research. Most traditional researchers feel that such an approach fails to capture the unique quality of the loneliness experience, and instead clusters together a multitude of phenomena related to loneliness (cf. Van Tilburg, 1988). Loneliness, they contend, can only be studied as a subjective experience and this seems to rule an empirical entry approach like that of Dessens and Jansen out as a serious alternative. However, in the next chapter we will advocate an empirical entry approach that does permit investigation of the subjective quality of the loneliness experience.

4.2.2 Measuring loneliness

Depending on the chosen conceptualization of loneliness as either a unidimensional or a multidimensional concept, the operationalization of the loneliness concept has resulted in both uni- and multidimensional measurement instruments A number of the unidimensional instruments consist of some variant on the single question 'Do you feel lonely?' De Jong Gierveld (1984) criticizes the use of such a measurement procedure on two grounds First, it fails to capture the entire range of the concept it is intended to measure (this criticism seems especially valid when one considers loneliness to be a multidimensional concept, as De Jong Gierveld does) Second, when delivered without any preliminary preparation, such a single item is not likely to break through the defensive wall behind which subjects hide their sense of loneliness Weiss (1982) even suggests that the remarkable absence of interest in loneliness before the seventies may be due to a defensive posture from the side of the researchers, who might be anxious to be confronted with their own latent feelings of loneliness Russell (1982) notes that the single item technique is likely to invoke response sets and a tendency to respond in a social desirable way In addition, it is difficult to determine the reliability of such a measurement instrument Nonetheless, the use of a single item rating of a person's loneliness has been one of the principal methods to validate other measurement instruments for determining loneliness It is then usually assumed that the correlation between the single item and the multiple item questionnaire forms an underestimation of the true validity of the latter instrument

Most multiple item, unidimensional measurement instruments for determining loneliness avoid explicit reference to the target concept, i e to loneliness Items usually ask about states that are considered to be related to loneliness, like

'There is no one who really understands me'

or an item like

'I know I can depend on my friends'

which is inversely related to loneliness The inclusion of the latter type of items is deemed especially important to eliminate the acquiescence bias Indirect wording of items is said to diminish the risk of response sets or social desirability tendencies, but this advantage is gained at the cost of lesser face validity

One of the most widely known measurement instruments for loneliness is the UCLA-Loneliness Scale This scale consists of 20 items, of which 10 are worded in the positive direction, and 10 in the negative direction Examples of items from the UCLA-scale are

'I feel isolated from others'

and, in the positive direction

'There are people I can talk to'

A four-point scale, ranging from 'never' to 'often' was used as response format The 20 items were selected by the classical procedure of deleting items from a larger initial sample on the basis of their item-total correlations (a procedure that Guttman so strongly opposed to, as we may remember) The resulting scale had a high internal consistency (coefficient Alpha 96) Concurrent validity was evident from substantial correlations with scales measuring anxiety and depression, and from the absence of significant correlations with unrelated affective states as creativity, embarrassment, sensitivity, and thoughtfulness (see Russell, Peplau & Cutrona, 1980) To determine discriminant validity of the UCLA-scale measurements of depression, self-esteem, introversion- extraversion and other states that correlate highly with loneliness were factor analyzed to obtain a number of unrelated predictors of loneliness. Four orthogonal factors emerged, labelled affiliative motivation, social risk taking, negative affect and social desirability. The social desirability factor proved to be no significant predictor of loneliness, a multiple regression analysis with the other factors as predictors showed these to account for 43% of the variance in the loneliness scores. After eliminating the variance explained by these factors, a self-labelling loneliness index was shown to account for 18% of the remaining variance, thus establishing discriminant validity of the UCLA-Loneliness Scale (see Russell, Peplau & Cutrona, 1980, and Russell, 1982).

Nonetheless, De Jong Gierveld (1984) has criticized the UCLA-scale on the ground of its restrictive emphasis on the 'deprivation of sociability and friends'. She believes this restricted semantic range to be related to the fact that the development and testing of the UCLA-scale is based purely on student samples. She notes that as a result, attempts to identify lonely widows with help of the UCLA-scale has met with failure (see also Rubinstein, Shaver & Peplau, 1979).

De Jong Gierveld proceeded with the construction of a new measurement instrument, that was to capture the multidimensional nature of the loneliness experience. 11 items pertained to the 'nature of the missing relationships' (the nucleic dimension), 11 items to the time perspective, and in addition, 16 emotions (seven positive and nine negative) were included to capture the evaluative dimension, with items like 'I feel unique', and 'I feel sad'. Of the 11 items pertaining to the nucleic dimension, 9 items were used as a unidimensional measurement instrument for loneliness (De Jong Gierveld referred to this scale as the 'intensity of deprivation-scale'; see De Jong Gierveld, 1984).

This scale contained only items worded in the negative direction, and it seemed to focus primarily on the more severe cases of loneliness. To overcome these deficiencies, De Jong Gierveld constructed a new unidimensional loneliness scale, which met the criteria of a Rasch scale, and consisted of 5 positively and 6 negatively worded items. It was ensured that the semantic content of the scale probed the entire range of intensity of the loneliness experience (see De Jong Gierveld & Kamphuis, 1985).

In her major study on the experience of loneliness (reported in De Jong Gierveld, 1984), De Jong Gierveld made use of the original 9-item deprivation scale as an index of loneliness. Apart from this scale, she made use of three other measurement instruments for loneliness. A self-rating scale reading
'I consider myself to belong to the group of ..... not lonely/moderately lonely/strongly lonely/excessively lonely people'
A single statement running
'I sometimes feel lonely'
and a judgement on the loneliness of the subject, made by an interviewer. Correlations between these various indexes of loneliness ran from .51 to .66. Such correlations differ substantially from zero, and are therefore taken as indication of the validity of the measurement instruments (concurrent validity). However, alternatively one could say that they also differ substantially from one, that they do not therefore measure the same thing, which a critic could argue indicates a lack of validity.

For her main research, De Jong Gierveld decided to make use of only one of the available measurement instruments. After some deliberation she decided upon the self-rating scale. One of her chief arguments in favor of the self-rating scale is that it permits a clearcut dichotomization between non-lonely (those who say they belong to the group of not-lonely people) and lonely individuals (those who state they belong to either one of the lonely groups) Use of the deprivation scale would not have allowed such a clearcut division between the lonely and the non-lonely De Jong Gierveld's choice for a single item might appear somewhat in contradiction to her earlier ventilated criticism concerning the use of such a measurement instrument, but one of her chief objections concerned the way such a single question was administered to subjects In her research, the single question was only put before the subjects after careful preparation by the interviewer, thus diminishing the risk of social desirability responses or response sets

4 2 3 Loneliness as a theoretical concept a critical evaluation

The work of De Jong Gierveld on the conceptualization of loneliness has been very thorough, and in the course of time led to the development of three unidimensional, and one multidimensional instrument for the measurement of loneliness Without a clear understanding of the concept under investigation, no adequate operationalization can be possible The result would be different operationalizations of the same concept, which may give rise to conflicting results As we mentioned before, this may explain the failure of the UCLA-scale to identify lonely widows Owing to the thoroughness with which she devoted herself to the conceptualization of loneliness, the scales that were developed by De Jong Gierveld do not seem to suffer the defect of a too restrictive semantic content

Yet how can we be sure that these scales really measure loneliness, is the perennial question that confronts the operationalists Peplau, Miceli and Morasch (1982) note that 'labelling ourself as lonely results from an inferential process by which we recognize or give meaning to our unique, personal experiences, and map them onto a more general category or concept' It are these personal experiences that form the content of the items in the scales of De Jong Gierveld A situation like 'wishing you had a really close friend' and 'missing people around you' may, but need not, result in an appraisal by the subject of his emotional state as one of loneliness De Jong Gierveld (1984) seems to subscribe to this view, because she stresses the subjective character of the loneliness experience

In that case, the items of De Jong Gierveld's deprivation scale cannot themselves be said to measure loneliness, but instead specify situational and personal determinants of loneliness If one states a wish of having a close friend, then the absence of a close friend can be seen as a hypothetical situational determinant of the loneliness experience Likewise, the absence or presence of people in one's vicinity may be a situational determinant of loneliness These and other situational determinants may, but need not, produce loneliness in the individual Whether or not the individual will experience loneliness is partly dependent on a number of additional determinants, related to the individual The identification of these determinants seems a stimulating challenge for future loneliness research

The sum of an individual's positive responses to De Jong Giervelds deprivation scale will be related to loneliness, since the content of the items has been shown to relate to loneliness This content may therefore be seen as consisting of various situational determinants The sumscore can however never be equated with loneliness, since it is possible that a subject misses a good friend without feeling lonely, or that he may feel that he cannot confide in anyone without feeling lonely. It is logically possible, that a subject responds positively to each of the items of the deprivation scale without feeling lonely. We can only be certain that a person feels lonely when he says so. But conversely, we cannot be sure that a person will not feel lonely when he denies the experience. Especially the tendency to respond in a social desirable may refrain the subject from admitting to a sense of loneliness. However, De Jong Gierveld (1984) reports validity data on the self-rating question 'I consider myself to belong to the group of ..... non lonely/ moderately lonely/ strongly lonely/ excessively lonely people' that are comparable to those of the deprivation scale. This suggests that a direct question asking about a subject's sense of loneliness need be no less effective than a collection of indirect questions.

Earlier we discussed the work of Dessens and Jansen on underrepresentation. Traditional loneliness researchers oppose this approach because it focusses on objective social isolation, and this cannot be equated with loneliness. We now see that attempts to measure loneliness via a collection of indirect questions are actually vulnerable to exactly the same criticism as Dessens and Jansen's approach of concentrating on objective deprivation. Objective deprivation need not result in loneliness, but neither does subjective deprivation. Translated into a concrete example: if someone has no friends (a state of objective social deprivation), he need not feel lonely, but if someone says that he misses the company of friends he need still not feel lonely. Perhaps he merely feels bored. Of course, we may have good theoretical reasons for assuming that the probability of a subject feeling lonely in a case of subjective deprivation exceeds the probability of a subject feeling lonely in a case of objective deprivation. But neither forms of deprivations may be taken as a measure of loneliness, they can only be used as predictors of loneliness.

Loneliness is an experience in itself; it cannot be analyzed into sub-experiences without loss of the unique quality of the overall experience. This point of view seems at variance with the practice of conceptualization, as outlined by De Jong Gierveld. De Jong Gierveld considered loneliness as a theoretical concept, which had to be made explicit before it could be operationalized. She identified three dimensions, one of which formed the nucleus of loneliness. But actually, loneliness is no theoretical concept, but forms an empirical phenomenon. In fact, loneliness forms what Roskam called (cf. chapter 3) an 'appraisive response' to certain social situations. What we are interested in, is why some people react to a situation with an appraisal of loneliness, whereas others do not react that way to the same situation. What De Jong Gierveld calls the nucleic dimension of loneliness, we would call a domain definition of loneliness related phenomena: if you research loneliness, you should concentrate on the quantitative or qualitative inadequacy of certain relationships. The next step would be to search for the situational and personal determinants of loneliness. By splitting up the nucleic dimension into three component subdimensions, we feel that De Jong Gierveld has actually made a beginning in specifying such determinants. The three subdimensions she mentioned - missing a partner, feeling deprived of sociability, and feeling abandoned - specify three different types of deprivation, the effect of which on the experience of loneliness could be object of investigation.

So we do not feel that one can break up the experience of loneliness into component parts, and then add up responses to these component parts so as to measure a person's loneliness. Loneliness is an experience that should be understood by relating it to what De Jong Gierveld views as its component parts This different perspective can lead to an empirical entry approach to research on loneliness, that does not necessarily restrict itself to a study of objective social isolation In chapter 5 it will be outlined

4.3 Theories on loneliness

Over the last decades, various attempts have been undertaken to come to a theoretical understanding of loneliness These attempts at theorizing stem from different perspectives, a number of which are briefly discussed by Perlman and Peplau (1982) Probably the oldest theories on loneliness have been advanced by psychoanalysts According to psychoanalytic theorists, loneliness is a pathological state that has originated in childhood Zilboorg (1938) for example, sees loneliness as the outcome of a strong narcissism, an infantile state of mind which the lonely have failed to overcome Like the little child, the lonely individual is thought to have an excessive and unrealistic desire for being loved, cared and tendered The failure of fulfillment of this narcissistic desire leads to feelings of loneliness and hostility, the latter emotion being characteristic for the lonely, according to Zilboorg

A different perspective stems from Carl Rogers, whose theory of the self forms the basis of an alternative explanation of loneliness Rogers (1973) argues that people have a so-called 'true self', which, under the pressure of society, is usually suppressed Instead people learn to present and behave themselves in ways that meet the demands of society The result is alienation from ones true self According to Rogers, those of us who experience our true selves, but feel unable to show this true self to the outside world out of fear for rejection, experience loneliness So in fact, Rogers believes loneliness to be a manifestation of poor adjustment.

Rogers and the psychoanalysts see the cause of loneliness as related to the psychology of the individual A very different point of view is provided by sociologically oriented theorists From their perspective, the cause of loneliness is to be found in society Particularly, the ideology of individualism is said to be in conflict with the natural tendency of man to form intimate relationships We are to rely on and to assert ourselves As a result, basic needs such as sharing and cooperation are often not fulfilled, resulting in loneliness (Slater, 1976) Social developments such as a decline in primary group relations, an increase in family mobility, and an increase in social mobility are said to amplify the conflict between the pressures of society and the basic human needs, thus further fostering feelings of loneliness (Bowman, 1955)

The theoretical perspectives that we briefly touched on all suffer from a certain one-sidedness in their attempts at explaining loneliness The psychodynamic and Rogerian theorists focus exclusively on the individual for their understanding of loneliness, whereas the sociologists focus exclusively on the pressures that society places upon the individual (Note that in a sense Rogerians and loneliness sociologists could be seen as complementary Rogerians do recognize that the true self is becoming obscured by pressure from society, without further elaborating on the nature of these pressures, whereas loneliness sociologists recognize that the pressures from society are in conflict with basic human needs But their analysis of this conflict focusses primarily on the pressures from society) What the three perspectives have in common, is their lack of empirical validation The ideas of the different schools have been developed by clinical case studies or by study of literature, social indicators and mass media. Little or no research has been done to find empirical corroboration, so the scientific status of these theories is rather weak. Two other theoretical perspectives, which will now be discussed in more detail, have sought corroboration by empirical research. These perspectives are generally known as the social needs approach, first advanced by Weiss, and the cognitive approach, which froms an extension of the social needs approach.

4.3.1 The social needs approach

The social needs approach is primarily associated with the work of Weiss (1973). Weiss distinguished two types of loneliness, which he termed emotional isolation and social isolation. The former type of loneliness is primarily characterized by feelings of restless anxiety, whereas the latter focusses on feelings of boredom and marginality.

Weiss has suggested that loneliness as emotional isolation forms a condition that is strongly related to the experience of separation anxiety in children. In fact, Weiss feels that Bowlby's theory on attachment motivation has clear explanatory value for the understanding of emotional isolation. The nature of attachment needs and feelings change as we mature. Attachment behavior can first be clearly noted at around the fifth year of a child. It is at this age that the child shows a clear need of the presence of an attachment figure (usually the mother) for its sense of security. In the presence of the attachment figure, the child shows comfort and relaxation, whereas his or her absence is experienced as distressing. A further step in the maturation of the child is the establishment of secondary attachment figures, whose presence may make the temporary absence of the primary attachment endurable. As maturation progresses, the child shows an increasing tolerance to be temporarily separated from the attachment figure, as long as it feels confident that it will be able to regain access to the primary attachment figure whenever needed. Uncertainty in this respect may result in feelings of abandonment, giving way to sensations of hopelessness and despair. As the healthy individual enters adolescence, it begins to weaken its ties with its parents. They no longer function as attachment figures. Instead, intimate bonds with peers are formed, often resulting in a partnership with a member of the opposite sex, which then becomes the new dominant attachment figure (for a thorough discussion of attachment theory, see Bowlby, 1969). When one is unable to establish such an intimate relationship in adulthood, one is likely to feel separated. This time not so much separated from a particular person, but more from a particular - intimate - relationship. This is the condition of emotional isolation, which Weiss believes to be an adult version of the separation anxiety found in children (see Weiss, 1973).

What is it, apart from a sense of security, that an adult seeks in an intimate relationship? To gain understanding of the nature of the social needs that, when unfulfilled, may lead to loneliness, we may take a closer look at the various forms of loneliness that Lopata (1973) discerned in her study of loneliness in widows. She found that one of the reasons for feeling emotionally isolated was that the lonely subject does not (or in the case of widows: does no longer) perceive him- or herself as an object of love. People wish to be understood and respected, to be of importance in the eyes of someone else. Conversely, people long to focus their feelings of love and care on an intimate other. These needs are fulfilled in a relationship with a marital partner Another need that seems fulfilled in intimate relationships, is the sharing of experiences Whether they are of a positive or of a negative nature, people wish to bring their experiences with the accompanying emotions out into the open This requires a person that we can trust well enough to open our hearts to

Lopata discusses a number of other social needs that may give rise to the experience of loneliness People often need all sorts of help, ranging from advice on emotional problems to lending assistance in the handling of small instrumental problems that one cannot handle alone Furthermore, many activities from which one may derive pleasure and personal fulfillment often require the company or assistance of others Going out for dinner, undertaking sporting activities or taking a holiday are obvious examples These latter needs may be fulfilled by a marital partner, but, unlike the social needs that were discussed earlier, they do not require a real intimate relationship for their fulfillment

These needs are therefore more associated with the second type of loneliness that Weiss has discerned, and which he has called 'social isolation' Social isolation is characterized by feelings of boredom and aimlessness, caused by the fact that we do not find affirmation in the things we do We normally built up a social network, and receive recognition in the eyes of friends We play a role in a social community that receives affirmation from that community We feel accepted by others and derive a sense of self-worth in our interactions with others When people become isolated from life in a social community, much of the meaning of their lives gets lost. They may feel useless, bored and self estranged Feelings of marginality may be further enhanced by the experience of not knowing where to turn to in the case of life's daily little problems

According to Weiss, emotional isolation and social isolation are two different types of loneliness that need separate alleviation People who feel socially isolated will not be helped by extra attendance of their loving partner, because their sense of loneliness does not derive from a lack of intimacy Conversely, a man with many peer relations may still be emotionally isolated if he lacks a real intimate relationship to fulfill his attachment needs Empirical support for Weiss' distinction between the two types of loneliness has been found by Cutrona (1982) and by Rubinstein and Shaver (1982) However, seemingly at variance with these results, De Jong Gierveld (1982) found three different types of lonely people, all of which were strongly characterized by emotional isolation The first of these types she labelled 'the hopeless lonely who are very dissatisfied with their lives' This type of lonely person lacks an intimate relationship, as well as any other satisfactory type of social relationship Such a person feels socially deprived and harbours feelings of resentment towards other people, who they blame for their adverse situation The second type was labelled 'the periodically and temporarily lonely' People who fall into this category do have satisfactory social contacts, but they lack a marital partner Although some of their existing social contacts may provide them with intimacy, they miss the real depth of intimacy associated with a marital partner Type two lonely individuals expect their situation to be of a temporary nature The last type of lonely person was labeled 'the resigned, hopelessly lonely' The lonely people of this category, mostly widows and of older age, do not blame others for their situation They have accepted it and see no way out anymore It is clear that the first and third of the types that De Jong Gierveld found actually display a mixture of emotional and social isolation Her results do not falsify the distinction proposed by Weiss, but they do suggest that a separate occurrence of loneliness due to social isolation is not common.

Personality variables

As a theorist on loneliness, Weiss has been designated an interactionist (e.g. see Perlman & Peplau, 1982). This is because Weiss feels that we should not solely look for situational factors as causal determinants of loneliness, but also for characteristics of the individual that may predispose him to become lonely. Loneliness is thus seen as the product of an interaction between personal and situational determinants. What are the personal characteristics, that correlate with loneliness?

One of the personality factors, that have repeatedly been shown to possess a negative correlation with loneliness, is self-esteem. To explain this negative association, two divergent views have been posed. From one perspective low self-esteem can be seen as a cause of loneliness, from the other loneliness can be viewed as the cause of low self-esteem (see Peplau, Miceli & Morasch, 1982). Low self-esteem might be concomitant with a feeling of self-estrangement, and this, according to e.g. the therapeutic school of Carl Rogers, may give rise to a sense of loneliness. Also, low self-esteem may have an impairing effect on the social competence of the individual, and this way indirectly promote loneliness. The alternative causal connection suggested may be intuitively more plausible. If our social accomplishments fail to meet our social desires, we may feel that we have failed, that we are socially inadequate. The low sense of self-worth that we entertain is then clearly the consequence of our experience of loneliness.

Marangoni and Ickes (1989) review a body of research reports, that show a consistent relationship between loneliness and lack of self-disclosure. Lonely people engage into less intimate and meaningful relationships than do non-lonely people. Also, the behavioral patterns of lonely individuals have been shown to differ from other people. They pay less interest in their interaction partner, and are more self-focussed. In this respect Marangoni and Ickes mention an interesting result from research by Vithus and Horowitz (1987), who showed that even brief training in conversational and partner attention skills could significantly reduce loneliness. In general, lonely people have greater difficulty in building up and maintaining social contacts. In part, this may be enhanced by such personality traits as shyness, social anxiety, and introversion, which have been shown to be associated with loneliness (see Perlman & Peplau, 1981; De Jong Gierveld, 1984).

According to Weiss (1973), loneliness must be dealt with by providing the lonely with the social interactions that they need. That is, they should find e.g. a partner for the alleviation of emotional isolation, or should develop a social network for the alleviation of social isolation. Weiss believes that there is no other way for helping the lonely but by providing them with the interactions they need. This position is however challenged by the second major theoretical approach to loneliness, the so-called cognitive approach.

4.3.2 The cognitive approach

The cognitive approach may be seen as an extension of the social needs approach. Cognitivists agree with Weiss that people have social needs and that failure to meet those needs may result in loneliness, but they stress the individuality of those needs Although to a certain extent we all share the same needs, some people are more demanding with respect to their social network than others In the language of the cognitively oriented theorists they have higher standards One of the main differences between the theoretical position of the social needs approach and that of the cognitive approach seems to be that social needs theorists do not recognize the existence of individual standards, but instead assume the existence of a universal standard the fulfillment of the basic social needs Significant deviation of that universal standard is likely to result in loneliness The cognitivists, on the other hand, believe that the same deficiency in social relationships may or may not lead to the experience of loneliness, depending on the social standards of the individual concerned Only if there exists a substantial discrepancy between what an individual desires and what he has been able to realize, is he likely to feel lonely

The cognitivists stress the importance of the cognitive assessment made by the individual of his situation Loneliness is an emotional state, reflecting a lack of wellbeing But the affective component of the loneliness experience is itself insufficient to qualify the experience as loneliness Any number of depressing states would result in the same affective condition Likewise, loneliness is characterized by certain behavioral characteristics - notably the lack of social contacts - but these characteristics need also not correspond to loneliness The same characteristics may give rise to the experience of solitude, which may contribute to one's sense of wellbeing For an individual to qualify his experience as loneliness, he needs certain cognitive cues He must have the conviction, that he would feel happier if he could engage in certain forms of social interaction, that are presently absent see Peplau, Miceli & Morasch, 1982)

The cognitive approach may be schematized as in figure 4 1 below The view that loneliness results from the cognitive assessment of the individual that the quality of his social relations fails to meet the quality of social relations as desired by him, is also known as the cognitive discrepancy model (see Peplau, Miceli & Morasch, 1982, De Jong Gierveld, 1984, Van Tilburg, 1988) It bears the interesting consequence that the alleviation of loneliness does not necessarily require the realization of new social relationships, as Weiss suggested Two other ways of coping with loneliness are possible, according to the cognitivists First, an individual may lower his standards, and this way diminish the perceived discrepancy between his relationships as desired and his relationships as realized Second, an individual may devaluate the importance of the perceived discrepancy, a strategy that De Jong Gierveld (1984) has labelled 'cognitive trickery' An example of a case of cognitive trickery would be an individual who feels lonely because he does not have the partner that he desires, and who comes to terms with his situation by focussing on other people in a comparable situation, who are even worse off By convincing himself that his situation could have been far worse than it factually is, he diminishes his sense of dissatisfaction with his situation, thus reducing loneliness

In the cognitive view, the personal standards play a key role in the presence or absence of the loneliness experience How are these standards established? According to Peplau, Miceli and Morasch (1982), standards are derived in two ways First, people base their subjective standards on past experiences By our active participation in social life, we have learned what sort of relationships gratify our social needs and which relationships do not. Once we have established a gratifying social network, that experience immediately sets our standards for the future. Should our future social situation be qualitatively much less than what we were used to, we are likely to feel dissatisfied and may experience loneliness.

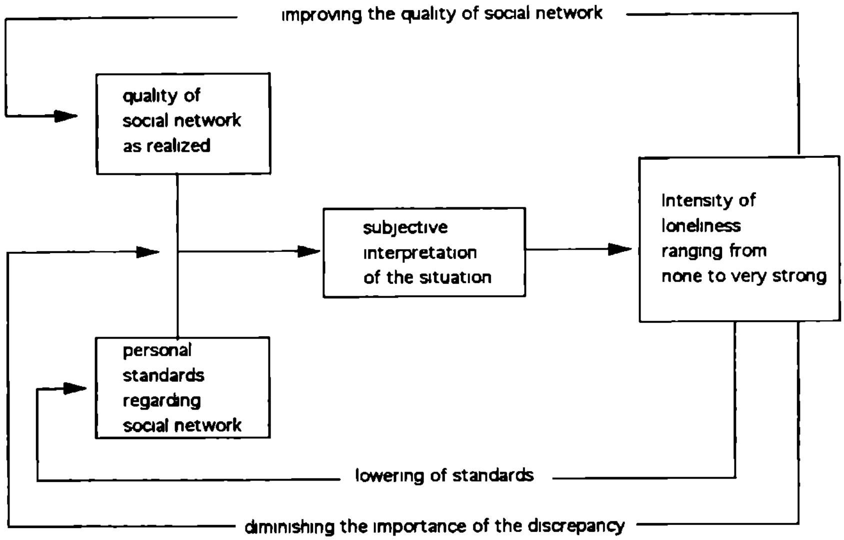

Figure 4.1. The cognitive discrepancy model of loneliness (taken from Van Tilburg, 1988, p.11)

Secondly, people base their standards on a comparison with the situation of others. The social relationships of peer groups suggest to the individual what he may reasonably expect in his social network. A young adolescent who notices that most of his peers have found girlfriends or boyfriends, may start to feel lonely because he has not succeeded in forming such a relationship. Had his peers likewise been still alone, he would not have evaluated his social situation as deficient in this respect. It is as yet unclear what kind of others people use as a sort of reference group for social comparison.

As Perlman and Peplau (1981) note, personal standards are not rigidly fixed, but may change over time or over different situations. They are also related to expectations. When a person moves to a rather deserted environment, he or she will not expect to make much friends and consequently the failure to do so will be experienced as less distressing than it would have been under circumstances where one expected to make new friends easily.

The hypothesis of the cognitivists that the social needs theory should be supplemented with variable individual standards as a causal factor of loneliness, was most directly tested by Van Tilburg (1988). The extent to which social needs were satisfied in the social life of an individual, Van Tilburg referred to as the 'quality of the social network'. He hypothesized that the same quality of a person's social network would give rise to different degrees of loneliness, depending on the standards of the individual concerned. The higher these standards, the stronger the degree of loneliness Van

Tilburg found empirical corroboration for this hypothesis. Controlling for the level of quality, he found low positive correlations between loneliness and the expressed desire to engage in an as yet non-existent partner relationship (r=.24), between loneliness and the expressed desire to engage in some sort of new social relationship (r=.24), and between loneliness and the expressed importance that the individual attaches to having a partner (r=.08). Against his expectation, however, Van Tilburg found a negative correlation between the expressed importance attached to having an intimate relationship and loneliness (r=-.18).

Reviewing the research literature on the relationship between loneliness and the quality of one's network of social relations, Van Tilburg noted that in most studies only weak correlations between the two variables were reported. Closer inspection of the operationalizations of the 'quality of the social network' variable, led Van Tilburg to conclude that most researchers had paid to much attention to objective characteristics of the network, such as number of contacts, frequency of contacts, etc. Van Tilburg developed a new operationalization that stressed the subjective character of the perceived quality of the social network. He first had his subjects name a number of relationships that were important to him, and next proceeded to ask questions about these contacts such as:

- Do you note that he/she cares about you?
- Does he/she help you with little things, such as borrowing, looking after, shopping?
- Would you share your feelings with him/her?

This subjective evaluation of the quality of the individual's social network led to a negative correlation with loneliness of -.30. Van Tilburg presented this result as clear support for the cognitive view that a clear distinction should be made between subjective and objective social isolation.

To emphasize this difference, De Jong Gierveld (1984) explicitly defines loneliness as subjective social isolation. Objective and subjective social isolation may be related, but not in an easy way, as figure 4.2 (taken from De Jong Gierveld, 1984) shows.

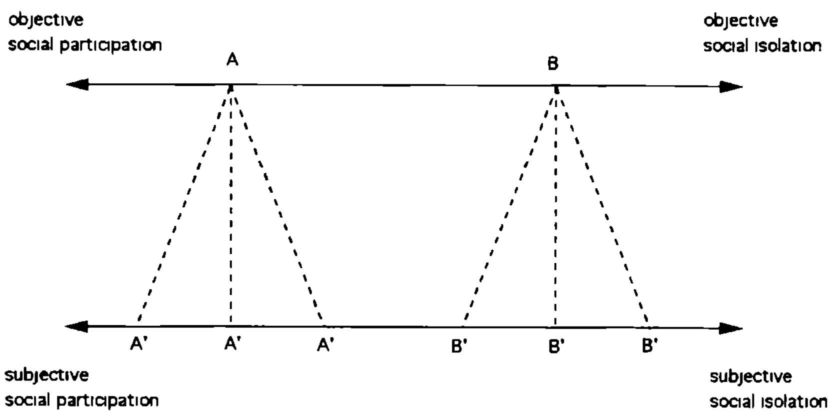

Figure 4.2. The relationship between objective and subjective social isolation
Knowledge of the objective social participation or isolation of a person does not allow us to predict with accuracy how this person experiences his or her subjective social participation or isolation. (Taken from De Jong-Gierveld, 1084, p. 34)

Persons A and B differ in their degree of objective social participation or isolation This does not allow for a clear prediction as to their degree of subjective social isolation, however A variety of possible places on the subjective continuum exist, the exact place being dependent on a host of different variables, such as the nature of the relationships that one is missing, the degree of intimacy of the missing relationships, the importance attached to the missing relationships, the likelihood of establishing the missing relationships in the foreseeable future, the social skills of the individual, and others (see De Jong Gierveld, 1984) Further empirical support for the contention that loneliness cannot be equated with actual number of social contacts (as with friends, neighbours, relatives, etc) has been found in studies from Cutrona and Peplau (1979), Fischer and Phillips (1982), Lopata (1980), and Ross (1979)

4 3 3 Concluding remarks

Although loneliness has become a serious topic of research only since the seventies, theoretical perspectives on the causes and meaning of loneliness can be traced to the early decades of this century But a systematic approach to the study of loneliness, with accompanying empirical research, has been manifest only during the last two decades Most of the contributions to the theory of loneliness come from researchers applying either a social needs or a cognitive perspective As we have seen, both approaches recognize the existence of fundamental social needs which, if unfulfilled, may lead to the experience of loneliness The cognitivists stress that apart from considering the nature of those social needs, attention should also be given to the individual's cognitive organization of his situation The same situation may or may not give rise to an experience of loneliness, depending on the standards of the individual regarding his social network Various empirical studies have corroborated the alleged importance of these standards

4.4 A critical evaluation of theories on loneliness.

In a previous section, mention was made of Derlega and Margulis' conception of concept development in three stages After the importance of a concept has been justified and work on conceptualization has been sufficiently dealt with, the concept will be defined in terms of the laws and lawlike statements in which it occurs This totality of statements will constitute a theory (Derlega & Margulis, 1982) We are probably saying the same when we state that a theory of loneliness consists of the specification of determinants of loneliness, together with their functional relationship to loneliness Since in psychology, determinants are either of a situational or of a personal variety, we can state this formally as

$$L = f\,(p,s)$$

in which L is the experience of loneliness, and p and s are personality and situation variables that act as determinants of the experience

Evaluating current theories on loneliness means that we take a closer look at the personality and situation variables that have so far been identified and examine the functional relationships between these variables and loneliness that have as yet been uncovered An obvious shortcoming of the pre-scientific theories, such as psychoanalysis and the self theory of Carl Rogers, is that their explanatory concepts are not defined in terms of observable phenomena To say that loneliness results from the awareness of alienation of the true self, as Rogers maintains, can at best have some heuristic value, in that it may lead the way towards the uncovering of relevant observable phenomena At present, a concept like 'true self' has no empirical referent and so its importance in the ontogeny of loneliness can neither be demonstrated nor falsified Theories like the one advanced by Rogers and the psychoanalysts are not scientific, and we will not consider them any further

The two main theoretical approaches that we discussed were labelled the social needs approach and the cognitive approach As we saw, Weiss takes loneliness to be the outcome of both situational and personal determinants As Weiss points out, however, the investigation of situational determinants has up to now been rather crude 'Situational studies have been content to note, for example, that about half of a sample of hospitalized patients report themselves as lonely But they have not gone on to ask in just what respect the situation of the non-lonely hospitalized patient is different from that of the lonely hospitalized patient Yet it is just this information that we need, not only to understand why it is that hospitals are lonely places, despite their utter absence of privacy, but also what might be done about it' (Weiss, 1982, p 75) The investigation of personal determinants has so far also found wanting, according to Weiss 'Characterological studies have failed to consider which shy people are not lonely, and which extroverted people are Early history may play a role in susceptibility to loneliness, or level of self-esteem may interact with outgoingness in some complex way Better understanding of what kinds of people are susceptible to loneliness would contribute to an understanding of the nature of loneliness' (Weiss, 1982, p 75)

As we will remember, the key explanatory concepts in Weiss' thinking are 'need for intimacy' and 'need for social affiliation', related to the two types of loneliness emotional isolation and social isolation We discussed how Weiss related the postulated need for intimacy to Bowlby's attachment theory It should be understood that such a 'need' concept has heuristic value only, in that it could suggest to us the kind of observables that act as situational determinants of loneliness Intimacy, by itself, is not an observable but an appraisal by a subject of his situation For the purpose of theorizing, it should be analyzed into more or less objective situational variables Lopata's work on the loneliness of widows helped to analyze the general denominator of intimacy into constitutive elements But the causes of loneliness that she identified - not feeling that you are loved by someone, not to have someone who respects and understands you, who thinks you are important, etc - suffer more or less the same defect as the more general concept of intimacy They are still intuitive concepts and not observable phenomena Again, they do have clear heuristic value for the process of uncovering such observable determinants

A systematic exploration of those aspects of relationships, that together determine the quality of social relationships, was undertaken by Klein Beernink (1983) In all, she distinguished 66 empirical indicators that made a supposedly independent contribution to a person's sense of social wellbeing

She referred to these aspects as 'supportive' Examples of such aspects are 'to be pampered', 'to feel safe', 'to be able to express yourself freely', 'sexual contact', etc

Van Tilburg (1988) subsequently used this inventory of supportive aspects of relationships to construct a scale for the measurement of the overall quality of a person's social network In order to keep the number of questions acceptable, Van Tilburg skipped those aspects that were exclusively associated with a particular type of relationship (e g 'making love') Since the remaining aspects could be further grouped into homogeneous clusters, a representative sample of aspects was selected to construct a 29-item questionnaire Data analysis led to a final selection of 10 items, that met the psychometric criteria of a Mokken-scale The sumscore provided an indication of the quality of the relationships of the individual[1]

Earlier, we argued that Weiss' explanatory concept of intimacy had heuristic value only, in that it could lead to the identification of relevant situational determinants of loneliness Weiss himself has stated that the identification of these determinants is of prime importance for making progress in the study of loneliness Klein Beernink has done a thorough job in analyzing positive relationships into constitutive supportive elements These could be seen as (some of) the situational determinants that Weiss wished to see identified and studied But by adding them up to construct a hypothetical variable like 'quality of the social network', Van Tilburg has in fact brought us back to the stage of an abstract, non-empirical variable like intimacy

To understand why Van Tilburg's quality variable is non-empirical, we can refer back to Guttman's objection to scale construction as opposed to scale analysis, discussed in chapter 2 The supportive aspects of social situations that Klein Beernink identified, Guttman would characterize as a domain of observations[2] Scalability of this domain of observations is an hypothesis that should be put to the test. This hypothesis has obviously been found untrue, otherwise Van Tilburg would not have needed to delete any items in order to construct his scale Van Tilburg's scale is therefore an artificial product, the construction of an empirical indicator that cannot really be abstracted from any empirical lawfulness As such it seems meaningless to study the relationship between the sumscore obtained on this questionnaire, and loneliness

As we discussed in the previous section, Van Tilburg adheres to the cognitive approach Whether the lack of fulfillment of social needs will lead to the experience of loneliness, is supposedly mediated by the standards of the individual regarding his network of relationships The same lack of quality of personal relationships (as measured by the questionnaire) will lead to more loneliness, the higher the standards of the individual, Van Tilburg hypothesized Klein Beernink's list of supportive aspects of social relationships gives a rough taxonomy of man's social needs The cognitivist's assertion that different people differ with regard to the importance they attach to these needs (differential standards) could be tested by confronting subjects with a social need, and respectively ask them to what extent they consider fulfillment of this need to be important (their standard towards this need),

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[1] For each subject, this sumscore was determined eight different times, each sumscore relating to a different intimate relationship (the eight relations were the eight most intimate relationships) The final quality score was determined by adding up the eight sumscores

[2] Although Klein Beernink's taxonomy lacks the systematic character of a mapping sentence

and to what extent this need has actually been fulfilled in their lives

In actuality, Van Tilburg operationalized three different standards the importance attached to having an intimate relationship, the importance attached to a partnerrelationship, and the desire to engage into new relationships Most of the items of the questionnaire designed to measure the first of these standards do indeed to a large extent correspond with the items of the quality scale So both of these questionnaires pertain to the same domain of relevant situations, as one would expect them to do But the other two standards do not seem directly related to the content of the quality-scale The only thing these standards have in common with the content of the quality-questionnaire is that they are about social contacts, which is very general The hypothesis that a lack of fulfillment of social needs may lead to loneliness, but that this is dependent on the individual's standards regarding those needs is intuitively plausible, but why should the relationship between a lack of social needs and loneliness be mediated by one's desire to engage into new contacts? Can such a desire to engage into new contacts really be interpreted as a standard regarding social needs, or could such an expressed desire be interpreted as reflecting a lack of fulfillment of social needs? Such confusion easily arises were one tries to establish relationships between concepts, rather than between observable phenomena

Standards are person related determinants of loneliness As they are operationalized by Van Tilburg, they suffer from the same defect as most of the other personal determinants of loneliness that have been studied Neither shyness, introversion, self-disclosure, etc , nor the standards discussed by Van Tilburg are objective phenomena (like e g age, gender, income, etc) They are not directly observable, nor do they form abstractions from some kind of detected empirical lawfulness Their existence is debatable, and therefore so are research findings relating to these variables

Derlega and Margulis (1982) maintain that up to the present, little real theoretical insight in loneliness has been achieved It can be argued that this is due to a large extent to a failure to identify elementary situational and personal determinants Determinants, that are objectively given as opposed to hypothetical variables that are deliberately constructed to form a scale Apart from this fact, and probably related to it, the research literature also shows a conspicuous absence of functional relationships between proposed determinants and loneliness Nearly all research reports that are summarized in the contributions in the sourcebook on loneliness by Peplau and Perlman (1982) consist of the presentation of correlations between loneliness and its alleged determinants On top of this, loneliness is usually measured with help of a collection of items that do not directly refer to the concept of loneliness An example, mentioned in subsection 4 2 3 , was formed by De Jong Gierveld's deprivation-scale We argued that such scales cannot be considered a measure of loneliness, but instead form a collection of possible situational determinants of loneliness This means that much of the correlation coefficients reported in the literature on loneliness should actually be considered as correlations between supposed determinants of loneliness and supposed determinants of loneliness

The conclusion is therefore, that a theory on loneliness, in the sense of the formal definition of a theory given above, has not yet been presented We belief that such a theory cannot be properly be established within a conceptual entry approach

4.5 Conclusion

Systematic research on loneliness has now been undertaken for over 20 years Almost exclusively, psychologists and sociologists investigating loneliness have adopted the conceptual entry approach Consonant with such an approach, most researchers have regarded loneliness as a theoretical concept, that should be carefully conceptualized before any serious research can be undertaken One of the most thorough and well documented attempts at conceptualization has been undertaken by De Jong Gierveld A questionnaire that she designed to measure loneliness, based on this conceptualization, avoided explicit reference to the concept of loneliness How then, can we be sure that the concept really measures loneliness? Ultimately, proof of validity rests on correlations with other measurement instruments that are designed to measure the same concept Usually, one or more of these instruments are a variant of the single item question 'Do you feel lonely?'

We believe that interest in the experience of loneliness was first aroused because we know of individuals who claim that they feel lonely What we wish to establish, therefore, is what characteristics of situations or of persons influence the likelihood of a person exclaiming that he feels lonely This does not mean, however, that we believe that the work on conceptualization done by De Jong Gierveld would be meaningless On the contrary, De Jong Gierveld has outlined the domain of phenomena, relevant to the study of loneliness She has made clear what sort of situations should be studied, if theoretical insight on the causes of loneliness is to be developed De Jong Gierveld has defined the domain of interest, relevant to the study of loneliness Relevant situational and personal characteristics that function as determinants of loneliness will be found in the domain of interest delineated by De Jong Gierveld in her conceptualization work

Progress in research on loneliness has been made in that various studies have repeatedly shown correlations between loneliness and determinants like e g self esteem and self disclosure to exist. We believe that it will be difficult within the conceptual entry approach to establish a more precise, functional relationship between loneliness and its potential determinants This is because different researchers will disagree on the exact empirical meaning of concepts such as self esteem, and therefore different researchers will work with different operationalizations, or empirical realizations of the same concept Since these different operationalizations do not correlate perfectly, it seems highly unlikely that an established functional relationship can be replicated this way

In our view, what is needed to come to genuine theoretical understanding of the causes and determinants of loneliness, is to identify relevant objective phenomena as situational and personal determinants With objective phenomena we mean empirical phenomena, instead of theoretical concepts The same concept will have a slightly different meaning for different persons, but an objective empirical phenomenon should - at least to a large extent - have the same meaning for different persons This means that it becomes possible for a given functional relationship between loneliness and its potential determinants to be replicated in further research

As the next chapter will make clear, it is possible to capture psychological experiences in terms of such objective phenomena, which means that an empirical entry approach to loneliness need by no means be psychologically sterile

5 AN EMPIRICAL ENTRY APPROACH TO THE STUDY OF LONELINESS

5.1 Introduction

In chapter 3, we discussed and advocated the possibility of studying appraisive judgements, following an empirical entry approach In this chapter we will outline how we studied loneliness within the methodological framework of the empirical entry tradition We will retrace the various steps that were taken and the difficulties that were met, following this approach

One cannot study loneliness (or any other subject) without first giving a precise definition of the object of study We may say that loneliness, as an object of study, will first have to be conceptualized[1] There are various ways of doing this, and the choice of one conceptualization over another depends on the questions a researcher will wish to answer A first possible conceptualization is that of loneliness as an experience As such, we define loneliness an an appraisive response to a situation (cf the general facet design, section 3 3 1, chapter 3) Research will focus on characteristics of the situation and the subject, that determine the likelihood that loneliness will be experienced Second, loneliness may be conceptualized as a so-called secondary empirical term By this we mean that we would not conceptualize loneliness as a theoretical concept or as an empirical concept, but as a property of a relationship of observables that we seek to explain An example could be the definition of loneliness as the negative valuation of a subject of the absence of certain types of social interaction Third, loneliness could be defined as a sociological category, in terms of networks of social relations, and their sociological categories Fourth, loneliness can be conceptualized as a theoretical concept, if certain regularities have been shown to exist that our theory interprets as a varying proneness of individuals to appraise themselves as lonely in a variety of situations In that case, we would refer to such a theoretical concept as 'proneness to appraise oneself as lonely'

In our empirical entry approach, we will conceptualize loneliness as an appraisive response to a situation This will be done by formulating a facet design that defines the domain of our object of study

In section 5 2, our attempts to define our domain of interest will be discussed Various facet designs were constructed and discarded before we finally decided on a satisfactory domain definition for a study of loneliness In section 5 3 we discuss our attempts at articulating this domain definition into a facet design that could be used as a research design for an actual study on loneliness The facets of this design form potential situational determinants of loneliness In section 5 4 we outline a theory on loneliness In congruence with the empirical entry approach, that aims to specify a functional relationship between loneliness and its potential situational and personal determinants, the theory will be unfolded in two separate subsections, one discussing the relationship between a number of situational determinants and loneliness, and the other discussing the relationship between personal determinants

[1] With conceptualization, we do not mean defining a theoretical concept (as in the conceptual entry tradition) but defining the object of study See section 5 2

and loneliness In section 5 5, a psychometric model is introduced that constitutes the formalized version of the theory Specific hypotheses can be tested by incorporating them in this model, which results in extensions of this basic model that will also be discussed In the final sections, our work on the construction of questionnaires, to be used for making the observations that are necessary for a test of the theory will be discussed The chapter closes with a few remarks on an intended pilot study and on the incomplete design that we were going to use

5.2 The development of a domain definition of loneliness

When we set out to undertake an empirical entry approach to the study of loneliness, many of the insights and strategies that we formulated in chapter 3 were not yet fully clear to us In particular, the distinction between the use of facet design as a tool for defining domains, and its use as an observation scheme or (in a more elaborated form) a research design was not yet fully grasped by us We feel it will be instructive for other potential users of facet methodology to get an impression of the various attempts that we made to specify a facet design for the study of loneliness A discussion of the reasons for discarding some facet designs and retaining others will be helpful to other potential facet methodologists in their own endeavour to demarcate their domain of interest with help of facet design

The logical first step in an empirical entry approach is the formulation of a facet design, with the purpose of defining a domain of interest In our attempt to determine our domain of interest, we relied heavily on De Jong Gierveld's work on the conceptualization of loneliness (De Jong Gierveld, 1984) We found that all instances of loneliness had to do with one or more of the following aspects

- Objective social isolation (although the frequency of contacts is not directly related to loneliness, it appears to interact with other variables as a potential determinant of loneliness),
- A lack of intimacy in the existing relationships,
- A desire to form new relationships,
- The involuntary character of the situation,
- The time perspective on the situation (loneliness may be perceived as durable or temporary)

It seemed therefore reasonable to take these aspects as defining characteristics of the domain of phenomena related to loneliness We arrived at the mapping sentence presented in table 5 1

Although this mapping sentence seemed to agree with De Jong Gierveld's conceptualization of loneliness, we felt it was unsatisfactory In essence, a facet design should function as a coordinate system for making observations A theory free, empirical referent for the testing of any theory on the domain The way we formulated the above mapping sentence, our facet design seemed to be

TABLE 5.1: FIRST MAPPING SENTENCE ON LONELINESS

A given phenomenon belongs to the domain of loneliness phenomena, if it

concerns a person (P) with (demographic characteristics) and

(intra-individual characteristics) who is
voluntary
involuntary

confronted with a supposedly
temporary
permanent
situation of objective

social integration
social isolation
in which he/she has attained a subjectively

adequate
inadequate
number of intimate relations that he/she

attempts
does not attempt
to expand, and on the whole evaluates as a

positive
negative
situation.

contaminated with theoretical presuppositions, probably owing to the fact that we based it on De Jong Gierveld's attempt to make explicit loneliness as a theoretical concept. In addition, we thought the chosen facets to be too vague to function as coordinates for making empirical observations. For example, how to relate a situation like 'not being able to talk over your problems with your partner', which intuitively seems related to the domain of loneliness, to the facets of our first mapping sentence on loneliness? We arrived at the conclusion that our demarcation of the domain of loneliness should be cast into another facet design, one that at the same time was clearly theoretically neutral, and could be used as a coordinate system for making observations

Considering the literature of loneliness, we decided that the two key characteristics of any loneliness experience were relative absence of social intercourse and relative absence of intimacy As we discussed in the previous chapter, intimacy and social intercourse were seen by Weiss (1973) as the two basic social needs, related to the development of emotional isolation and social isolation, respectively We therefore concluded that the empirical phenomena that these two characteristics refer to, together define the domain of situations related to the experience of loneliness We had not yet taken notice of Klein Beernink's work on the empirical aspects of social support, so we set out to make a list of relevant empirical phenomena by interviewing a number of employees of the psychological laboratory of Nijmegen on the subject. What typical instances of social intercourse could they name? What did they consider typical behavioral instances of intimacy? Based on such loose interviews, a list of behavioral instances was compiled, containing basic elements like the following

1 Going out to the cinema (social intercourse),

2 Dining out (social intercourse),

3 Having a chat (social intercourse),

4 Making an informal telephone call (social intercourse),

5 Crying out with someone (intimacy),

6 To encounter understanding from someone (intimacy),

7 Placing a high value on a good relationship with someone (intimacy),

8 Finding it important to reconciliate yourself with a certain person (intimacy),

Using this procedure we identified about 14 typical instances of social intercourse, and some 20 varieties of intimate expression For practical use, we fused the individual elements into more generic categories For instance, the above mentioned elements nrs 1 and 2 were put into a generic category named 'going out for pleasure', and nrs 3 and 4 also became a single element of the social intercourse facet, bearing the generic name 'having casual contacts' Likewise, elements nrs 5 and 6 fused into the single intimacy element 'feeling free to show strong vulnerability', and nrs 7 and 8 became 'feeling somewhat attached' The resulting mapping sentence, presented in table 5 2 below, seemed to be theory free and to be of potential use as an empirical referent A critic could express doubt as to whether the domain specified really pertained to the domain of loneliness, but, as we discussed in chapter 3, a domain definition is never right or wrong in itself. It can be judged as either more or less fruitful for the construction of a theory on the subject matter. Those researchers studying loneliness who feel that the domain specified will not yield valuable insights on loneliness, are free to adopt a different domain definition and to proof their point (cf. Guttman, 1981b).

TABLE 5.2: SECOND MAPPING SENTENCE ON LONELINESS

```
The cognitive assessment of a person (P) of the frequency of

   A: Feeling free to show mild vulnerability in
      Sharing a basis of trust and acceptance in
      Feeling free to show strong vulnerability in
      Feeling somewhat attached                      (while)
      Being affectionately attached
      Feeling warm and secure
      Sharing a romantic relationship
      Having sexual contact
      Unspecified

   B: Going out for pleasure
      Going on a visit / being visited
      Undertaking recreational activities   with his/her
      Having casual contacts
      Undertaking voluntary activities
      Unspecified

   C: Partner
      Family
      Neighbours                                    R: never
      Colleagues            may be registered as        to
      Fellow club members                             very often
      Fellow students
      Others
```

Yet, again we were not satisfied. For one, the elements of facet A (expressions of intimacy) were ambiguous and open to subjective interpretation. What constitutes 'mild vulnerability', for example, is a debatable question that cannot be objectively decided. The cause of this unwanted ambiguity is the fact that although we started off with dissembling the generic concept of intimacy into constitutive elements of an objective empirical nature (like 'finding it important to reconciliate yourself with a certain person'), we subsequently began to fuse these elements into generic concepts again. Actually, we made the same error that we credited Van Tilburg with in the previous chapter (section 4.4).

What bothered us most, however, was that formulated like this, the mapping sentence hardly looked anything like the domain definitions that Guttman gave of e.g. intelligence items and attitude items. In the present form, the facet design functioned as an observation scheme rather than as a domain definition. It was at this stage, that it became clear to us that facet designs could be used for two different and distinct purposes: either as a tool for defining domains, or as an observation scheme or research design. A domain definition, we felt, should only contain facets that were necessary for the purpose of including relevant phenomena and excluding irrelevant ones. These facets should be generic rather than specific, and be split up into different elements only in so far as these elements form a subset of all the potential elements belonging to the facet, with the excluded facet elements being of no relevance to the domain of interest (see the discussion in chapter 2, section 2.3). Our second mapping sentence, we now felt, did not present a domain definition of loneliness but a taxonomy of observations that could potentially be of relevance for the study of loneliness. Such a taxonomy should be in congruence with a priorly given domain definition of loneliness. Apart from the fact that this taxonomy was partly comprised of ambiguous facet elements, we also doubted whether the elements of facets A and B really exhaustively describe the domain of interest and whether they are really mutually exclusive.

Discarding the second mapping sentence, we now set out with the explicit intention to delineate, or demarcate, the class of relevant phenomena pertaining to loneliness from phenomena irrelevant with respect to loneliness. We posed the following question to ourselves: if we say we wish to study loneliness, what kind of behavioral phenomena do we have in mind? That this preliminary question is not one to deal with superficially, may be inferred from the following observation by Coombs: 'It is not uncommon for a behavioral theory to be somewhat ambiguous about its domain. The result is that there is usually an experiment that will support the theory, and another experiment that will disconfirm it. The value of such experiments is to be found in the implications they may have for the boundaries of the domain, rather than for an overall acceptance or rejection of the theory' (Coombs, 1983). A logical first step in the process of theorizing should therefore be the delineation of relevant phenomena, i.e. the demarcation of behavioral events that pertain to the domain of loneliness. Actually, this amounts to giving a definition of what loneliness is about, but unlike the usual types of definitions, this definition is explicitly stated as a collection of relevant PxSxR observations, pertaining to loneliness. Hence the term domain definition. A domain definition of loneliness gives us the boundaries of all the potential observations that bear meaningfully on the experience of loneliness. What then, are these potential observations?

A first feature of loneliness experiences, on which all researchers seem to agree, is that it constitutes a subjective sensation I e , it is not possible to qualify an instance of objective social isolation as an instance of loneliness (see e g De Jong Gierveld, 1984, Perlman & Peplau, 1981) Only the subject him or herself may qualify the experience as one of loneliness In essence then, the experience of loneliness constitutes an appraisive response to a situation Formally, this means that the response range of our domain definition runs from (very) little to (very) much lonely Of course, this is synonymous to saying that an experience is one of loneliness if and only if the subject qualifies it as such, or, i e loneliness is in the eyes of the beholder (cf Coombs' conception of risk, Coombs & Huang, 1970)

What restrictions should be placed on situational characteristics? What features of a situation need be present in order to consider them related to experiences of loneliness? An obvious feature is that loneliness pertains to social situations, or more precisely, to situations of social exchange Outside the (broad) domain of social exchange situations, no behavioral events occur that (at least to us) have a bearing on loneliness This domain may be further restricted De Jong-Gierveld (1984) noted that each loneliness experience is characterized by a sense of missing I e , someone feeling lonely experiences a shortage of something connected to his social life But a shortage of what, exactly? This provides ground for theoretical speculation I e the 'what' is a question to be filled in theoretically and to be tested empirically In the definition of our domain, we only specify what sort of observations we wish to theorize about Since the experience of loneliness seems related to the perceived infrequency of certain situational characteristics, this suggests that the frequency of social exchange situations constitutes an important observation for the theoretician on loneliness Hence, it should be taken up as a facet in the domain definition The above considerations lead us to formulate the domain definition of loneliness, presented in table 5 3

TABLE 5.3: A DOMAIN DEFINITION OF LONELINESS

A {PxSxR} triple belongs to the domain of loneliness experiences iff

the subject (P) appraises himself in a {social exchange situation}

	high		(very) much	
of		frequency as		lonely
	low		(very) little	

We had now demarcated the domain of potential observations that we were interested in The next step would be the further articulation of this facet design for the purpose of actual theorizing and research

5.3 From domain definition to observation scheme

The domain definition of loneliness states that loneliness is an appraisive response to a social exchange situation A theory on this domain will relate a number of characteristics of the subject - to be specified in person facets - and a number of characteristics of the situation - situation facets - to the response facet, the statement of the subject that in a given situation (S) he either does or does not feel lonely Once we have specified relevant person and situation facets, we have a facet design specifying all the observations to which our theory will pertain The cartesian product PxSxR specifies all logically possible observations within this domain, and the theory will specify which of these logically possible observations will actually occur, and which observations will not occur In the case of a probabilistic theory, it is the likelihood of certain observations that will be specified

The domain definition of loneliness states that all situations relevant to the study of loneliness are social exchange situations This means that situation facets will specify features of social exchange situations At first, we did not have any clear idea about which features of social situations would be particularly relevant for the study of loneliness Since most of the explanatory constructs in traditional loneliness research do not unequivocally refer to empirical phenomena, the available literature on the topic of our interest did not immediately suggest to us any situation facets that would be of obvious importance So the first articulation of our domain definition into a more elaborated facet design was inspired by mere common sense As it happened, this facet design helped us to evolve alternative facet designs in a more systematic fashion. Our first The initial attempt to articulate the domain definition into a facet design that could be used as a research design for actual study, is presented in table 5 4 below

This facet design contains six facets specifying social exchanges Any social exchange is initiated by either the subject, or by the partner of the social exchange If it is the subject who shares something with the other, he is active in the social exchange If it is the other who shares something with the subject, the other is the active agent of the social exchange, and hence the subject is passive The second facet specifies the mode of the social exchange We may be sharing something, or we may be communicating information Alternatively, we may be providing or seeking support, cooperation, etc Furthermore social exchanges clearly have an object. Possible objects are specified by the third facet Suppose we have lost our way We are then seeking information as to how we may get where we wish to be Here we are obviously active subjects in search of support in the form of information Alternatively we may be sharing an experience with someone, or asking about someone's attitudes, etc Of course, the object of social exchange may originate either from the subject or from the other The information that we want will obviously originate from the other, but it may be our experience that we are trying to communicate, or the other's goods that we wish to borrow (seeking support) The last two facets specify with whom we are interacting, be it a friend, a relative, or a partner, and to

TABLE 5.4: FIRST ARTICULATION OF THE DOMAIN DEFINITION

```
                                     frequent
The {subject} experiences the        ..........     occurrence of a {social
                                     infrequent

                                 very much
exchange situation} as           ..........    lonely with respect to the
                                 very little

mode of exchange

where 'social exchange situation' is specified by:

           subject: active, passive
  mode of exchange: sharing, support, communication, cooperation,
                    asking
object of exchange: experiences, goods, goals, attitudes,
                    information
  origin of object: self, other
   in area of life: work, leisure, hobbies, health, home, sex
 in social context: in general, with friends, family, partner
```

which area of life the social exchange pertains. We may be seeking information with regard to our work, or we may be in search of someone to share our leisurely activities with, etc.

The problem with this initial attempt at articulation of our domain definition into a potential research design is that the chosen facets seem somewhat arbitrary. No rationale has been given for this particular choice of facets. Furthermore, the chosen elements are not exhaustive and mutually exclusive. In the 'mode of exchange'-facet, for instance, there appears to be considerable overlap. Specifically, any type of communication may also be designated as a form of sharing. The same goes for 'cooperation'. On the other hand, depending on the specific type of communication, cooperation, or asking, each of these elements could be taken to reflect support. If I help someone out with a mathematical problem, I am communicating information to him, and in doing so supporting this person. Likewise, to ask someone about his health may be taken to express concern and as such form an instance of support. Cooperation, lastly, has obvious connotations of support. The reason for this overlap seems to be that 'communication', 'cooperation' and 'asking' are fairly concrete and unequivocal categories, but 'sharing' and 'support' are not. The latter are concepts of a higher order, which come into play only after social exchange in the form of communication or in any other form has been established. We may qualify a specific form of communication as either 'sharing' or 'support', depending on its specific content. A demarcation of social exchange behavior may make use of a 'mode of exchange' facet containing elements like 'sharing' and 'support', or it may contain elements like 'communication', 'cooperation', and 'asking', but not both. The elements belong to domain definitions of a different order (see Roskam, 1990).

The 'object of exchange'-facet is also subject to obvious criticism. This facet was included in the design because it would have a different bearing on the experience of loneliness whether one shares information with someone, or goods, or attitudes, or goals. This seems a plausible assumption, but a critic may ask why just these particular elements were taken up as relevant. Of course, there was no justification except a feeling of common sense. Apart from this weakness, this facet design entails linguistic problems which appear when we try out all different sorts of structuples. We may share information, experiences, attitudes, and so on. But how do we support information? Or goods? One way out of this would have been to state that a number of combinations is logically impossible and can therefore not be dealt with. Instead, we resolved to construct a new facet design in a more systematic fashion. To this end, we tried to specify social exchanges with help of a number of very basic elementary facets.

5.3.1 Elementary facets of social exchanges

Direction of social exchange

Any social exchange involves at least two participants. We decided to restrict ourselves to social exchanges that actually involve no more than two participants. Any such social exchange may be said to have a direction. I am advising you, you are helping me out with my work, I ask about your marriage, etc. Social exchanges may often be designated as flowing from me (the subject) to you (the other), or vice versa. The direction of the exchange may be an important feature of social exchanges, and can be used as an elementary facet to specify such exchanges. Of course, the 'subject' facet of the facet design presented in table 5.4, qualifying the subject as either active or passive may be said to imply the direction. In the case of an active subject, the social exchange flows from the subject to the other, in the case of a passive subject, it is the other way round. However, there are social exchanges which are better designated as bidirectional. Suppose I am discussing yesterday's football match with a friend. In such a case one could say that the subject is active, but this would not imply, as it does in most other cases, that the other is passive. In conversations, subject and other are both active, the social exchange is bidirectional. So instead of a 'subject' facet, we now adopted a 'direction of social exchange' facet, containing three elements: 'subject to other', 'other to subject', and 'bidirectional'. Of course, the first of these two elements corresponds with the former 'subject active' and 'subject passive' elements.

Mode of social exchange

A second facet pertains to one of the most distinctive features of social exchanges the mode in which they are carried out Any social exchange is either verbal or nonverbal If we compare this with the distinction of 'communication', 'cooperation' and 'asking' in the facet design of table 5 4, a verbal exchange from the subject to the other (or vice versa, or bidirectional), corresponds with 'communication', and a nonverbal bidirectional social exchange corresponds with cooperation Further elaboration of the design may permit the distinction between 'communication' and 'asking' As yet this is not possible with the two facets discussed 'asking' would be designated the same way as communication, namely as a unidirectional verbal exchange This also makes explicit that at least up to a certain extent, these two elements overlap each other

Type of mode

The second facet, containing the elements 'verbal' and 'nonverbal', we called the 'mode of exchange' facet, Any exchange mode may be of a cognitive or an affective type A verbal exchange is of a cognitive character, for example, if it concerns a matter-of-fact statement, like saying that one has watched a certain television programme A subsequent subjective assesment of this programme, like 'it was funny' or 'it was boring' conveys information of an affective nature Since the distinction between cognitive and affective social exchanges pertains to the mode of exchange, we referred to this additional facet as the 'type of mode'

Active versus passive social exchanges

Apart from qualifying an exchange mode as either cognitive or affective, a second (different) qualification of the exchange mode is possible Suppose we are confronted with a friend who pours (his or) her heart out If we do nothing else but listen, this would probably be regarded as a sympathetic attitude towards our friend, which doubtlessly provides her with comfort However, we could also sit beside her, put our arm around her, stroke her hair, etc In both cases, our behavior could be qualified as affective and nonverbal However, the first example showed us in a passive attitude, whereas in the second we were actively conveying our sympathy In general, nonverbal social exchanges may be said to be of either a passive kind (just smiling, just listening, etc) or of an active kind (what we usually designate as instrumental behavior) We called this facet, containing the elements 'active' and 'passive', the 'action status of the mode' Note, however, that this distinction pertains to the nonverbal social exchanges only, since verbal social exchanges are by their nature always of an active kind There are no passive verbal exchanges

The facets discussed so far may be combined to produce certain prototypical acts These are shown in table 5 5 below

TABLE 5.5: PROTOTYPICAL ACTS - corresponding to the possible combinations of the elements of the Mode, Action Status, and Type facets.

MODE	ACTION STATUS	TYPE	PROTOTYPICAL ACT
Verbal	Active	Cognitive	To tell something
Verbal	Passive	Cognitive	(non-existent)
Verbal	Active	Affective	To praise someone
Verbal	Passive	Affective	(non-existent)
Nonverbal	Active	Cognitive	To lend a hand
Nonverbal	Passive	Cognitive	To listen to someone
Nonverbal	Active	Affective	To put your arm around someone
Nonverbal	Passive	Affective	To smile at someone

Focus of social exchange

An elementary facet of obvious importance for the specification of social exchanges is one that designates what the exchange is about. Any social exchange is about something, has a certain focus, as it were. We may be engaged in a physical struggle which was the result of an insulting remark directed at us, and in that case the exchange may be said to be about an experience of ours, namely our frustration. Alternatively, we may be trying to show someone who has lost his way the shortest way to his destination, and the focus of the exchange is on the problem of the person we are trying to help. Or we may be discussing our ideology with a companion, in which case the focus is on our attitude, or our values. Very generally, we may say that the focus is always on either a problem, an attitude, or an experience. This general distinction corresponds with the distinction of inferential, preferential, or appraisive judgements, that we discussed in chapter 3, subsection 3.3.1. We therefore referred to this facet as the 'focus of social exchange', containing the elements 'experience', 'attitude', and 'problem'. Compared to the 'object of exchange' facet of the facet design presented in table 5.4, the focus-facet contains elements that appeared to be both exhaustive and non-overlapping[2]. The elements that were taken up in the previous facet design and that we now discarded can be seen to have been covered by the present design. If I share goods with someone, I may be doing so

2) Later on we had to conclude that 'problem' and 'experience' could overlap, therefore requiring further refinement of these categories. See subsection 5.6.2.

because he is in need of them, in which case the focus of the social exchange is a problem (namely that of the other). Sharing information may mean that the focus is on the problem (if I am cognitively trying to help someone), but it may also mean that it is on our experience, for instance when I am telling my holiday adventures to someone.

Partner of social exchange

We concluded our list of facets demarcating social exchanges with one that was already present in the previous facet design. It concerns the facet specifying the person we are interacting with, or, i.e. 'the partner of the social exchange'. This facet may be taken to contain the elements 'partner', 'family', and 'friends'. The last of these elements includes friends at work, in the neighborhood, etc. Actually, the 'partner of the social exchange' facet constitutes an open facet which could be expanded with an indefinite number of elements, like 'colleagues', 'acquaintances', etc. By subsuming all these alternative potential elements under the category of 'friends', and by adding 'others' as a fourth element, we 'closed' this facet with a set of elements that are both mutually exclusive and exhaustive.

We had now specified social exchanges in terms of a small number of elementary facets. An overview of these facets is given in table 5.6 below.

TABLE 5.6: ELEMENTARY FACETS SPECIFYING SOCIAL EXCHANGES

Direction of social exchange:	subject to other, other to subject, bidirectional
Mode of social exchange:	verbal, nonverbal
Action status of mode:	active, passive
Type of mode:	cognitive, affective
Focus of social exchange:	experience, attitude, problem
Partner of social exchange:	partner, family, friends, others

With these elementary facets in mind, we began to re-examine the literature on loneliness to see if this provided suggestions for relating these facets to research hypotheses.

5.3.2 A research design for the study of loneliness

We saw in the previous chapter how Weiss' concept of intimacy was translated by Klein Beernink (1983) and Van Tilburg (1988) in terms of social support. Over the last decades, a vast amount of literature has been produced on the topic of social support. A critical review of this literature was presented by House and Kahn (1985). House and Kahn noted an almost exponential growth in the literature dealing with social support in relation to social well-being, but also an unwanted lack of specificity in conceptualization and measurement. As a first and necessary step in overcoming this situation, House and Kahn set out to review the literature on social support, to see what results were yielded and with what instruments. However, a preliminary remark made by House and Kahn clearly exposes the limited value of the existing literature: 'The research appeal of social support, however, is based neither on the specificity of the concept nor on the emergence of some uniquely successful empirical measure. Rather, like the related concept of stress, social support has attracted researchers and stimulated research across the biomedical, behavioral and social sciences because of its integrative promise and intuitive appeal. It suggests an underlying common element in seemingly diverse phenomena and it captures something that all of us have experienced. The term connotes enough that it has proved fruitful even in the absence of denotation' (House & Kahn, 1985). This shows us two things: 1) social support has emerged in the literature as a relevant issue by common sense, and 2) the emphasis on the relationship between social support and social well-being, as found in the literature discussed by House and Kahn, does not imply that there are no other features of social exchange behavior that may bear meaningfully on social well-being (or its absence, i.c. loneliness). Other variables besides social support may well be operative, but simply overlooked since their relevance is less intuitively obvious.

In their review, House and Kahn conclude that social support is generally conceptualized in three different ways. The first concerns the quantity or number of social relations that an individual entertains. Regarding the empirical research done on this aspect of social support, House and Kahn note that the general finding is that up to a certain number of relations, an increase in quantity results in an increase of social well-being and health. Beyond that critical quantity, further expansion of the number of relations has little extra effect on well-being (a finding also noted by Van Tilburg, 1988). A second approach to the assessment of social support concentrates on characteristics of the network of relations of an individual. Of all possible characteristics, the literature shows that especially reciprocity (who frequently initiates the social exchanges, the subject, the other, or both?), and gender of the persons one interacts with (frequent contact with women appears to be health promoting) have important bearing on social health. The third approach to social support concerns the functional content of the relationships. Measurement instruments probing this functional content typically ask for the perceived availability of different types of support, which are traditionally subdivided into the generic categories of instrumental support (someone does a job for you, or lends you something, etc.), informational support (receiving suggestions, directives, etc.), appraisal support (affirmation, feedback, social comparison), and emotional support (affect, trust, esteem, listening, etc.).

Based on their extensive review of the literature, House and Kahn conclude that the aforementioned characteristics of social support are the most important ones with regard to social well-being and health. However, as we observed above, no reference is made to empirical findings that show that other features of social exchange behavior do not play an important role. It is possible therefore, that such other aspects of social exchanges are simply overlooked. Furthermore, the results that are reported in the literature are all founded on the operationalistic approach, and are therefore subject to various forms of criticism Besides the specific objections that may be raised against the operationalistic approach as such (see Roskam, 1989b), the observation of House and Kahn that 'one of the most influential review papers on social support (Cassel, 1976) offered neither an explicit definition of support nor any specifications regarding measurement' (House & Kahn, 1985) suggests that the conceptualization of social support has been dealt with rather loosely, bringing along a certain fuzzyness of the concept However, notwithstanding such questionable methodological value, the consistency of the findings reported in the literature provides valuable suggestions as to the sort of observations that will yield the most fruitful insights concerning the experience of loneliness These findings may therefore be especially of relevance for the specification of a research design type of facet design

There are two variables that House and Kahn distinguished as particularly important to social well-being, one being the reciprocity of the social exchanges, the other the presence of social support It seems reasonable therefore, that a facet design for research on loneliness should at least incorporate these two variables as facets, or as combinations of facets Where reciprocity is concerned, this is simple since the 'direction of social exchange' facet in our domain definition seems to cover it Social support forms a different matter, however

House and Kahn distinguished four different kinds of social support First of all they mention emotional support, under which they subsume characteristics of social exchange like affect, trust, esteem, listening, etc Secondly, there is instrumental support, with examples like someone doing a job for you, someone lending you something, etc Thirdly, they mention informational support (receiving suggestions, directives, etc), and lastly they point to the importance of appraisal support, by which they refer to such social characteristics as affirmation and social feedback The importance of social support has been well founded, even though, as House and Kahn freely admit, the concept has so far been used very loosely, without attempts toward stringent definition

When one takes a closer look at the examples that House and Kahn gave as an illustration for the various forms of social support, it becomes apparent that the concept of support has been used here very generally Whereas the rendering of a service or the supply of information form examples which we cannot see as anything else but instances of support, some of the other examples are more indirectly related to support The presence of trust in a relationship, for example, is probably instrumental in the maintenance of someone's emotional stability Should an emotional problem occur, the subject knows he can turn to his partner or friends for help, and this feeling will in all probability be health promoting However, to call the presence of trust in a relationship itself an instance of social support, rather than a prerequisite to the possible reception of support when needed, seems to be stretching the concept beyond its natural limits The same may be said of the examples given for what is termed 'appraisal support' Affirmation and social feedback will possibly be health promoting, but to suggest that these characteristics of social situations are health promoting because they constitute a form of social support is meaningless unless it is clear what characteristics of these social phenomena qualify them as instances of social support Otherwise, it may be that they are considered as instances of social support because they are found to be health promotive, whilst at the same that health promoting character is explained by calling affirmation and social feedback instances of social support

Such circular reasonings are by no means exceptions in social science, and their presence once again stresses the importance of giving a clear definition of the concepts that we use

A good definition of an empirical concept requires that we may unambiguously decide whether a given subject, object or situation belongs to the concept or not The examples of instrumental support and informational support, given above, conform to the common sense notion of what support is Closer scrutiny of these examples shows that in these cases the support that is given pertains to a *problem* of the subject to receive advice, or to receive physical or material help In the other examples, corresponding to emotional and appraisal support, such a problem situation is absent The presence of trust in a relationship, or the possibility to find affirmation in a relationship, have no bearing on problem situations of a subject Rather, they may be said to constitute a positively toned experience for the subject which, of course, is likely to be health promoting So rather than to speak of emotional, instrumental, informational, or affirmational support, it may be simpler and more objective to speak of an emotional, instrumental or informational type of exchange (we will discuss below how these three types are related to the elementary facets characterizing social exchanges, specified in table 5 6) For affirmational support there seems to be no such translation into an equivalent type of social exchange Affirmation and feedback seems to be inextricable characteristics of any positively toned social exchange, so we will not consider these aspects of social exchanges as a separate category

Above, it was noted that the examples given for emotional support on the one hand and for the other two types of support on the other hand, differed with respect to the fact that in the emotional examples which were given it was an experience that formed the heart of the social exchange, whereas in the other examples the social exchanges focussed on a problem situation But of course, it is possible to have an emotional type of social exchange which focusses on a problem situation An obvious example is the provision of comfort by one of the participants of the social exchange to the other On the other hand, it is equally possible to envisage an instrumental type of social exchange that focusses on an experience, rather than on a problem An obvious example forms the playing of a game of tennis together, in which case the pleasant experience of the game forms the focus of the instrumental social exchange In general, we may say that those social exchange situations where the focus is on some kind of problem, are situations of support, whereas those situations where the focus is on some kind of experience or activity are situations of sharing However, we will not make use of complex terms such as support and sharing, which convey a lot of connotations, but rather confine ourselves to the more elementary categories of the type of social exchange and those of the focus of exchange In terms of the even more elementary facets specified in table 5 6 (defining social exchanges), we can define an emotional type of social exchange as any exchange of an affective type of mode Regardless whether the mode of the exchange is verbal or nonverbal, regardless also whether the action status of the mode is active of passive, any social exchange of an affective nature may be called an *emotional type* of social exchange As a second category, the *instrumental type* of social exchange may be defined as any social exchange in a *nonverbal mode* of a *non-affective type*, the action status of which is *active* Lastly, the *informational type* of social exchange may be defined as any social exchange in a *verbal mode* of a *cognitive type* Table 5 7 gives a summary of the relationship between our elementary categories of table 5.6 and the more complex 'type of social exchange' facet.

TABLE 5.7: TYPES OF SOCIAL EXCHANGE - defined in terms of more elementary facets

MODE	ACTION STATUS	TYPE OF MODE	TYPE OF SOCIAL EXCHANGE
verbal	active	cognitive	informational
verbal	active	affective	emotional
nonverbal	active	cognitive	instrumental
nonverbal	active	affective	emotional
nonverbal	passive	cognitive	?
nonverbal	passive	affective	emotional

There is one combination of elementary facets that does not immediately define a higher order type of social exchange, namely nonverbal x passive x cognitive, a combination of facet-elements that yields exemplary situations like 'listening to somebody', 'lending someone your ear', etc. It may be remembered that House and Kahn considered 'listening' as an example of emotional support. We feel that this is only justified when the focus of the social exchange has an emotional character (e.g. you are listening to someone who is pouring his heart out). In such a case, however, it seems more reasonable to qualify the act of listening as a nonverbal passive act of an affective type, rather than of a cognitive type.

An observation scheme for a study of loneliness

So far we have redefined a number of elementary facets in terms of facet elements with - according to House and Kahn - direct relevance to the study of social well-being, and therefore also with direct relevance to the study of loneliness. We have a 'direction of social exchange' facet, which will enable us to study the importance of reciprocity for social well-being. We have a facet specifying the type of social exchange, the elements of which are defined by the more elementary categories of table 5.6, and are closely related to the different kinds of support discussed by House and Kahn. By taking a problem as the focus of the social exchange, the different types of social exchange yield clear-cut instances of support. It will obviously be interesting to examine how such social exchanges bear on loneliness in a way that is different from social exchanges with different foci like an attitude or an experience. In the case of the latter focus, the different types of social exchange yield typical instances of sharing. So the 'focus of social exchange' facet, in conjunction with the 'type of social exchange' facet, partly covers the distinction between 'sharing' and 'support' that we included in our previous facet design of table 5.4. Retaining the facet specifying the sort of person with whom one is interacting (the literature on loneliness strongly suggests this distinction to be of relevance), we arrived at the facet design for observations relevant for research on loneliness, presented in table 5.8.

TABLE 5.8: OBSERVATIONS RELEVANT FOR RESEARCH ON LONELINESS

```
                                        {very infrequent}
The {subject} experiences the              ...........      occurrence of a
                                        {very frequent}

                                very much
{social exchange} as            ............  lonely
                                very little

direction of social exchange:subject to other, other to subject,
                                   bidirectional
    focus of social exchange:problem, attitude, experience
  partner of social exchange:partner, family, friends, others
     type of social exchange:instrumental, informational, emotional
```

We felt that this facet design would permit an empirical entry study of loneliness, which includes observations of typical interest to the psychologist. We could for example ask a subject whether he would sooner feel lonely when his partner never disclosed her problems to him, or when she never discussed her attitudes with him. Assuming that different people will agree on what constitutes a problem and what constitutes an attitude, we are studying objective phenomena, just like Jansen, Dessens and Priem (1990) did in their sociological study of underrepresentation. The difference with their study is that we will focus on the appraisive judgements of subjects, thus probing psychological dimensions.

5.4 A theory on the experience of loneliness

As we argued in chapter 3, psychology deals with choice behavior. Given a certain situation S, a given subject P is left to respond in a number of ways, and the actual response chosen by P constitutes an observation for the psychologist. In contrast, if a given situation S were to evoke, by logical or physical necessity, the same response from any subject, this response would not be of interest to the psychologist, as it does not constitute a choice Any psychological theory is about classes of observations to which a subject might respond in a number of different ways That is, if a sample of subjects (P), a domain of relevant situations (S), and the set of potential responses (R) are well specified, than the theory is about all potential PxSxR events, and it predicts which events will, and which events will not occur (a probabilistic theory does the same but in terms of probability statements)

In table 5 3 we presented our domain definition for a study on loneliness In that domain definition we demarcated the domain of behavioral phenomena, which in our view pertain to the experience of loneliness In table 5 8 we presented an articulated version of this domain definition That is, we specified facets that we feel will be of importance for an attempt to come to a theoretical understanding of loneliness All the facets that were specified are situation facets, as yet no person facets have been introduced and discussed

Starting point for any theory on loneliness is the assumption that different subjects will react differently to the situations that we may present to them That is, we assume that some subjects are more prone to appraise a situation as lonely than others Furthermore, we assume that some situations are more likely to evoke a loneliness response than others A good theory will specify which subjects will respond with a loneliness appraisal to which situations, i e it will state which of all potential PxSxR instances will occur This means that such a theory links the responses of the subjects to characteristics of the subjects on the one hand, and to characteristics of the situations on the other In line with this dual character of a theory, we will develop a theory on loneliness in two stages In the first stage we will discuss some characteristics of persons which we predict will influence their proneness to appraise situations as lonely, and in the second stage we will discuss characteristics of situations that will affect loneliness responses

It should be noted that the considerations in the following two subsections are part of the theory only inso far as they will eventually be formalized into a model for the data, together with specific hypotheses for data analysis

5 4 1 Personal determinants of loneliness responses

As we discussed in chapter 4, subsection 4 3 2, cognitively oriented theorists on loneliness emphasize the importance of individual standards The gap between these standards and the network of social relations as actually realized by the subject, is thought to determine the extent to which a subject will experience loneliness For our discussion of personal determinants of loneliness, we will take this cognitive perspective as a starting point

Subjects may be characterized by their valuation of potential social exchanges (i e their standards), their opportunity to engage in these social exchanges, their actual engagement in these social exchanges, and their satisfaction with their valued social exchanges The number of social exchanges valued, the number of valued social exchanges that one could potentially engage in, the number of valued social exchanges that one actually engages in and the number of valued exchanges that one is satisfied with can each be pictured as sets of social exchanges We hypothesize that the interrelationship of these sets for a given subject determine the probability of this subject feeling lonely in a given situation. The theory on these interrelationships will be unfolded stepwise.

1) We assume that all people have certain social needs: everyone desires at least some form and amount of social exchange. Some people prefer frequent and many different contacts, whereas others desire only moderate social exchange. Regardless of these interpersonal differences, every person has a set of desired or valued social exchanges, the realization of which form a prerequisite for his sense of well-being. Such a set of valued social exchanges we may represent by the set V, and the assumption that everyone values at least some social exchanges may be expressed formally as

$$V \neq \emptyset$$

It should be noted that the valuation of something forms a preferential response. We are presently dealing with valuation of social exchange situations, and this class of responses may be defined in a manner which is analogous to the definition on loneliness.

2) We assume that people wish to maximize their sense of social well-being, and that they will therefore seek to realize the social exchanges they value.
3) In order to realize a certain valued social exchanges, there must be opportunity to do so. The set of valued social exchanges that may potentially be realized (i.e. there is opportunity to do so) we may designate as set C, being a subset of V.
4) We assume that the size of C is determined by situational factors. De Jong-Gierveld (1984) pointed out a number of social factors that may be potentially relevant in this respect. For instance, a middle aged widow may have less opportunity to realize her valued set of social exchanges, than a young unmarried woman. These and similar considerations await elaboration in a sociological theory on loneliness.
5) To realize a social exchange requires an opportunity to do so, but even in the presence of such an opportunity realization of the valued social exchange is not certain. Actual engagement in social activity requires some social skill, and people may differ to the extent that they possess such skill. The set of social exchanges that one actually engages in we may denote with E, which forms a subset of C. We may consider the size of E relative to C as determined by personal characteristics of the subjects. More generally, we may tentatively define as social skill everything apart from values, that mediates between 'opportunity' and 'engagement'. Relevant characteristics may be shyness, introversion, social self confidence, etc.
6) Subjects will be more or less satisfied with the factual status of their set of valued social exchanges. We assume that a subject will not be satisfied with a given social exchange as long as it is not realized. Only after a social exchange has been realized, may it be judged as satisfactory. Formally, this may be expressed as:

$$S \subseteq E$$

where S designates the set of valued social exchanges that one is satisfied with, and E designates the set of valued social exchanges that one has realized.

7) The smaller the amount of satisfactory social exchanges relative to the amount of valued social exchanges (m(S)/m(V)), the higher the probability of a subject appraising a situation representing the absence of a social exchange as lonely. The proneness of a subject to appraise situations as lonely we may designate with ξ_V.
8) De Jong Gierveld (1984) emphasized the importance of the time perspective regarding the experience of loneliness. Subjects who believe that their adverse condition will last only temporarily will experience their sensation of loneliness as less intense than subjects who believe their situation of loneliness to be stable, or durable. Based on this assumption, we may expect the effect of m(S)/m(V) on ξ to be influenced by the amount of realized social exchanges relative to the amount of potentially possible social exchanges: m(E)/m(C). We may say that the ratio m(E)/m(C) reflects the ability of the subject to realize social exchanges. The smaller m(E)/m(C), the smaller his ability, and therefore the less hope he may have that the ratio m(S)/m(V) will increase within the foreseeable future. Of course, if the set C is empty, the ratio m(E)/m(C) is formally undefined. Therefore we state as an additional definition that if C equals zero, so does m(E)/m(C).
9) The effect of m(S)/m(V) on ξ_V is further influenced by the amount of potentially possible social exchanges, relative to the amount of valued social exchanges: m(C)/m(V). The ratio m(C)/m(V) may be taken to reflect the favorability of the subject's circumstances for realizing new social contacts. The smaller m(C)/m(V), the more unfavorable these circumstances, and therefore the less hope the subject may have that m(S)/m(V) will increase within the foreseeable future.

Depending on the interrelationships of their valuation of, their engagement in, their satisfaction with, and their opportunity for realizing social exchanges, subjects will be more or less prone to respond to a situation with a loneliness appraisal. That is, different subjects will show different proneness to loneliness. On the other hand, different situations will tend to be appraised as loneliness to a different degree, independent of the characteristics of the subjects making the response. Why some situations will be appraised as lonely more often than other situations forms the subject of the second part of the theory on loneliness.

5.4.2 Situational determinants of loneliness responses

All potential situations that we consider relevant for a study on loneliness are given in the observational scheme of table 5.8. The situations may be characterized by their constituent facet elements. If the theory on loneliness has anything to say about the different potential of situations to evoke a loneliness response (i.e. the situation is appraised or experienced as lonely), it must do so by reference to the facets that make up the situations. What role do the facets play in determining the probability that a situation will be appraised as lonely? It should be understood that all facets are thought to play an active role in determining this probability, for if they did not, their presence in the mapping sentence would not be warranted (but neither would it be harmful)

In the following we present various intuitive considerations which will eventually be formulated as specific testable hypotheses, in terms of stimulus-response relations

The frequency facet

The first facet of the observation scheme for research on loneliness pertains to the frequency with which certain social exchanges occur De Jong-Gierveld, who has done extensive research on loneliness (see e g De Jong-Gierveld, 1984) regards the missing of certain relationships as the key feature of loneliness Without this subjective feeling of missing, there is no experience of loneliness This means, that we should expect to find loneliness to be related to low frequency of social exchange, and to find it unrelated to high frequency of these social exchanges For the purpose of theorizing, we will henceforth restrict ourselves to observations pertaining to social exchange situations of very infrequent occurrence

The direction-of-social exchange facet

A further facet in the observation scheme for research on loneliness forms the 'direction-of-social exchange' facet Any social exchange may be characterized as either flowing from the subject to the other, or from the other to the subject, or it may be characterized as bidirectional, in which case a direction cannot truly be specified (like in a discussion between two people) De Jong-Gierveld (1984) states that loneliness is always an involuntary experience One does not choose to feel lonely, one is confronted with the experience of feeling lonely The implication seems to be that loneliness is more often connected to social exchanges which flow from the other to the subject, than to situations where social exchanges flow from the subject to the other This follows from the fact that I can - up to a certain extent - freely decide to help somebody else, but that I can exert little control over somebody else's willingness to help me or not The fact that I have no influence over the latter situation, seems to make it amenable to sentiments of loneliness if no one will help me, I may feel lonely In contrast, the fact that I do not help others forms a personal decision I may eventually decide to help someone after all Of course, if I do not know anyone, than I cannot help anyone, and in that case the fact that I refrain from social exchange is not a personal decision but possibly a state of affairs that I find very undesirable In that case, such situations may well give rise to sensations of loneliness It is important to see, however, that whereas we can never choose to be helped, we can often choose to help For this reason, we may expect that the probability of a situation being appraised as lonely will be higher for those situations depicting absence of social exchanges that flow from the other to the subject, than for absence of social exchanges flowing from the subject to the other To engage in the third type of social exchange situations, characterized as bidirectional, we are partly dependent on the cooperation of the other we cannot discuss a topic with someone else unless the other agrees to do so Therefore, we can exert less influence over the occurrence of this sort of social exchanges than we can over the occurrence of social exchanges flowing from us (the subject) to the other For this reason, we may assume that absence of bidirectional social exchanges will be more often associated with loneliness responses than unidirectional social exchanges flowing from the subject to the other. On the other hand, a subject seems to have more freedom to establish a bidirectional social exchange than to establish a unidirectional social exchange flowing from the other to the subject. We may therefore expect that absence of social exchanges that flow from the other to the subject has the strongest potential of evoking loneliness experiences, followed by absence of bidirectional social exchanges, that will evoke a loneliness response more often than social exchanges flowing from the subject to the other.

The type-of-social exchange facet

The next facet of the observation scheme of table 5.8 distinguishes between types of social exchange, notably between an informational, an instrumental, and an emotional type of exchange. The following considerations may provide a rationale for an ordering of these three elements. It is easy to advice someone, in the sense that is does not require much effort to do so. Therefore, if you need advice, you may probably readily find someone who will give it to you. To lend someone instrumental support, however, requires more effort and will therefore also be harder to get. If a person does provide you with instrumental support, he thereby demonstrates that he is willing to invest some time and effort in order to help you. Therefore, if someone is willing to lend you instrumental support, he conveys a certain sympathy for you. Since in general the investment of time and effort is much greater for any instrumental social exchange than for informational social exchanges, more sympathy is conveyed with the provision of instrumental support than with the provision of informational support. Lastly, emotional exchanges are by their nature more personal than any of the other types of social exchange. Being more intimate in nature, this type of social exchange fulfills an important social need in human beings. We therefore hypothesize that the absence of an emotional type of social exchange will more strongly elicit loneliness than the absence of the other types of social exchange, and absence of the instrumental type of social exchange will more strongly elicit loneliness than absence of the informational type of social exchange.

The focus-of-social exchange facet

Two separate rationales suggest an ordering of the elements of the focus-of-social exchange facet. First, whereas a problem and an experience are foci with an emotional character, attitudes are preferential and cognitive in nature. In general, we expect social exchanges of an emotional nature to have a greater bearing on social well-being and its absence in the form of loneliness, than social exchanges of a cognitive nature. This expectation led us to hypothesize that absence of the emotional type of exchange would elicit loneliness more strongly than absence of either of the other two types of exchange. Likewise, it leads us to hypothesize that absence of social exchanges focussed on emotional issues like problems or experiences will more strongly elicit loneliness than absence of social exchanges focussed on an attitude.

A second rationale suggests an ordering between a problem as focus and an experience as focus. People may feel a need to share their experience, as they may feel a need to share their problems. However, unlike an experience, a problem requires alleviation. One has to find some solution and this often means that one is in need of assistance from somebody else. For this reason, failure to establish social exchanges in which the focus is on a problem will in general be more serious, and more detrimental for one's sense of social well-being than failure to establish a social exchange with an experience as its focus. For this reason, we hypothesize that absence of social exchanges with a problem as focus will more strongly elicit loneliness than absence of social exchanges with an experience as focus.

The partner-of-social exchange facet

Like the 'focus of social exchange' facet specifies what the social exchange is about, the 'partner of social exchange' facet specifies with whom we are engaging in a social exchange. We may interact with our partner (whoever we consider that to be), with our family, or with friends (we will presently not consider any other categories). A rationale for ordering these facet elements is provided by the psychological distance between the partner of social exchange and the subject. The greater the psychological distance between a subject and the person he interacts with, the smaller the impact that this partner of social exchange has on the sense of social well-being of the subject. Naturally, the relationship with a marital partner will usually be the most intimate, i.e. the relationship with the smallest psychological distance between the subject and the other. Second in place in this respect seems to be the relationship with one's relatives. Because less psychological distance usually implies greater intimacy, we hypothesize that situations characterized by the absence of social exchanges with a marital partner will elicit loneliness the most strongly, followed by absence of social exchanges with one's relatives, which we believe to elicit loneliness more strongly than absence of social exchanges with friends.

We have now outlined a rationale for a theory that predicts that different subjects will appraise the same situations as lonely to a different extent, and that different situations will be differently appraised as lonely by the same subjects. If we restate this by saying that both situations and subjects may be ordered along a unidimensional latent trait which we may call 'loneliness', this suggests an appropriate psychometric model.

5.5 The logistic model in connection to the theory proposed

Our attention is on the appraisal by our subjects of situations as lonely or not lonely. We may assume that these responses are governed by a unidimensional latent trait, and that both the items and the subjects may be placed on a unidimensional scale representing this latent trait, so that the probability of the appraisal of a situation as lonely by subject v on item i depends on the location of both v and i on the scale. The higher the position of subject v on the scale, the higher the probability that he will appraise a situation as lonely; the higher the position of the item on the scale, the lower the probability that v will appraise that situation as lonely.

Graphically, this may be depicted as in figure 5.1. The curve represents the trace line of an item (a symbolic situation) and is usually referred to as an item characteristic curve (ICC). If the latent trait corresponds to latent loneliness, than a subject with latent proneness to loneliness equal to σ has a probability of .50 of appraising the situation portrayed in the item as lonely, a subject with latent proneness to loneliness less than σ has a probability less than .50 of appraising the situation as lonely, and a subject with latent proneness to loneliness greater than σ has a probability greater than .50 to respond to the item with loneliness.

Latent trait models such as the Rasch model have traditionally been used in the domain of ability tests. Hence the specific terminology of item *difficulty* and subject *ability*. In the domain of appraisive judgements, such as the domain of observations pertaining to the experience of loneliness, it would still seem meaningful to speak of items as being more or less difficult. A 'difficult' item pertaining to the domain of loneliness is an item with a very low probability of evoking a loneliness response from a subject. It requires a very lonely-prone subject to feel lonely in the circumstances portrayed in the item. However, it does not seem meaningful to refer to the subjects' probability of responding to an item with loneliness as his 'ability' to feel lonely. Rather, we will refer to the position of the subject on the latent trait of loneliness as his 'proneness' to feel lonely.

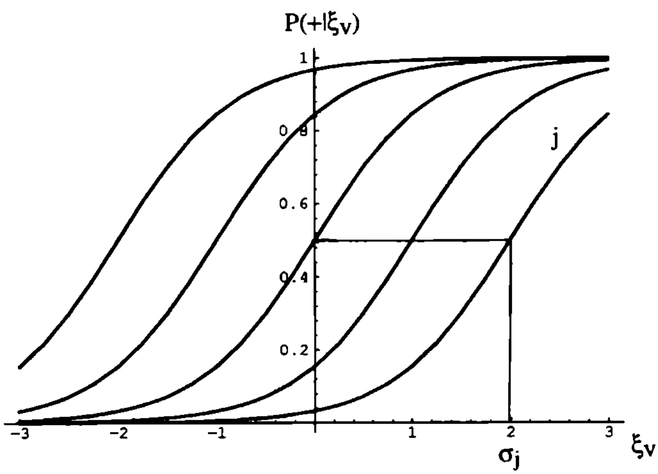


Figure 5.1. Probability that an item will elicit a response of loneliness, as a function of the position of subjects and items along the unidimensional continuum of latent loneliness The potential of the item to elicit loneliness (denoted by the symbol σ) is defined as the point on the latent continuum where the probability of a loneliness response is .50

One of the oldest latent trait models that have been suggested is the two-parameter normal ogive model, proposed by Lord (1952):

$$P_i(\xi) = \int_{-\infty}^{\alpha_i(\xi-\sigma_i)} \frac{1}{\sqrt{2\pi}} e^{-z^2/2}\, dz \tag{5.1}$$

where

$P_i(\xi)$ = the probability that a randomly selected subject with ability ξ gives a positive (or correct) response to item i;

σ_i = item difficulty, defined as the point on the scale where a subject has a probability of .50 of giving a positive (or correct) response to item i;

α_i = a discrimination parameter, proportional to the slope of $P_i(\xi)$ at the point $\xi = \sigma$;

z = a normal deviate from a distribution with mean σ and standard deviation $1/\alpha_i$.

The values of σ_i vary from minus infinity to plus infinity, with values of σ on the negative end on the scale corresponding to items that are very easy, and items with values of σ on the positive end of the scale corresponding to very difficult items. The rationale behind the choice of the normal ogive model is the assumption that the latent trait position of the person v fluctuates randomly, following a normal distribution. The variance of this within subject dispersion is dependent on the specific item that the subject is confronted with. Both assumptions lack substantial justification and are therefore rather artificial (cf Lord, 1980).

A model that is virtually indistinguishable, empirically, from the normal ogive model, but mathematically more tractable, is the two-parameter logistic model, suggested by Birnbaum (see Lord & Novick, 1968):

$$P_i(\xi) = \frac{\exp \alpha_i(\xi - \sigma_i)}{1 + \exp \alpha_i(\xi - \sigma_i)} \tag{5.2}$$

where $P_i(\xi)$, σ_i, and α_i have the same interpretation as in the normal ogive model.

In the special case that the different items have ICC's with equal slopes, the discrimination parameter α_i may be set equal to one, and the two-parameter logistic model reduces to the one-parameter logistic model, which is commonly known as the Rasch model, named after the Danish mathematician who was the first to propose it (Rasch, 1960). Although there exist several versions of the Rasch model (see Fischer, 1974), we will only consider the most popular and fully exploited version, the unidimensional dichotomous Rasch model.

The Rasch model is equivalent with the following assumptions (see Fischer, 1974):

1) Unidimensionality: all items pertain to the same latent trait, and consequently all proneness and item parameters can be mapped into a single continuum;
2) Monotonicity: the probability of a positive response of subject v to item i increases with the proneness of subject v;
3) Local stochastic independence: whether subject v will respond positively to item i depends only on the proneness parameter and on the characteristics of the item; it is independent of the

subject's response to other items. Formally:

$$P\left(X_{vi}=1, X_{vj}=1 \mid \xi_v, \sigma_i, \sigma_j\right)=P\left(X_{vi}=1 \mid \xi_v, \sigma_i\right) P\left(X_{vj}=1 \mid \xi_v, \sigma_j\right) \tag{5.3}$$

4) Sufficiency of the raw scores: the sum of positive (or correct) responses given by a subject forms a sufficient statistic for the proneness parameter ξ.

When these four assumptions are met, all ICC's are parallel, i.e. have equal slopes. In the case of the two-parameter logistic model, a sufficient statistic is obtained by taking a weighted sum of positive responses (with weights equal to the values of the discrimination parameters of the items concerned).

Rasch developed his model with the aim of establishing a measurement model which satisfies the principle of specific objectivity. It means that an unequivocal comparison between two objects is possible, irrespective of the number and nature of the agents (e.g. stimuli) used to make that comparison. This is characteristic for measurement in the natural sciences. For example, we can determine the masses of two objects by applying a mechanical force to these objects. The result that we will register, is not dependent on the specific type of mechanical force that we will use. Which mechanical force and how strong is of no concern for the result that we will register. Rasch has shown that the one-parameter logistic model follows from the requirement of specific objectivity. Used as a measurement model for social science, it implies that if we have a collection of items that is Rasch homogeneous (i.e. the structure of the data obtained with help of these items conforms to the characteristics of the Rasch model), we can scale and compare two subjects v and w such that the expectation of the estimated difference (ξ_v - ξ_w) is independent of the selection of items.

5.5.1 Hypotheses concerning the situational determinants

The theory unfolded in paragraphs 5.4.1 and 5.4.2 permits the formulation of a number of hypotheses. Since the hypotheses of section 5.4.2 pertain to the facets of the observational scheme of table 5.8, for the sake of clarity these will first be reproduced below (see table 5.9). Note that in contrast to table 5.8, the present facet design reflects our intention to focus on infrequently occurring social exchanges of a desirable nature only.

Since all facets are thought to exert an independent influence on the probability that a situation will be appraised as lonely, we may hypothesize that the item location parameters of the items satisfy an additive model (depending on the results of data analyses, we may at a later stage investigate possible interaction effects among pairs or triples of facets).

Hypothesis 1:

$$\sigma_{ijkl}=a(i)+b(j)+c(k)+d(l) \tag{5.4}$$

where

a(i) represents the influence of the i^th element of facet A on the item location parameter;

TABLE 5.9: FACET DESIGN SPECIFYING SITUATIONAL DETERMINANTS

The {subject} experiences the {very infrequent} occurrence of a

{social exchange situation} as very much .... very little lonely.

A: Direction of social exchange:	(1)	Subject to other;
	(2)	Other to subject;
	(3)	Bidirectional;
B: Focus of social exchange:	(1)	Problem; (2) Attitudes;
	(3)	Experience;
C: Partner of social exchange:	(1)	Partner; (2) Family; (3) Friends;
D: Type of social exchange:	(1)	Instrumental; (2) Informational;
	(3)	Emotional;

b(j) represents the influence of the j^{th} element of facet B on the item location parameter;
c(k) represents the influence of the k^{th} element of facet C on the item location parameter;
d(l) represents the influence of the l^{th} element of facet D on the item location parameter;

In matrix notation, this hypothesis may be written as:

$$\sigma_i = \sum_k q_{ik}\eta_k \qquad (q_{ik} = 0,1) \tag{5.5}$$

where
$q_{ik} = 1$, if struct k forms a constitutive part of item i,
$q_{ik} = 0$, if otherwise.
η_k represents the effect of struct k on the item location parameters.
For all items simultaneously, we may write

$$\underline{\sigma} = Q\eta \tag{5.6}$$

where
Q = a matrix designating the presence of a struct in an item;
η = a vector containing the effects of the structs on the item location parameters;
Concerning the specific roles of elements within the facets, we may hypothesize the following:

Hyp.2: $\eta(A2) < \eta(A3) < \eta(A1)$

Hyp.3: $\eta(B1) < \eta(B3) < \eta(B2)$

Hyp.4: $\eta(C1) < \eta(C2) < \eta(C3)$

Hyp.5: $\eta(D3) < \eta(D1) < \eta(D2)$

The foregoing hypotheses imply that the data structure should conform to the linear logistic model, obtained by substituting eq.5.5 in eq.5.2:

$$P_i(\xi) = \frac{\exp(\xi_v - \sum q_{ik}\eta_k)}{1 + \exp(\xi_v - \sum q_{ik}\eta_k)} \tag{5.7}$$

Corroboration of the hypotheses concerning the situation bound determinants will be manifested by an acceptable goodness of fit of this model.

5.5.2 Hypotheses concerning the personal determinants

The proneness of a subject to appraise a situation as lonely is thought to depend on the number of his valued social exchanges that he is satisfied with, relative to the total number of social exchanges that he values.

Hyp.6: The smaller the value of $m(S_V)/m(V_V)$, the higher ξ_V ;

The impact of $m(S_V)/m(V_V)$ on ξ_V, is hypothesized to be related to the number of valued social exchanges the subject engages in, relative to the number of valued social exchanges he might potentially engage in (i.e., he has the opportunity to do so). The smaller this latter ratio, the higher the impact of $m(S_V)/m(Vv)$ on ξ_V.

Hyp.7: The smaller the value of $m(E_V)/m(C_V)$, the stronger the impact of $m(S_V)/m(V_V)$ on ξ_V;

Lastly, the impact of $m(S_V)/m(V_V)$ on ξ_V is hypothesized to be related to the number of valued social exchanges he might potentially engage in, relative to the total number of social exchanges that he values. The smaller this latter ratio, the higher the impact of $m(S_V)/m(Vv)$ on ξ_V.

Hyp.8: The smaller the value of $m(C_V)/m(V_V)$, the stronger the impact of $m(S_V)/m(V_V)$ on ξ_V;

If we partition the various ratio scores of our subjects in three parts, low $m(S_V)/m(V_V)$, medium $m(S_V)/m(V_V)$, and high $m(S_V)/m(V_V)$, with similar partitionings for the other two ratio's, then we have three independent variables of each three levels, to which we may apply analysis of variance. With use of matrix notation, we may formulate the ANOVA model in a regression model, yielding the following equation:

$$\xi_v = \underline{\beta}' \underline{X}_v + \varepsilon_v \tag{5.8}$$

where

$\underline{X}_v$ = a vector of length p consisting of the observations for individual v on p predictors;

$\underline{\beta}$ = the vector of the unknown regression parameters;

ε_v = residual term.

Substituting this equation in equation eq.5.2, the unidimensional logistic model, gives:

$$P_i(\xi) = \frac{\exp(\underline{\beta}' \underline{X}_v + \varepsilon_v - \sigma_i)}{1 + \exp(\underline{\beta}' \underline{X}_v + \varepsilon_v - \sigma_i)} \tag{5.9}$$

which is a variant of the logistic model known as the logistic regression model (see Zwinderman, 1991b). The former three hypotheses may be translated into the hypotheses that the β values corresponding with the main and social interaction effects predicted by hypotheses 7 and 8 will be unequal to zero, whereas β values corresponding to any other main or interaction effects will be zero. Corroboration of the hypotheses concerning the subject bound determinants implies that under these restrictions the model will show an acceptable goodness of fit.

5.6 Preparing an empirical test of the theory on loneliness

5.6.1 Selection and form of relevant observations

We have now specified a theory of loneliness, in the form of

$$L = f(p,s)$$

where L is the statement of a subject that he feels lonely, and p and s are the personal and situational determinants that we discussed in subsections 5.4.1 and 5.4.2 respectively. The functional relationship between loneliness and its proposed determinants is expressed in variants of the logistic model, which were presented in section 5.5. The next step is to test these hypothesized functional relationships. To this end, we need to make observations. Although several different methods of data collection could potentially be used, we decided in favor of using the questionnaire method.

In the course of developing the questionnaire, several issues had to be addressed. First, there was the translation of the *depth structure* - the domain of observations as specified by the facet design - into a *surface structure*: the creation of questionnaire items that could be taken as correct translations of the structuples. Second, a choice had to be made concerning the specific formulation of the items: *concrete and specific or abstract and general.* In the next section we will outline the considerations that eventually led us to opt for the latter type of item formulations, which yield a sort of items that we have called *templates*. Having decided to make use of templates, we faced further decisions on the exact formulation of the templates.

In the course of making these decisions, some further changes in the structure of our facet design were made The template formulations showed us that some of the facet elements were not disjunct, and that other facets could be simplified These *changes in the structure of the facet design* and their consequences for the formulation of templates will also be discussed below The final structure of our facet design could be seen as the articulation of our original *domain definition* into a *research design*, an articulation that had been guided by the specific research questions that we wished to answer The changes we had made into the structure of our earlier facet design, entailed a reformulation of one of our hypotheses, as well as the formulation of a new one These *new hypotheses* will also be discussed in the next section The following section will close with a discussion on the *choice of alternative response categories* It was obvious that one of the response alternatives would be 'I feel lonely', but beside the simple dichotomous alternative 'I do not feel lonely', a choice could also be made for a polytomous response format, with other emotional appraisals besides loneliness as alternative response categories We will review the considerations that led to our decision to make use of a polytomous response format

Apart from items necessary for research on the hypothesized situational determinants of loneliness, an additional set of items had to be constructed for research on the hypothesized personal determinants of loneliness Since the personal determinants required a slightly different item format than the situational determinants, we will discuss our work on the construction of items for research on the personal determinants of loneliness in a separate section

5 6 2 A questionnaire for the situational determinants

The situational determinants were specified in the facet design of table 5 9 A readable item would portray a situation characterized by each of these facets Since we are focussing on the infrequent occurrence of such situations, an item could read 'If you would seldom engage in situation X, how would you feel?' However, a drawback of such a presentation is that it may be confounded with the actual situation of the subject Some subjects, who engage in situation X very often, might answer 'I would not feel lonely' mainly because they visualize the situation as they actually experience it in their lives, rather than that they try to imagine what it would be like if they could seldom engage into this situation To prevent such a confounding effect, we preferred a different formulation 'John does seldom engage in situation X If John were you, how would you feel?' In this way, we believed it would be unlikely for the subject to confuse the hypothetical situation portrayed with his actual situa tion Presenting a whole list of such item formulations would seem to require that we use different names (John, Peter, Mark, etc) for each different situation If we would present such situations continually figuring a certain John, the subjects might begin to form a certain image of John, which could then influence their responses Obviously, a response to a particular item should be independent of responses given to previous items Therefore if the first item figured a certain John, the next could figure a certain Mark, followed by a Paul, etc Of course, to enhance identification, in the case of female subjects female names were used

Depth structure vs surface structure

Having decided upon this general issue, we next had to agree on the precise wording of the item formulations The structuples that may be derived from our facet design, and to which our hypotheses pertain, together form the depth structure of our domain of interest There are different ways into which we may translate the structuples into readable items Each specific way of formulating items on the basis of our structuples, will yield a different surface structure Although the hypotheses pertain to the depth structure, they will be tested by reference to the surface structure It is therefore of importance that the surface structure forms an adequate representation of the depth structure Our first attempt was to translate the structuples into recognizable, real life situations Examples of such items are the following

'John seldom gives his relatives the impression that he cares for them' (A1 B3 C2 D3)
'John is a man of principles, but his wife makes no effort to live up to these' (A2 B2 C1 D3)
'John's friends generally do not pay much attention to him' (A2 B3 C3 D2)
'John and his relatives rarely engage into casual conversation with each other' (A3 B3 C2 D2)

The cartesian product of our facet design permits the derivation of 81 different structuples Each of these was translated into a questionnaire item of a similar sort as the examples presented above

However, from research done by Talsma et al (1992) we knew that classification of items based on a facet design could easily produce disappointing results When we asked a small group of subjects to categorize our items into the corresponding facet elements, it quickly became apparent that there was indeed no clear one-to-one correspondence between items and structuples If 'John's friends generally do not pay much attention to him', it is clear what the direction of the social exchange is, and also what the partner of the social exchange is But what is the focus of the social exchange? Although the focus was meant to be an experience, it could just as well be an opinion or a problem And what type of social exchange is portrayed here? Paying attention should be conceived of as an informational type of social exchange, but it might might as well be affective, if the attention would be on an emotional problem of John Also, the fact that 'John is a man of principles, but that his wife makes no effort to live up to these' should be seen as an affective type of social exchange, but some might take it to be an instrumental type of social exchange

It became clear to us that the structs underlying the various concrete item formulations were not reflected clearly enough Since we aimed to use the facet design as a coordinate system for making observations, it was essential that there should be no misunderstanding about which structuples lay underneath the concrete item formulations We therefore decided upon a different approach

Concrete and specific vs abstract and general items

As an aid to the construction of items in which all structs would be recognizably represented, we proceeded to construct so-called templates, very general item formulations in which the same words (or lines of words) - representing each of the structs - constantly reappeared in different combinations, thus representing different structuples These templates could easily be constructed by a computer programme, once we had decided on the correct words to represent the different structs For most facet elements, the words to be used in the templates were identical to the structs themselves In fact, such was the case for all facets except for facet D, the 'Type of social exchange', with structs D1 'instrumental', D2 'informational' and D3 'emotional' For these three facet elements, we initially decided on the following translations for inclusion in the templates

Instrumental 'to undertake some physical action'

Informational 'to say something'

Emotional 'to show an interest in'

At the time we were working on the the templates, we came to consider the inclusion of a new facet, a facet determining whether the focus of the social exchange belonged to the principal character of the situations (i e the person with whom the subject had to identify himself with), or whether it belonged to the partner of the social exchange We felt that it might make a substantial difference in the probability of a situation being appraised as lonely whether the 'locus of the focus', as we called the new facet, would be the subject (or rather the principal character (s)he had to identify with) or the other We believed that situations would elicit loneliness more strongly in cases where the locus of the focus would be the subject A concrete example clearly demonstrates the plausibility of this assumption if a friend of John never talks to John about John's problems, this would seem more distressing for John than the situation in which John's friend never talks about his own problems to John

Including this new facet E, with elements E1 (locus the subject) and E2 (locus the other), we constructed templates like the following examples

'John shows (A1) an interest (D3) in a problem (B1) of his partner (C1, E2)'

'John undertakes (A1) some physical action (D1) to help his relative (C2) with his/her problem (B1, E2)'

'John says (A1) something (D2) to a friend (C3) about his (John's) (E1) problem (B1)'

'John's partner (C1) shows (A2) an interest (D3) in an experience (B3) of John (E1)'

In a similar fashion, we created templates for all 81 structuples Reviewing this initial list of templates, we felt some dissatisfaction concerning the way the D3-element (emotional type of social exchange) was represented in the templates 'To show an interest in the other' we considered too weak an expression to convey the emotional character of the situation Besides, there seemed to be considerable overlap with the informational type of social exchange, which in the form of a concrete, real life situation would also often take the form of someone showing an interest in someone else For a new list of templates, we translated the emotional character of the social exchange situation into 'expressing your personal feelings' (in the case where the actor forms the locus of the focus), or into 'expressing sympathy with someone' (in the case where the other forms the locus) Furthermore, instrumental social exchanges were now expressed as 'to do something', whereas informational social exchanges were now expressed simply as 'to say something' In addition, the third element of the focus facet, 'experience', was now translated into 'experience or activity'. This extension seemed called for to enable a combination of D2 with B3: to do something, focussed on an experience. Since the term experience connotes a purely mental phenomenon, this combination may be somewhat difficult to imagine. However, engaging into a certain activity constitutes a certain experience, and to do something, focussed on an activity is easily imaginable.

The new approach yielded templates like

'John seldom does something for a friend, where a problem of this friend is concerned' (A1 B1 C2 D2 E2)
'John and his brother seldom say something to each other, where an experience or activity of John is concerned' (A3 B3 C2 D3 E1)
'John's wife seldom expresses her sympathy with John, where a problem of John is concerned' (A2 B1 C1 D3 E2)

For each of the template items, we formulated a corresponding real life situation. However, we now came to feel that the value of these concrete, real life situations for our research purpose was actually limited. The reason for this may be shown by comparing the next two template items with their corresponding concrete translations. In both cases, the first situation is hypothesized to have a greater probability of being appraised as lonely.

General formulations (templates):
Item A: 'John's wife seldom does something for John, where a problem of John is concerned'.
Item B: 'John's friend seldom does something for John, where an experience or activity of John is concerned'

Specific (real life) formulations:
Item A: 'Although John cannot cope on his own with the redecoration of the house, his wife seldom offers to lend him a hand'
Item B: 'Although John likes to play football with his friend, his friend usually declines to do so'

In the case of the general formulations, it is reasonable to assume that John would feel lonely in both cases portrayed. No matter what kind of problem John has, his wife seldom helps him. No matter what sort of experience or activity is concerned, John's friend will seldom help John to achieve or realize it. On the other hand, in the concrete formulations we see that John's wife and his friend decline to help him in a specific sort of situation. It is of course conceivable that they would help him with countless of other problems or activities. If we wish to investigate whether not being able to talk over your problems gives more cause for feeling lonely than not being able to talk over your opinion, than in our observations we should not be concerned with one particular kind of problem, but with any kind of problem. And this calls for a general type of formulation. So we now began to feel that rather than using the general formulations as templates for the formulation of specific, real life situations, we should actually use the templates as the actual items in our questionnaire

Changes in the facet design

Reviewing our second list of templates, we still encountered a few obvious weaknesses Take for example the following two items

'John seldom does something for his wife, where an experience or activity of his wife is concerned'
'John seldom does something for his wife, where an attitude is concerned'

We felt that there might be a risk that subjects would extract only the first part of the information conveyed by these items 'John seldom does something for his wife' Everyone immediately understands what this means, but the extension of the situation with 'concerning an experience or activity' or 'concerning an attitude' has, because of its general (abstract) nature, less obvious meaning So we felt it was very possible that subjects would base their response primarily on the first part of the item, which of course does not differentiate between the two situations portrayed Since we could think of no immediate solution to this problem, we decided to defer this matter till after the pilot study, in which we hoped to get an impression of the seriousness of the problem For the results of the pilot study, see subsection 6 4 1, chapter 6

A second weakness pertained to the 'affection' element of the 'type of social exchange' facet For our general item formulations, we had translated 'affection' into 'expressing one's feelings' (in the E1 case) and into 'showing one's sympathy with' (in the E2 case) Reviewing our general items, we noted situations like

'John seldom shows sympathy with his wife, where an attitude of his wife is concerned'
'John seldom shows sympathy with his wife, where an experience or activity of his wife is concerned'

In Dutch, 'to show sympathy with' strongly connotes something like conveying condolences This fact renders the first of these items somewhat unintelligible, and makes the focus of the second item indistinguishable from a problem situation obviously the experience is a traumatic one Furthermore, we now came to conclude that the emotion-element was actually not disjunct with the other elements of the 'type of social exchange' facet, and so overlap with the other elements was inevitable, whichever translation we would decide upon Instrumental acts, as well as informational acts, may be either of an emotional, or of a non-emotional nature It is mainly the situational context, that determines whether we recognize an instrumental or an informational act as either emotional or not For instance, in case the act focusses on a problem situation, the impression of an emotional quality will more easily be conveyed than when an act focusses on an attitude We therefore decided to skip the 'emotional' element altogether

Considering the remaining two elements of the 'type of social exchange' facet, we now felt that as generic categories they were actually unnecessary abstract What did we mean by an 'instrumental act'? Nothing more or less than the fact that someone does something, an act that goes beyond a mere verbalization What did we mean by an 'informational act'? Nothing more or less than that somebody says something, i e utters a verbalization Since we aim to use facet design as a coordinate system, its facet elements should be as clear and unequivocal as possible Bearing this in mind, we substituted a 'mode of social exchange' facet for our original 'type of social exchange' facet, containing the elements 'to do' and 'to say'

Apart from the 'emotional' element of our former 'type of social exchange' facet overlapping with other elements, we had also noted that the 'experience' element of our 'focus of the social exchange' facet was not disjunct with the 'problem' element An experience, when very negative, may in itself constitute a problem A traumatic experience, for example, constitutes an emotional problem To ensure that the elements of the 'focus of the social exchange' facet would become truly mutually exclusive, we added the adjective 'positive' to the 'experience' element Translations of this facet element now took on the form 'a positive experience or activity' This way, the probability of overlap with the 'problem' element seemed to be excluded

One final change that we made concerned the specific wording of the items We decided to reformulate all situations in the following form 'If one would seldom engage in situation X, how would one feel?' This seemed to us a more natural way of phrasing a general situation than the use of 'stories' about imaginary characters (John seldom does this, Peter seldom says that, etc) At the same time, this new way of formulating the items did seem to minimize the possibility of subjects confounding the situations portrayed with their actual situation Appendix A lists the items pertaining to loneliness, in the way we used them in the questionnaire

Domain definition vs research design

We had started off our study of loneliness with a clear demarcation of the domain of observations, to which our interest and attempts at theoretical understanding would pertain The development of this domain definition was described in section 5 1 2 Gradually, we developed a theory on this domain of observations A test of this theory requires certain observations to be made These necessary observations led to the articulation of our domain defining facet design into the facet design presented in table 5 10, which - as a contrast to the role of facet design as domain definition - we might call a research design

This facet design specifies all the observations necessary for a test on the situational determinants hypothesized by the theory (an independent facet design is necessary for the specification of observations necessary for testing the personal determinants hypothesized by the theory, this will be presented in the next section) It can be verified that the observations specified by this research design all remain within the boundaries of the domain definition

A few items may serve as examples of the items that we constructed on the basis of this research design

'If a person's relatives would seldom say anything to this person concerning this person's problems,

TABLE 5.10: MAPPING SENTENCE FOR RESEARCH ON LONELINESS (1)

The subject experiences the {very infrequent} occurrence of a

		partner	
social exchange situation with		relative	where
		friend	

subject to other		doing	
other to subject	is/are		something concerning a
both bidirectionally		saying	

a problem		subject		very much	
an attitude	of		as		lonely
a positive experience		other		very little	

this person would feel '

'If a person would seldom say anything to his/her partner concerning the attitudes of this partner, this person would feel '

'If a person's friend would seldom do something for this person, where a nice experience or activity of this person is concerned, this person would feel '

New hypotheses

Since one of the originally intended facets, the 'type of social exchange' facet, had been changed into the new 'mode of social exchange' facet, a change in the formulation of hypothesis 5, discussed in subsection 5 5 1, is required The original hypothesis was that the base parameters for the different structs of the 'type of social exchange' facet would be ordered as follows

Hypothesis 5 $\eta\,(D3) < \eta\,(D1) < \eta\,(D2)$

For our new 'mode of social exchange' facet, we hypothesize that

Hypothesis 5' η (D1) < η (D2)

This hypothesis is motivated by our expectation that to do something for someone requires more investment, both physically and emotionally, than merely to say something Thus, doing something for someone seemingly reflects more intimacy, and as such we expect it to have greater bearing on the probability of a given situation being appraised as lonely or not.

Apart from one facet being changed into a new one, we had also added an entirely new facet E, specifying the locus of the focus We earlier defended the inclusion of this facet on the basis of our assumption that it would make a difference whether the focus was the subject's, or whether the focus pertained to the other If the subject identifies with the person having the problem, the attitude, or the nice experience, he is more likely to deliver a loneliness response than in the case that the other forms the locus of the focus This leads to hypothesis 9

Hypothesis 9 η (E1) < η (E2)

where η (E1) is the base parameter belonging to struct E1

Alternative response categories

We had now decided upon the way we were going to phrase the social exchange situations that may be derived from our facet design into item formulations There remained the decision concerning the response categories to use We saw two options Either we could present the items in dichotomized form, with response categories 'lonely' versus 'not lonely', or we could use a polytomous response format, with 'lonely' being just one of the response categories For the purpose of data analysis, responses could subsequently be dichotomized by coding the 'lonely' responses 1 and all other responses 0 One major objection to using a dichotomous response format, we felt, was that the subject was artificially forced into considering the situation presented from a perspective that we had chosen for him Suppose that in real life our subject would not consider the situation presented to him as lonely, but instead as disappointing, or some similar negative emotional state Because he is forced to choose between 'lonely' and 'not lonely', our subject may decide to respond that he would feel lonely, since this category represents a negative emotional state, just like his true appraisal of the situation does By choosing the lonely category the subject may feel that he has captured at least some aspect of his feelings

Obviously, that is not what we want. To overcome the danger of artificiality, we decided to use a polytomous response format Apart from the 'lonely' category, we would take up three other categories that were more or less appropriate for the sort of situations to be evaluated The choice of which categories to include we deferred till after the pilot study, in which we would ask subjects what sort of emotions they considered appropriate for the situations portrayed

To test the hypothesized roles of our personal determinants of loneliness, we had to determine the measure of the set of social exchange situations that a subject values, the measure of the set of social exchange situations that he/she actually engages in, the measure of the set of social exchanges that he/she could potentially engage in, and finally the measure of the set of social social exchanges that a subject is satisfied with. How to determine the measure of these sets?

The simplest and most direct way is to count the number of social exchanges that a subject claims to value, to engage in, etc. However, this presumes that we can offer our subject a finite collection of social exchange situations, over which his appraisal in terms of valuation, engagement, etc. may be asked. In principle, of course, the number of social exchanges is infinite. To overcome this problem, we decided to present the subjects with the same social exchange situations that we used for determining loneliness. This meant that we would construct our items based on the mapping sentence presented in table 5.11 below.

TABLE 5.11: MAPPING SENTENCE FOR RESEARCH ON LONELINESS (2)

```
The subject judges the {frequent} occurrence

                                            partner
of a social exchange situation with        relative    where
                                            friend

   subject to other                doing
   other to subject       is/are               something concerning a
   both bidirectionally            saying

   a problem                    subject
   an attitude            of                as
   a positive experience        other

very much      important that it exists
               satisfactory
               frequently occurring
very little    frequently possible
```

A total of 81 different situations may be derived from this design, and these we could present to our subjects, with a request for a judgement of these situations as valued or not, satisfied with or not, etc.

Valuation of social exchanges

How to formulate the items? In the case of valuation, the decision was easy. We aimed to formulate the items simply as

'Do you find it important that one should engage into situation X?'

Let situation X be 'saying something to your partner about your problems'. We would then ask our subject 'Do you find it important that one says something to one's partner about one's problem?'. We preferred this general formulation over a more personal one to decrease the possibility of the subject's valuation of the situation being influenced by the way the situation is realized in his own life. An overview of the valuation items is given in Appendix B.

Engagement in social exchanges

We next had to find a formulation for determining the actual engagement of a person into a situation. The most straightforward formulation would have been 'Do you engage into situation X?'. This would lead to an item like 'Do you say something to your partner about your problems?'. This formulation we considered to vague, however. In reality, people are likely to be more or less open about their problems to their partner. Some people often talk their problems over with their partner, some less often, others seldom. Few people will always or never talk their problems over. Openness seems partly dependent on the nature of the problem. So we felt that a more realistic formulation would contain a reference to the frequency in which a subject engages into a certain situation. Again, simply to ask 'Do you often engage into situation X?' we considered to vague, since a quantifier like 'often' may be interpreted in a different way by different subjects. We finally chose to use the following formulation:

'In your opinion, do you engage into situation X sufficiently often?'

A subject who responds to this question in the negative, states that he misses the occurrence of the situation portrayed. It should happen more often. We consider such a response as indicating that the subject does not engage into the situation portrayed. Although in actuality he might very well engage into the situation portrayed now and then, it is clearly not enough. An overview of the engagement items is given in Appendix C.

Satisfaction with social exchanges

However, a potential problem with this formulation seems to be the risk that the response of the subject indicates his satisfaction with the situation portrayed, rather than merely his engagement into it. If somebody states that to his opinion he talks over his problems with his wife sufficiently often, this might express satisfaction instead of merely indicating engagement in the situation portrayed. To avoid this contamination, we decided to offer the items asking about engagement and the items asking about satisfaction in pairs. First, a subject would be asked whether a given situation occurred sufficiently often, and then, as a logical next question, he would be asked whether the situation as he experienced it satisfied him. This way, we felt, the subject would immediately understand that the two items posed different questions to him. To present the example again, a subject would be confronted with the next pair of items:

'In your opinion, does it occur sufficiently often that you say something to your partner about your problems?'
'Are you satisfied with the way you say something to your partner about your problems?'

Of course, few people are always or never satisfied with the way they talk over their problems, so instead of using a simple 'yes' or 'no' as response options, we decided to opt for 'yes, mostly', 'sometimes' and 'no, mostly not'. Only the first category was taken as an indication of satisfaction with the way the situation was realized in one's own life. An overview of the satisfaction items is given in Appendix C.

Opportunity for social exchanges

Finally, we had to decide on a formulation for the items asking about the opportunity to engage into a certain situation. This proved the most difficult appraisive category to put into item form. Any obvious formulation like 'Do you have the opportunity to engage into situation X' clearly would not do, because that would leave it to the subject to decide just what constitutes an opportunity, and it was to be expected that different subjects would feel differently about this. In addition, the risk existed that subjects would interpret 'opportunity' in a way that we considered inadequate. For instance, they might feel that they did not have the opportunity to talk over their problems with a friend, because they consider themselves too shy to open themselves up to somebody else. Clearly, that is not what we mean by opportunity. To avoid all confusion, we eventually decided that the opportunity to do or say something to a partner exists, if the subject actually has a partner. If he has no partner, the opportunity to engage into some sort of social exchange with a partner does not exist. Likewise, the opportunity to do something for or say something to a relative or a friend exists if one has a relative or a friend. A person without living relatives clearly does not have the opportunity to do or say anything to a relative. So in the questionnaire, instead of explicitly formulating a situation X and asking whether one has an opportunity to realize it, we would simply ask whether or not one has a partner, a living relative, or a friend. An affirmative response immediately implies that one has an opportunity to engage into any situation involving a partner, or a relative, or a friend. Of course, this way of measuring the set of social exchanges that one can potentially realize does have its limitations. For instance, if a subject has a living relative in the United States, he does not really seem to have an opportunity to engage into much of an social exchange situation with this relative. Nevertheless, we felt that in most cases, the chosen way to determine opportunity would provide the required information.

We had decided upon the way to determine whether or not a subject would value, engage in, be satisfied with, and be able to engage into a given situation Suppose again the situation would be 'To say something to your partner about your problems', we would then have the following four questions

'Do you find it important that one says something to one's partner about one's problems?'
'In your opinion, does it occur sufficiently often that you say something to your partner about your problems?'
'Are you satisfied with what you say to your partner about your problems?'
'Do you have a partner?'

Of course, the response to the last question determines the opportunity for all situations involving a partner This last question has to be posed only once, all other questions need to be presented for every separate social exchange situation Like we already said, it was considered important to present the item asking about engagement in conjunction with the item asking about satisfaction In contrast, it was felt that the items asking about valuation should not be coupled to these two items, to avoid contamination of responses

We now had 81 different situations over which to ask four different questions (asking about loneliness, valuation, engagement, and satisfaction, respectively) Obviously, a total number of 324 items would be far too much for a single questionnaire This meant that we had to opt for an incomplete design, which will be discussed later

5 6 4 Preliminary research

In the previous subsection we discussed our decision to make use of a polytomous response format We aimed to present our subjects with items followed by four different response categories, one of which would be 'lonely' Which other response categories to use? We wanted to include appraisive categories that are more or less naturally associated with the situations portrayed To determine those categories, we decided to carry out a pilot study (for the results of this study, see subsection 6 4 1, chapter 6)

Apart from determining relevant categories for inclusion in a questionnaire, the pilot study served a second purpose With help of our facet design, we had constructed 81 different situations These situations were formulated as general (instead of specific) items and, because each item contained five different bits of information, were quite complex in nature We were interested in two questions first, would every subject read a given item the same way, or would different subjects interpret the formulated situations in an unpredictable, idiosyncratic way? If that were the case, than our whole research would be meaningless Second, we wanted to know whether every bit of information contained in the items would be truly processed by the subjects, or whether the complex collection of bits of information would lead the subjects to concentrate on several nucleic bits of information at the expense of ignoring some of the other bits For example

'It seldom occurs that John's brother says anything to John about an attitude that he (John's brother) has'

The bits of information conveyed in this item are that it is John's brother who is the actor in this situation, that he seldom says anything, that it is John to whom he seldom says anything, that it is an attitude about which he seldom says anything, and lastly that the attitude about which he seldom says anything is his own Such a load of information might very well be condensed by a subject to a more simple situation, for example one in which John's brother does not talk much with John at all To check whether the subjects would take up the different bits of information contained in the items, a pilot study was deemed necessary

5 6 5 Partitioning the set of items and the group of subjects

As various computer programs exist for handling incomplete designs, we planned to make use of a linked incomplete design. In practice such a design means that we will construct a number of different questionnaires, each containing a number of items that are also present in another questionnaire Which items to include in which questionnaires was a question that we felt we could only answer after studying the results of the pilot study Further discussion on the actual incomplete design that we used will therefore be deferred to subsection 6 5 3 1

5.7 Summary

In this chapter, a theory on loneliness was presented specifying a number of hypotheses on potential personal and situational determinants of loneliness The theory was formalized into an item response model that is hypothesized to give a correct description of the data structure To allow for a test of this theory, data would be collected by means of a questionnaire Included in the questionnaire would be items asking about loneliness, as well as about valuation of, engagement in, satisfaction with and opportunity for certain social exchanges

For the items asking about loneliness, we had to decide between either concrete and specific item formulations, or abstract and general item formulations Since loneliness seems to result from structural, general deficiencies in one's social exchanges, we eventually decided in favor of the latter In the course of constructing the items, we brought some final changes into our facet design In facet B (Focus of social exchange), the elements 'problem' and 'experience or activity' appeared not to be disjunct, since a traumatic experience will constitute a problem We therefore added the adjective 'positive' to the third element, making this into a 'positive experience or activity' Likewise, we felt that the elements of facet D ('Type of social exchange') were not disjunct, and decided to leave out the third element, 'emotional' type of social exchange This left us with 'informational' and 'instrumental' types of social exchange To render the elements less equivocal, we renamed these elements 'to say' and 'to do', and referred to these two elements as the 'Mode of social exchange' Lastly, we added a fifth facet to our facet design, specifying the locus of the focus of social exchange

For the items asking about the subject's valuation, engagement, satisfaction and opportunity, we decided to make use of the same situations we used for the construction of loneliness items This required the use of an incomplete design, since inclusion of all possible situations in the questionnaire would result into too many items

6 PILOT STUDY

6.1 Introduction

For our main study, we had decided to make use of item formulations like the following

'If it would seldom happen that your partner says something to you concerning your problems, you would feel '

The advantage of such a general formulation is that all structs are recognizably embedded in the items, and that the situations portrayed convey a clear structural nature in the example given above, for instance, it is clear that it does not matter what sort of a problem the subject has, given any problem at all his partner seldom talks to him about it

Having decided upon this type of item formulation (see subsection 5 6 1, chapter 5), a number of questions had to be looked into First, could we be certain that different subjects would read and understand an item in a comparable way, or would there be a risk of idiosyncratic interpretations on the part of our subjects? Furthermore, as each item contained five different facets, could we be sure that a response was based on all these different bits of information, or could it be that subjects would base their response on just one or two characteristics of the item, while ignoring the other details?

Apart from seeking an answer to the above questions, we also wished to see whether problems of an unexpected nature might occur in the use of the general item formulations, problems that we had not thought of ourselves We therefore felt it necessary to carry out a pilot study A second objective of this pilot study was to identify emotional states that could be used as response categories for our items, alongside with the loneliness category

6.2 Subjects

As subjects in the pilot study 18 females and 3 males figured, of which 19 were psychology students, and 2 were residents of a residential home for the elderly Fifteen subjects were under 40 years of age, most of them about 25 years Of the remaining 6 subjects, 2 were approximately 45, 2 approximately 65, and 2 approximately 80

6.3 Method

Each individual subject was interviewed for about 1,5 hours At the beginning of the interview, the subject was informed that he would be presented with nine different questionnaire items, each depicting a situation of social exchange He was told that for each situation he would be asked to state how he read the item presented - i e how he visualized the situation portrayed -, and to express how he would feel if he were the principal character figuring in the social exchange situation

If the subject had no questions, the first of the nine situations was presented to him on a card The nine situations were as diverse as possible, every possible struct was present in at least one of the items For the purpose of this pilot study, the items were formulated as in the following example

'John seldom does something for his partner, where a problem of his partner is concerned'

For each item, the principal character was given another name In the case of male subjects, the names were male, in the case of female subjects, they were female This way we hoped that the subject could readily identify him- or herself with the principal character

After the subject had been presented with a card on which a social exchange situation was described, he was asked to state his impression of the situation What kind of situation was sketched in this item? The subject was left to respond without any guidance or interference by the researcher This way we hoped to avoid that the subject would consider the item in more detail than he would ordinarily do, merely because he felt encouraged to do so by us After the subject had stated how he had understood the situation portrayed in the item, he was asked how the principal character would feel in the situation portrayed When the subject named an emotional state in response to this question, he was asked why he felt that the principal character would experience this emotion This way, an impression was gained of the sort of information that the subject had used to arrive at a response

The subject was subsequently asked whether he could think of other emotional states that were likely to be experienced by the principal character in the situation He was encouraged to name as many emotional states as he considered likely After the subject stated that he could think of no more likely states, he was presented with a checklist of emotions generated by other subjects He was then asked to consider each of the emotions in the checklist, and to decide whether or not it was likely that the emotion considered would be experienced by the principal character in the situation portrayed Finally, the subject was asked to reconsider all the emotional states that he had thought likely in the situation portrayed, and to pick out the four most probable of these After he had done this, he was presented with the next item, whereupon the whole procedure was repeated

6.4 Results

6 4 1 Frequencies

Table 6 1 lists the frequencies of the various emotional categories that were mentioned[1] Only those categories were registered as mentioned, that were ranked by a subject as belonging to the four most likely emotional states in a given situation

Close examination of the categories that were mentioned immediately suggests a grouping of categories that share a comparable semantic content Such a grouping yields the following generic

[1] For the original Dutch terms see Appendix H

TABLE 6.1 - FREQUENCIES OF EMOTIONAL CATEGORIES

Category	*Frequency*	*Category*	*Frequency*
Disappointed	65	Proud	7
Disinterested	44	Ill at ease	7
Powerless	43	Desperate	6
Uncertain	35	Appreciation	5
Hurt	35	Abandoned	5
Lonely	34	Isolated	5
Angry	33	Aloof	4
Inferior	33	Depressed	4
Superior	33	Cool	4
Frustrated	26	Uncomprehended	4
Afraid	24	Ashamed	3
Sadness	18	Slighted	3
Bypassed	16	Aggressive	3
Irritated	15	Deprived	3
Indifferent	14	Respect	3
Rejected	14	Bored	3
Cast out	13	Pleased	2
Alienated	13	Powerful	2
Satisfied	12	Contempt	2
Worried	11	Huffy	2
Resignation	11	Regret	1
Insignificant	10	Inhibited	1
Neglected	9	Glad	1
Conscious of guilt	8	Unmotivated	1
Free	8	Strong	1
Jealous	8	Resigned	1
Cramped	7		

categories[2)]

[2)] See Appendix H for Dutch translations

Strong = Superior + Powerful + Proud + Strong;
Lonely = Lonely + Cast out + Abandoned + Isolated;
Powerless = Powerless + Desperate + Cramped;
Inferior = Inferior + Insignificant;
Uncertain = Uncertain + Worried + Afraid;
Angry = Angry + Frustrated + Irritated + Huffy + Aggressive;
Indifferent = Indifferent + Disinterested + Unmotivated;
Disappointed
Hurt

These nine generic categories of feelings may be considered the collection of feelings, or emotional states, that are naturally associated with the collection of situations defined by our mapping sentence. Frequencies of these generic categories are given in table 6.2. It can be seen that the loneliness category figures prominently. This was to be expected, since the items were derived from a research design type facet design that formed an articulated version of a domain definition of loneliness.

Out of the nine categories mentioned, a number of them had to be chosen to figure as alternative response categories for our questionnaire. Discussion of this choice will be deferred to section 6.5.2.

TABLE 6.2 - FREQUENCIES OF GENERIC CATEGORIES

Category	*Frequency*
Angry	74
Uncertain	70
Disappointed	65
Lonely	60
Indifferent	57
Powerless	56
Inferior	43
Strong	41
Hurt	35

6 4 2 Comments of subjects on item formulations

6 4 2 1 Comments on the 'Mode-of-social exchange -facet

We have made a distinction between 'to do something' (struct D1), and 'to say something' (struct D2) Our situations always reflect one of these two possible modes of social exchange, and we wanted to examine whether our subjects would recognize the distinction made by us As it appeared, they frequently did not Take for example the following item

'It seldom happens that John and his wife do something together, concerning a problem of John's wife'

Most subjects interpret this situation as meaning that John and his wife *do not talk* the problem over To discuss the problem, hoping that this may lead to some relief, means *to do* something Of course this is not what we intended with use of the formulation 'to do', which was meant to imply some kind of physical action Strictly speaking, however, saying something means doing something It can therefore be expected that in those situations where a good conversation is the most likely and sensible act to undertake, subjects will confound 'doing' with 'saying'

6 4 2 2 Comments on the 'Focus of social exchange'-facet

In general, the three different categories of the 'focus of social exchange'- facet were clearly recognized and processed as a piece of information with bearing on the meaning of the situation as a whole Just a minor observation needs to be remarked concerning the 'attitude' element of the focus-of-social exchange facet This category was sometimes read as an opinion (i e a cognitive attitude), and sometimes as a desire or wish (i e an emotional attitude) This was to a large extent determined by the mode of social exchange Where the situation was about doing something concerning someone's attitude, the attitude was often considered as conative, and where the situation was about saying something about someone's attitude, the attitude was usually interpreted to be an opinion

6 4 2 3 Comments on the 'Direction-of-social exchange'-facet

Unidirectional social exchanges are always read in the way they are intended to be read However, with bidirectional social exchanges, something else happens Take the following example

'It seldom happens that John and his wife say something to each other about an opinion of John'

A typical comment of a respondent might run as follows
"Probably John knows that his opinions do not agree with his wife, and because he wishes to avoid an

argument, he chooses not to talk his views over with his wife". Such an interpretation of the situation is clearly unidirectional; in the example above, the social exchange runs from the subject to the other (John does not say anything to his wife). Some subjects leave it at that, others, however, continue with generating new perspectives, and may add: "Or, alternatively, it could be that John very much likes to discuss his opinions with his wife, but that his wife shows no signs of interest. She does not respond to John's viewpoints". This interpretation is again unidirectional, but this time it is the other way round. The social exchange should in that case be characterized as running from the other to the subject (John's wife does not say anything to John about John's opinion).

Table 6.3 shows which emotional states were mentioned in connection with respectively A1, A2, and A3 situations, and with what frequency these categories were mentioned.

TABLE 6.3: CONTINGENCY TABLE OF FACET A X EMOTIONAL CATEGORIES

	STRONG	POWERL.	UNCERT.	ANGRY	DISAPP.	HURT	INDIFF.	LON.	INFERIOR
A1	22	25	24	15	12	4	28	11	12
A2	3	9	17	29	31	17	10	28	18
A3	16	18	16	21	22	14	19	21	12

It can be seen that the two unidirectional structs yield clearly different emotional categories. The A1-situations, which reflect voluntarity on the part of the subject, are often responded to with emotions like 'strong' and 'indifference'. The A2-situations, on the other hand, reflect helplesness on the part of the subject, and yield emotions with a clearly negative undertone like 'lonely', 'angry', etc. But the A3-situations yield a mixture of emotions, some of which are typically associated with A1-situations, and some of which are usually associated with A2-situations. This clearly suggests that subjects respond to A3-situations by taking a unidirectional perspective. Furthermore, it seems that bidirectional social exchanges can only be interpreted unidirectionally. If John and his wife do not discuss John's opinion together, than either John refuses to talk, or his wife does not respond. This raises a problem where we wish to make use of bidirectional formulations in a questionnaire. The subject will base his response on a unidirectional interpretation, but we will not know which one.

6 4 2 4 Comments on the 'partner of social exchange'-facet

The 'partner of social exchange'-facet consists of three facet elements 'partner', 'relatives' and 'a friend' We have deliberately formulated the last facet element as 'a' friend, to ensure that subjects would not confound this category with 'the' friend, i e with someone very close to you, possibly even your partner Nonetheless, a few subjects did interpret 'a friend of John' as John's partner Similarly, although 'relatives' was meant to pertain exclusively to the nuclear family, a few subjects interpreted this facet element as husband, wife or kids[3] Special attention is needed in the instruction to make clear to the subjects what the distinction is between partner, family, and a friend

6 4 2 5 The A1D1E1 and A2D1E2 combinations

Situations characterized by a combination of structs A1,D1 and E1 or a combination of structs A2, D1, and E2 yielded a peculiar combination, that showed to be particularly difficult for subjects to imagine Confronted with this combination, subjects often expressed some sense of bewilderment Asked to give an interpretation of the situation presented to them, they indulged in a sort of creative phantasizing that could lead to unexpected and above all incomparable interpretations A few examples are given below

'It seldom happens that Els does something toward a friend, concerning a problem of Els'[4]

Respondent 'Doing something toward someone? What do you mean by that? What a silly word 'toward' Well, all I can think of is that apparently Els does not call upon her friend for help"

'It seldom happens that a friend of Els does something toward Els, concerning a pleasurable experience or activity of that friend'

Respondent "Eh? Is this formulation altogether correct? (long pause) Wait a minute Els' friend does something toward Els that she herself likes and this rarely happens So Els' friend usually does whatever Els likes Els always has the initiative and her friend follows subordinately "

'It seldom happens that Els does something toward her partner, concerning a pleasurable experience or activity that she likes'[5]

[3] The confusion could arise because in Dutch we used the term 'familie' Although in English 'family' is phonetically more similar to 'familie' then 'relatives', the English 'family' is semantically more similar to the Dutch 'gezin', i e husband, wife and children With 'familie', we specifically meant father, mother, brother or sister, and therefore we have used the English translation of 'relatives'

[4] Apart from the fact that it is difficult to imagine what you can do towards someone else, concerning a problem, attitude or experience of yourself this type of item was made additionally complicated because of the inclusion of the word 'jegens' (towards), which in Dutch language is used only infrequently

[5] Although apparently difficult to conceive of objectively correct interpretations of this type of situations do exist For example, when Els buys her husband a book that defends an attitude of hers, thereby hoping that her husband will be per suaded to share her attitude, Els is doing something towards her partner, concerning an attitude of Els

Respondent: "Difficultly put. This means that she does not see to it that her husband joins her? I find this very vague. What this item says to me is that Els does not undertake any attempt to make sure that they do something together"

The examples given above speak for themselves. The A1D1E1 and A2D1E2 combinations are very uncommon and therefore hard to imagine, resulting in very idiosyncratic interpretations.

6.4.2.6 Effects of the generality and complexity of the formulations

The general formulations we have chosen, sentences composed of constantly reappearing ingredients, may be considered as fairly complex, in that they contain a large amount of information. The task posed to potential respondents of the questionnaire is to process all the information offered, and to translate the general formulation into an imaginable situation. This is a task well suited for students, who are used to consider specific and concrete events as the outcome of generalized abstractions. It is therefore not surprising that to the young students, the task required from them posed no real difficulty. In general, their comments showed that they processed all the information presented to them, and, save for a few unfortunate combinations of structs like the ones discussed above, their interpretations proved correct. However, to the group of older subjects, the task apparently posed more difficulties. An example serves to illustrate this:

'It seldom happens that a friend of Els does something for Els concerning a pleasurable experience or activity of Els'

Respondent (female, 45): "That friend may have totally different experiences. Suppose Els has children but her friend has not. In that case it will be hard for this friend to share Els' experience" [I ask the subject to study the situation as formulated once again]. "Hold on, it says here 'does something'. But how can you do anything concerning an experience? Perhaps this friend refuses to look after the children of Els."

We see here an example of the tendency to focus on part of the information presented in the item, while ignoring the rest. First, this subject concentrates on the fact that the social exchange is about 'a pleasurable experience'. She ignores the fact that something is to be done with regard to these experiences. When she reads the item again, she now focusses on the fact that something is to be done, while ignoring the fact that this should have bearing on a pleasurable experience. In general, the impression was that correct interpretation of the complex situations posed more difficulties to people less accustomed to the task of translating the abstract and general into the concrete and specific. This has implications for the use of such items with a more heterogeneous population of subjects.

However, even to subjects more accustomed to the task, the complexity of the formulations may sometimes lead them astray. An example is given by the following item:

'It seldom happens that Els' sister does something toward Els concerning a problem of her (Els' sister)'

This led to the question: 'Are there one or two sisters involved here?' Other people remarked the importance of the closer specification of the 'her' as the sister of Els. They felt they might easily have got lost without such additional specifications in the formulations. In general, to an educated group of subjects the complexity of the formulations does not lead to particular problems, but the task posed to them does require concentration, and this may diminish after having judged a number of the formulations, which all look rather alike and therefore soon fail to be very inspiring.

6.4.2.7 Effects of the similarity of formulations

Many subjects have remarked - sometimes with irritation - that all formulations look very alike. This appears to be the consequence of repeatedly constructing novel situations with the same facet elements. Sometimes, subjects have stated: "Well, here we have the same (or largely the same) situation as before, so I can give the same responses here as I did earlier". Clearly then, the responses to the items are not always independent.

6.4.2.8 Additional observations

All formulations picture unsatisfactory social exchanges. Sometimes it is John who is deprived of a satisfactory social exchange (people do not say anything to him, or do not do anything for him), and sometimes it is the other. Unexpectedly, some subjects automatically tended to identify with the unfortunate character of the situation, and when asked about the feelings of John, started to generate possible feelings of the unfortunate, even if that was not John but the other. For instance in a situation like 'It seldom happens that John says anything to his partner about a problem of his partner', it is John's partner who is deprived of a satisfactory social exchange. Asked about John's feelings in such a situation, some subjects began to generate possible feelings of the partner. It seems probable however, that this sort of confusion is less likely to arise when we use the formulation that we have chosen for our actual questionnaire, e.g.: 'If you seldom say anything to your partner about a problem of your partner, you would feel...'. In this formulation, it is clear in whose feelings we are interested in.

Something else that the comments of the subjects made clear, is that in imagining the feelings of the principal character they tended, to a large extent, to project their own feelings in similar situations into John. Of course, this is what we expected, and hoped for.

A final conspicuous observation concerned a peculiarity that seemed to follow from the way the items were constructed. An example to illustrate:

'It seldom happens that John says something to his wife about a problem that he has'

Some respondents concluded that apparently, when the focus is on something else, like an experience or an opinion, John does say something about it to his wife Furthermore, they also tended to infer that since the item explicitly states that it is John who does not say anything to his wife, John's wife probably does talk about her problems to John This shows that subjects do take notice of the specific information conveyed by the item They notice that it is John who does not talk to his wife, and that this is something else than John and his wife not talking together at all They also clearly notice that John does not talk about his problem, and that this does not imply that John does not talk at all

6.5 Discussion and conclusions

We set up this pilot study in order to gain an answer to three basic questions First, what are the emotional categories that are more or less naturally associated with the domain of items that we are working with, second, could we be sure that different subjects would read and understand the item formulations in a comparable way, and third, would the totality of information contained in the items be used by the subjects as a basis for delivering a response, or would they base their response on just a few key characteristics of the items? The results of our pilot study, outlined in the previous section, clearly has implications for the final design of our main study These implications will be discussed in the following three subsections

6.5 1 Choice of situation facets

We started off with the intention of creating a questionnaire based on a facet design with five facets, three of which had three elements, and two of which had two elements This facet design permitted the construction of 108 different structuples The pilot study has made clear, however, that a number of these cannot be used for the purpose of our research In particular, the results of the pilot study have made clear that situations characterized by facet element A3 - so-called bidirectional social exchanges - are interpreted by subjects as either A1 or A2 situations This means that when confronted with an A3 situation, subjects actually deliver their responses to either an A1 or an A2 situation Of course we do not know exactly how a given individual will interpret a particular A3 situation, although we might be able to infer this from the actual response he has given In any case, it is clear that there are no responses that are specifically related to an A3 situation, and therefore we decided to omit this facet element

Apart from the A3 situations, problems also arose in the case of situations characterized by A1D1E1 and A2D1E2 combinations, in other words, situations in which a subject does something toward someone else concerning a problem, an attitude, or an experience of his own This particular combination yields an abstract formulation that is very difficult to translate into a real life type of situation It was obvious that subjects tried hard in coming up with at least some kind of interpretation of what was pictured in this item, but the result was that different subjects came up with very original but totally different and incomparable images of this item This means that we do not know what kind of information the subject is extracting from the item, and therefore we cannot simply relate his response to the structs that make up the item We therefore decided to leave out structuples characterized by combinations of either A1, D1 and E1 structs, or of A2, D1 and E2 structs

Leaving out all A3 structuples, as well as all A1D1E1 and A2D1E2 structuples, reduces our original collection of 108 possible structuples to 54 structuples These 54 different situations permitted a test of all the hypotheses that were specified in chapter 5, subsection 5 5 1, be it that the hypothesis on the role of the elements of facet A now only applied to elements A1 and A2 of this facet Table 6 4 below lists all the structuples that we included as items in our eventual questionnaire, together with the item identification numbers[6)]

TABLE 6.4: STRUCTUPLES AND ABSOLUTE ITEM NUMBERS FOR MAIN STUDY

1) A1 B1 C1 D1 E2	19) A1 B3 C1 D1 E2	37) A2 B2 C1 D1 E1
2) A1 B1 C1 D2 E1	20) A1 B3 C1 D2 E1	38) A2 B2 C1 D2 E2
3) A1 B1 C1 D2 E2	21) A1 B3 C1 D2 E2	39) A2 B2 C1 D2 E1
4) A1 B1 C2 D1 E2	22) A1 B3 C2 D1 E2	40) A2 B2 C2 D1 E1
5) A1 B1 C2 D2 E1	23) A1 B3 C2 D2 E1	41) A2 B2 C2 D2 E2
6) A1 B1 C2 D2 E2	24) A1 B3 C2 D2 E2	42) A2 B2 C2 D2 E1
7) A1 B1 C3 D1 E2	25) A1 B3 C3 D1 E2	43) A2 B2 C3 D1 E1
8) A1 B1 C3 D2 E1	26) A1 B3 C3 D2 E1	44) A2 B2 C3 D2 E2
9) A1 B1 C3 D2 E2	27) A1 B3 C3 D2 E2	45) A2 B2 C3 D2 E1
10) A1 B2 C1 D1 E2	28) A2 B1 C1 D1 E1	46) A2 B3 C1 D1 E1
11) A1 B2 C1 D2 E1	29) A2 B1 C1 D2 E2	47) A2 B3 C1 D2 E2
12) A1 B2 C1 D2 E2	30) A2 B1 C1 D2 E1	48) A2 B3 C1 D2 E1
13) A1 B2 C2 D1 E2	31) A2 B1 C2 D1 E1	49) A2 B3 C2 D1 E1
14) A1 B2 C2 D2 E1	32) A2 B1 C2 D2 E2	50) A2 B3 C2 D2 E2
15) A1 B2 C2 D2 E2	33) A2 B1 C2 D2 E1	51) A2 B3 C2 D2 E1
16) A1 B2 C3 D1 E2	34) A2 B1 C3 D1 E1	52) A2 B3 C3 C1 E1
17) A1 B2 C3 D2 E1	35) A2 B1 C3 D2 E2	53) A2 B3 C3 D2 E2
18) A1 B2 C3 D2 E2	36) A2 B1 C3 D2 E1	54) A2 B3 C3 D2 E1

6 5 2 Choice of response categories

In chapter 5, subsection 5 6 2, we discussed that we wish to refrain from offering subjects a simple

6) In the actual questionnaires, items were presented in different random orders See subsection 6 5 3 1

choice between 'lonely' and 'not lonely'. Instead, we we wanted to make use of a polytomous response format. Apart from 'lonely', a number of other categories had to be found that could be included in the questionnaire as possible response options to the items. The pilot study served to identify possible alternative response categories. In table 6.2 we listed nine generic emotional categories that were frequently mentioned by subjects as probable emotional states in the situations portrayed. We therefore decided to choose as alternative response categories a number of emotional states from this list.

One possibility would have been to present each item with all nine categories. However, that way we would create the serious risk that the 'lonely' category would be chosen too infrequently to permit a test of the model and the estimation of its parameters. In fact, this consideration led us to use no more than four response categories.

Referring back to table 6.1, it can be seen that 'disappointed' was the individual category that was mentioned by subjects most of all. This is undoubtedly due to the fact that this is a very general emotional state, that is more or less implied by most of the other, more specific, emotional states. Someone who feels angry, or lonely, or hurt is apt also to feel disappointed, because naturally he would have hoped for a different state of affairs. Because of its (too) general nature, and because of its overlap with the lonely category, we decided not to include 'disappointed' as response category.

Of the remaining categories, we decided not to choose 'hurt', because this emotional state was selected by subjects relatively few times (only 35 times, which compares weakly to the 74 times that subjects chose a category reflecting anger, for example). 'Strong' was also ignored as emotional category, because, as the situations all belonged to the domain of phenomena related to loneliless, we felt that a positively toned emotional category would not be a really serious alternative to a response category like 'lonely'. A response alternative like 'strong' would probably only be chosen in A1 situations by some subjects. A further category that we decided not to include was 'inferior'. This category we felt to be too extreme.

Of the remaining four categories (besides 'lonely'), we considered 'angry' and 'indifferent' to be appropriate alternatives. 'Angry', because it is one of the most natural responses to make in the type of situations that we wish to present, and 'indifferent' because unlike all the other responses this category is emotionally neutral. Although the situations we are dealing with are in general likely to evoke negative emotional states, it is very conceivable that some subjects remain entirely indifferent to them. Finally, two categories remained as potential fourth response alternative: 'uncertain' and 'powerless'. We decided to opt for 'uncertain', because of its somewhat more general nature (without being too general in nature, like 'disappointed'), and because it was favored by subjects more often than 'powerless'.

So, for the purpose of our research on loneliness, we decided to offer our items with four response alternatives: 'lonely', 'angry', 'indifferent', and 'uncertain'.

6 5 3 1 Incomplete design

With all A1D1E1, A2D1E2, and A3 situations situations discarded, there remain 54 different situations to translate into items for the questionnaire It was our original intention to pose these 54 situations four times to the subjects, respectively probing their appraisal of the situations as valued or not, satisfied with or not, engaged in or not, and as lonely or not However, this would lead to a questionnaire of 216 different items, all of which look rather alike We considered it unlikely that our subjects would remain concentrated and motivated for very long when confronted with such a monotonous task A solution might have been to split the questionnaire in two, and to ask our subjects to respond to the total of 216 items not all at once, but spread out over two different occasions However, even a questionnaire of 108 items still poses a sizeable task, and when confronted with this task for a second time, subjects may feel difficulties in remaining motivated

We therefore chose the alternative solution of using only a subset of all possible items in the questionnaire In the case of the valuation, engagement, and satisfaction items, we decided to make use of only A2 situations The rationale for this decision was that we suspected that the experience of loneliness would primarily be associated with A2 situations, because these situations had a clear involuntary character Since our aim was to relate the subjects' appraisal of situations as valued, engaged in, and satisfied with to their appraisal of situations as lonely, it seemed reasonable to restrict ourselves to those situations that were thought to be most clearly related to loneliness, i e to the A2 situations This meant that each subject had to appraise 27 situations as either valued or not, 27 situations as engaged in or not, and 27 situations as satisfied with or not

Our questionnaire would therefore contain at least 81 items The remainder of the questionnaire would be filled with items asking for an appraisal of the situation as either lonely or not If we were to include all 54 items, our questionnaire would contain a total amount of 135 items This we felt to be still too much In order to further reduce the number of items, we decided to make use of a linked incomplete design Instead of all 54 items, only 27 were used in a single questionnaire, making the total number of items in a questionnaire equal to 108 Four versions were created of 27x4 (valuation, engagement, satisfaction, and loneliness) items each, such that each of them occurred in two versions This way, the data would permit the estimation of subject and item parameters of all subjects and of all 54 items Table 6 5 lists the way that the items were distributed over the four different versions of the questionnaire (see also fig 5 2)

The engagement and satisfaction items were always coupled, but for the rest the items were placed in a random order This way we hoped to minimize possible dependence between responses to different items

6.5 3 2 Instructions to subjects

In our pilot study we found that older people and people of lesser education had difficulties with the

TABLE 6.5: LINKED INCOMPLETE DESIGN

Item	Versions	It.	Vers.	It.	Vers.	It.	Vers.	It.	Vers.	It.	Vers
1	C D	10	A D	19	C D	28	A B	37	B C	46	A B
2	A B	11	B C	20	A D	29	C D	38	A D	47	B C
3	C D	12	A D	21	A D	30	A B	39	B C	48	B C
4	B C	13	B C	22	A B	31	A D	40	A D	49	C D
5	B C	14	A D	23	B C	32	A D	41	B C	50	A D
6	A D	15	B C	24	A B	33	B C	42	A D	51	C D
7	B C	16	A D	25	C D	34	A D	43	B C	52	A B
8	A B	17	B C	26	A D	35	C D	44	A D	53	B C
9	B C	18	A D	27	C D	36	A D	45	B C	54	A B

Version A: 27 items, 9 items eq. version B, 18 items eq. version D

Version B: 27 items, 9 items eq. version A, 18 items eq. version C

Version C: 27 items, 9 items eq. version D, 18 items eq. version B

Version D: 27 items, 9 items eq. version C, 18 items eq. version A

abstract and general character of our items. In particular, they showed a tendency to focus on just part of the information contained in the items. Some of the facet elements making up the situations were ignored In addition, all subjects tended to interpret some of the D1 situations as D2 situations

To make as sure as possible that all subjects would read the items as they were intended to be read, we took several measures First, we wrote an instruction in which we tried to point out as clearly as possible that all items contained a lot of information, and that subjects should try their best to remain concentrated and to pick up all the information contained in the items This instruction, coupled to a number of test items, was subsequently put before a group of students. Their comments led to a revisal of the instruction, which in its turn was put before another group of students. This led to still more revisions, which were again tried out with a group of students Eventually, we came up with an instruction that - as far as we have been able to ascertain - was both clear and concise This we retained for use in our questionnaire In this instruction, we also pointed out clearly that 'to do something' indicates an act that goes beyond merely saying something.

Second, we included a so-called short assignment in the questionnaire, that was presented to the subjects immediately after the instruction They were asked to write down five different problems that a person might have After this, they were asked to write down five different attitudes that a person might have Finally, they were asked to write down five different experiences or activities that a person might like By making the subject think clearly and carefully about different problems, attitudes and experiences, we hoped to make him fully aware of the distinction between these categories The result would be, we felt, that subjects were alerted to the differences between situations dealing with problems, and situations dealing with atttitudes, or experiences Apart from asking the subjects to imagine five different problems, attitudes, and experiences, they were also presented with two similar situations that differed in only one respect one situation portrayed a subject doing something for somebody else, and the other situation portrayed a subject saying something to somebody else Subjects were asked to think of concrete examples of these situations, such that the difference between the two situations would become clear This further alerted the subjects to the difference between 'doing' and 'saying'

Third, with regular intervals we added an italicized message to the items, reminding the subjects for instance that 'to do something is more than just to say something', or that 'family means father, mother, brother, or sister', or that 'with 'a friend' we do not mean your partner' By repeating such italicized messages at regular intervals, we hoped to minimize the risk that subjects would interpret the items incorrectly

6 5 3 3 Final remarks

For our main study, we intended to make use of two different samples, with the second sample serving to cross-validate results that we hoped to find in the first Our first sample would consist only of social science students Since this constitutes a homogeneous group of relatively young and highly educated individuals, no particular problems in handling the questionnaire were expected for this group However, our second sample would consist of a more heterogeneous group of inhabitants of Nijmegen In this group, considerable variation in age and education level were to be expected Since our pilot study showed that people of elder age and lesser education were at a higher risk of handling the items incorrectly, we decided that in the second sample the questionnaires would have to be administered by a group of trained assistants By having the questionnaire administered by a trained assistant, extra control could be exerted on the way the subjects handled the questionnaire

For explorative purposes, we decided to append a few questions to the questionnaire, asking about personal characteristics such as gender, age, income, education level, marital status, and satisfaction with the social network Each of these variables has in previous research been shown to be related to loneliness

7 FIRST MAIN STUDY: HOMOGENEOUS STUDENT SAMPLE

7.1 Introduction

We conducted two separate main studies A first study made use of a sample of social science students, and a second sample consisted of a random selection of inhabitants of Nijmegen The second study was carried out for the purpose of cross-validating results from the first The present chapter gives an overview of the results of our first main study

In chapter 2, we discussed and criticized Guttman's facet theory as an approach that does not develop hypotheses derived from a substantive theory This failure to produce a cumulative body of substantive knowledge is due to the restrictive emphasis of facet theorists on the analysis of similarity data Our own methodological approach may be seen as an alternative elaboration of Guttman's facet approach, and therefore it will be of some interest to consider the difference in the kind of results that are produced by the two divergent approaches To this end, we have subjected our data both to the analysis of similarity data, and to several kinds of Rasch analyses However, since the primary purpose of our research is to evaluate the approach advocated by us for the domain of appraisive judgements, the analysis of similarity data will be considered only briefly and superficially

In contrast, in the sections on the Rasch model and its extensions ample space will be devoted to the discussion of technical issues such as estimation procedures and model tests The results of our Rasch analyses will be related to our hypotheses on situational and personal determinants of loneliness

In addition, an explorative examination of other data gathered by us will be presented and discussed These data concern our subject's valuation of, satisfaction with, and engagement in various kinds of social exchange situations Finally, our subject's appraisal of social exchange situations as causing feelings of angryness, indifference, and uncertainty will be considered The chapter closes with a section presenting some concluding remarks

7.2 Method

7 2 1 Subjects

Subjects for this research were students who were recruited while they were following an academic course The researcher was permitted 5 to 10 minutes to tell something about his research and to request students to fill in a questionnaire for him at home No details about the purpose of the research were given, students were merely told that we were interested in the way that social relations were judged and perceived Following this recruitment procedure, a total of 304 subjects were recruited The majority of these were psychology students, and the others were students of sociology, law, and remedial education As a curriculum requirement, all psychology students have to participate as subjects in psychological research for a total of eight hours For their participation in this research, they were credited with one hour Students of the other social science disciplines were strict volunteers, who did not receive any credit or pay for their participation Of the 304 subjects, 238 were female, and 65 were male students (one respondent had forgotten to indicate his or her gender) 90% of the subjects were between 18 and 25 years of age, whereas most of the remaining subjects were in their thirties, with the oldest subject being 45 years of age

All subjects were told that they could take the questionnaire home with them, and were asked to return it within one or two weeks It was stressed as important that each subject should fill in the questionnaire on his or her own, without consulting anybody else Furthermore, subjects were asked to complete the questionnaire in a single turn, without significant interruptions They were told that work on the questionnaire would require approximately one hour Those subjects who participated to fulfill the curriculum requirement were requested to deliver the questionnaire back to the researcher personally, whereupon they would receive an certificate of participation The other students were given a reply envelop which they could use to mail the questionnaire to the university, free of pos tage charge

7 2 2 Material

Four different versions of the questionnaire were used, each containing 108 different items asking subjects about their valuation of a social situation, their engagement in a social situation, their satisfaction with it, and their appraisal of the hypothetical absence of a given social situation, with the possibility of choosing from four different emotional categories lonely, angry, indifferent and uncertain The four versions of the questionnaire differed with respect to the 27 items asking about the emotional appraisal of the absence of a given social exchange situation Each version had nine items in common with one of the other three questionnaires, and 18 items in common with a second of the three versions (see subsection 6 5 3 1, chapter 6) In addition, each questionnaire contained a number of questions about personal variables such as age, gender, etc Of the 304 students, 73 filled out version A, 78 filled out version B, 69 filled out version C, and 84 filled out version D

7.3 Results and discussion

7 3 1 Frequencies

Tables 7 1 - 7 4 list the frequencies of a number of person characteristics (the frequencies of the ratio's that form the subject of the hypotheses concerning personal determinants are given and dis cussed in subsection 7 3 6 1) Frequency distributions of person characteristics that showed little or no variance are not reported here The frequency tables below pertain to a total of 269 subjects These are the subjects whose data figure in the Rasch analyses to be reported in later sections For technical reasons, 35 subjects who did respond respond to all items were omitted from these analyses Since all subjects are students, it comes as no surprise that many variables showed no variance all subjects are following a university course and have living relatives. Most subjects (over 98%) belong to the lowest income class (they receive a student grant), are unmarried and living alone (87%), have no children living at home (97%) or out of home (99%), and claim to have at least some friends (99%). The age distribution, reported below, shows that 90% of all subjects is under 26 years of age. Only nine subjects are older than 35.

TABLE 7.1: FREQUENCY DISTRIBUTION OF GENDER

Sex	Freq	Valid Percent	Cum Percent
Male	61	22.8	22.7
Female	207	77.2	100.0
Unknown	1	.4	
Total	269	100.0	

Somewhat surprising, but probably related to the fact that we were dealing with social science students, many of whom were strict volunteers, is the fact that the vast majority of subjects was female. When we wish to use a variable with such a skewed distribution as predictor for some other variable (as in our LLTM and LRM models), we have to be aware that the skewness of the distribution tends to suppress the correlations between variables. Two variables that correlate nearly perfect in the population, may not obtain a correlation close to one when one of the variables is markedly skewed in the sample.

The only variable with a somewhat symmetric distribution is the question whether or not one has a partner. The majority of subjects (N=192) affirm that they have a partner (although, as is apparent from their civil status, few of them are married or live together), whereas a sizeable minority (N=112) do not have a partner yet. Whether or not a person has a partner is determined by his response to engagement items. If the subject marks the response option 'this item does not apply to me: I do not have a partner', he indicates that he has no partner, and otherwise he makes implicitly clear that he does have one. This particular response determines the opportunity of the subject for engaging in a particular situation. In a similar way it is determined whether or not a subject has living relatives and whether or not he has any friends at all.

A final question was whether or not the subject felt that he or she has a sufficient number of friends. A negative response to this question indicates subjective social isolation and may be expected

TABLE 7.2: FREQUENCY DISTRIBUTION OF AGE

	Age	Freq	Valid Percent	Cum Percent
	18	30	11.2	11.2
	19	55	20.5	31.7
	20	42	15.7	47.4
	21	36	13.4	60.8
	22	33	12.3	73.1
	23	19	7.1	80.2
	24	19	7.1	87.3
	25	6	2.2	89.6
	26	6	2.2	91.8
	27	3	1.1	92.9
	28	2	.7	93.7
	29	4	1.5	95.1
	30	2	.7	95.9
	32	1	.4	96.3
	33	2	.7	97.0
	35	1	.4	97.4
	37	2	.7	98.1
	> 39	5	1.5	100.0
	Missing	1	.4	
Total	100	269	100.0	

to correlate highly with proneness to loneliness. Table 7.3 indicates that only 29 subjects felt they did not have a sufficient number of friends.

Because of their lack or virtual lack of variance, most variables cannot be used as predictors for proneness to loneliness. Variables that do show some variance (age, gender, civil status, sufficient number of friends, having a partner) will be cross tabulated with level of loneliness to see if any significant association between these variables and loneliness exists. These analyses and their results will be discussed in subsection 7.3.6.2.

TABLE 7.3: FREQUENCY DISTRIBUTION OF HAVING SUFFICIENT FRIENDS

Value Label	Valid Freq	Valid Percent	Cum Percent
Having sufficient friends	239	89.5	89.5
Not having sufficient friends	28	10.5	100.0
Unknown	2		
Total	269	100.0	

TABLE 7.4: FREQUENCY DISTRIBUTION OF HAVING A PARTNER

Value Label	Freq	Valid Percent	Cum Percent
Having a partner	169	62.8	62.8
Not having a partner	100	37.2	100.0
Total	269	100.0	

7.3.2 Explorative SSA

The approach advocated in this thesis differs markedly from the conventional facet theoretical approach, originally conceived by Guttman. For a proper evaluation of the empirical entry approach followed by us, it may be instructive to contrast this approach with the more traditional approach followed by facet theorists. As Canter (1985b) notes, a researcher following the recipe of facet theory would ultimately aim to retrieve regional hypotheses on the roles of the facets in a SSA configuration. In the initial phase of his research, a researcher will have only a vague notion of the regional structure to be found in a SSA space A preliminary SSA on data gathered with a smaller sample of subjects will help him to clarify the value of his expectations The outcome of this preliminary SSA may lead the researcher to reformulate his mapping sentence and to develop more precise regional hypotheses

Facet theorists usually develop their regional hypotheses on the basis of the contiguity principle two items will tend to be more similar as their structuple profiles look more alike The expectation is that items representing a similar facet element will tend to produce a regional cluster in a SSA space However, such an expectation seems to be in contradiction with our hypothesis that the data structure will be Rasch homogeneous, i e be unidimensional with conditional independence between items It is especially this latter assumption of the Rasch model which tends to contradict the expectation of regional structures corresponding to facet elements

With the ALSCAL program (Takane et al, 1976), we performed a SSA analysis on a matrix of tetrachoric correlations between items The best configuration was obtained in a four dimensional solution, with an acceptable measure of stress equal to 14 As Donald (1985) notes, one should not make any prior assumptions regarding the form any structure will reveal itself in, but look at the plot from all angles With three dimensions however, this is rather cumbersome, and with four dimensions it becomes almost impossible to do this We have therefore refrained from rotating the axes and instead searched for any identifiable regions corresponding to the facet elements in any of the two dimensional plots representing relationships between two out of the four dimensions The only facet that can be convincingly identified in the SSA space is facet A, representing the first dimension of the configuration Figure 7 1a gives one of the two dimensional representations in which A1 and A2 elements are clearly differentiated The fact that the SSA space reveals clear regional structures corresponding to facet A need not yet imply a violation of conditional independence, one of the assumptions of the Rasch model

None of the other three dimensions can be related to any of the other facets, although one two-dimensional representation does permit some structure concerning facet C to be detected (see figure 7 1b) It can be seen that C3 items are located predominantly in the middle part of the configuration, separating clusters C1 and C2 items

With a clearly identifiable regional structure for facet A only, it is probable that a traditional facet theorist would conclude that his domain is ill defined and start work on a modified version of his mapping sentence We believe, however, that a very different internal structure will be manifested that is not determined by structuple similarity, but by factors related to our substantive theory on loneliness

7 3 3 Additive tree analysis

Apart from a representation of similarities in a continuous space such as in SSA, similarity data can also be pictured with discrete network models, the most common of which forms the tree In a tree, objects or stimuli are represented as nodes in a graph The distance between the various nodes in the graph is expressed by the lengths of the paths that join them Shorter paths signify greater similarity

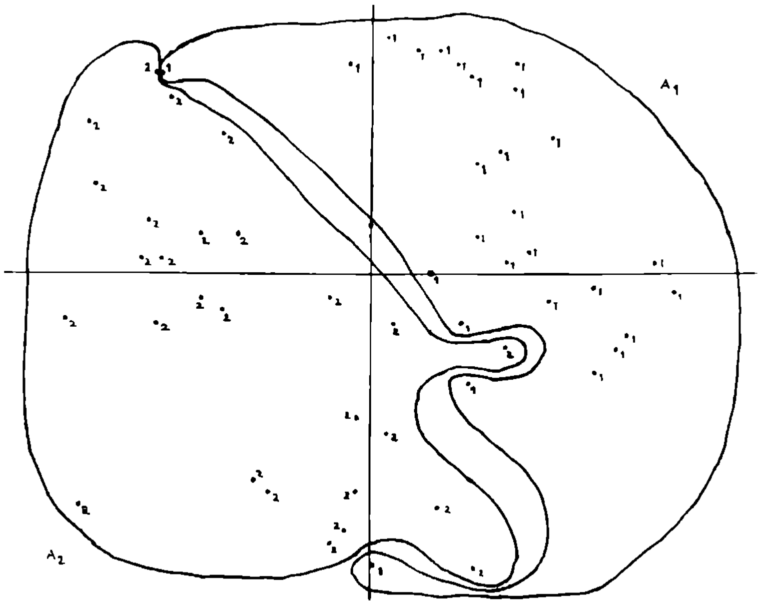


Figure 7.1a - One of the possible two dimensional configurations based on the four dimensional SSA solution. In this configuration, a partitioning of the space due to the role of facet A is clearly discernable. The ones in the figure indicate A1 items, the twos indicate A2 items.

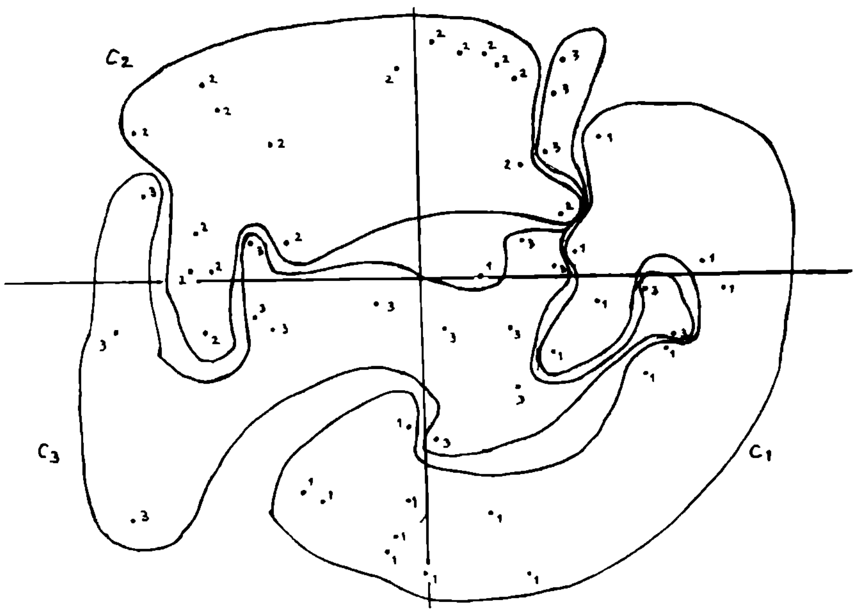


Figure 7.1b - One of the possible two dimensional configurations based on the four dimensional SSA solution In this configuration, a partitioning of the space due to the role of facet C is discernable The ones in the figure indicate C1 items, the twos indicate C2 items, and the threes indicate C3 items.

Various tree models have been developed. One of the oldest is known as the ultrametric tree, which satisfies the ultrametric inequality: given two disjunct clusters, all the distances within a cluster are smaller than the distances between clusters, and all the distances between clusters are equal (Sattath & Tversky, 1977). The ultrametric tree is very restrictive, and in order to provide a tree model that is more in congruence with reality, a less restrictive model called the additive tree model has been developed (see e.g. Carroll & Chang, 1973).

Like the ultrametric tree, the external nodes correspond to objects or stimuli and the distances between these are given by the lengths of the paths that join them. Contrary to the ultrametric tree, however, the external nodes of the additive tree need not all be equally distant from the root. Furthermore, given two disjunct clusters, intra-cluster distances may exceed inter-cluster distances, and an object lying outside a cluster need not be equidistant to all objects inside the cluster. For a formal definition of an additive tree, see Sattath and Tversky (1977).

Continuous spatial and discrete network models may both be appropriate for the representation of similarity data, with sometimes the spatial models providing a better fit, and sometimes the trees being more appropriate (see Pruzansky et al, 1982). In general however, additive similarity trees are to be preferred where 'object sets have a hierarchical structure that may result, for instance, from an evolutionary process in which all objects have an initial common structure and later develop additional distinctive features' (Sattath & Tversky, 1977, p 338). This suggests that the structuples that we derived from our facet design may be better represented by a tree than by a spatial model.

We analyzed our matrix of tetrachoric correlations between items with ADDTREE (Sattath & Tversky, 1977), which produced the additive tree presented in figure 7.2.

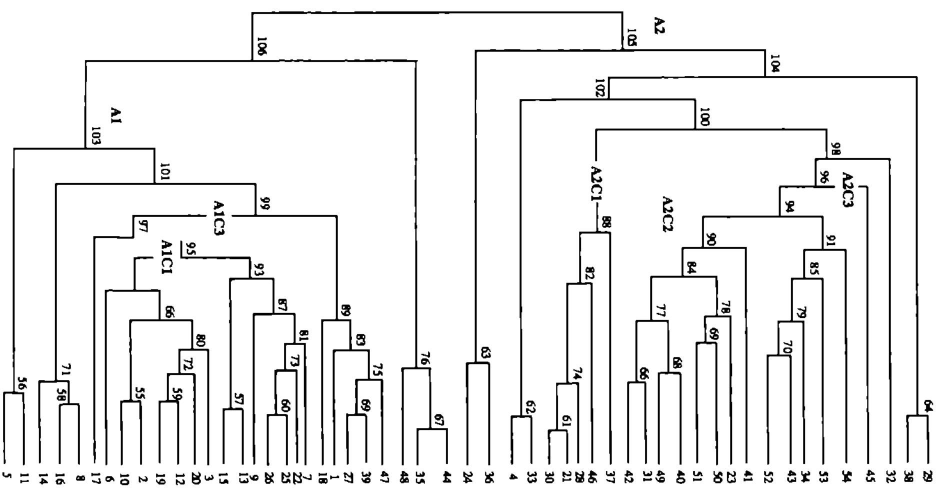


Figure 7.2 - An additive tree representing the similarity structure in the matrix of tetrachoric correlations. The clusters in the tree represent groups of highly correlating items. It can be seen that the two superclusters correspond to a group of A1 and a group of A2 items. Furthermore, smaller clusters can be defined as C1, C2 and C3 clusters, respectively.

Again, a clear differentiation between A1 items and A2 items can be seen immediately For the rest, only relatively small clusters of items, each corresponding to a common element of facet C, can be detected So the graphical representation produced by ADDTREE is markedly similar to the spatial configuration produced with ALSCAL

The conclusion that a traditional facet theorist would derive from this additive similarity tree is similar to what he would conclude on the basis of the earlier presented SSA configuration, namely that his domain of interest was ill defined We will not consider similarity data any further, and proceed with the analyses that pertain to our substantive considerations regarding the domain of loneliness

7 3 4 Rasch analysis

To carry out an unconstrained Rasch analysis, use was made of the RIDA (Rasch Incomplete Design Analysis) program, developed by Glas (1989) As its name suggests, this program can be used for analyzing a linked incomplete design like the one we used However, the program recodes every missing value into a negative response (zero) This strategy may be reasonable for achievement items, but is likely to produce misleading results with the sort of items used in our research Since this may significantly alter the structure of the data in case there are many missing data, we decided to leave out all subjects whose responses contained missing values This way we lost the data of 35 subjects and retained a sample of 269 respondents

7 3 4 1 Frequency distribution of sumscores

Table 7 5 lists the frequencies of sumscores As was to be expected, the distribution is somewhat skewed to the right Most people have a low proneness to respond with feelings of loneliness, only few people have a very high proneness to do so

7 3 4 2 Tests of Rasch homogeneity

In section 5 5 of chapter 5 we discussed the proporties of the one parameter logistic model, known as the Rasch model A set of items is called Rasch homogeneous, if and only if the different items can all be scaled along a unidimensional latent trait, all items have parallel ICC's, the sumscore on all items provides a sufficient statistic for the subject's 'ability', and all items are conditionally independent Several tests exist to determine whether the observed data structure is in congruence with these assumptions Broadly, these tests can be placed into two categories first order tests and second order tests (see Zwinderman, 1991a)

First order tests check on the validity of the assumption of identical ICC's for all items Since the Rasch model assumes a graphical structure as in figure 7 3, it is possible to check the validity of this assumption by partitioning the total group of subjects into a number of subgroups corresponding to different sumscores Assuming the Rasch model to provide a correct description of the structure in

TABLE 7.5: FREQUENCY DISTRIBUTION OF LONELINESS SUMSCORES

Sum Score	Freq	Percent
0	15	5.6
1	4	1.5
2	8	3.0
3	14	5.2
4	12	4.5
5	16	5.9
6	19	7.1
7	20	7.4
8	25	9.3
9	19	7.1
10	23	8.5
11	15	5.6
12	17	6.3
13	10	3.7
14	9	3.4
15	10	3.7
16	11	4.1
17	3	1.1
18	4	1.5
19	5	1.9
20	2	.7
21	2	.7
22	3	1.1
23	0	0.0
24	0	0.0
25	0	0.0
26	2	.7
27	1	.4
Total	269	100.0

the data, expected frequencies of positive responses to each item, or each pair of items, can be computed for each different sumscore group, and these can be compared to the frequencies that are actually observed

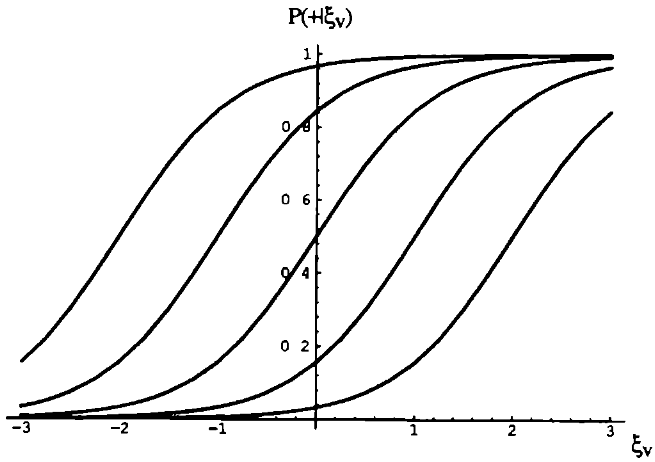


Figure 7 3 A Rasch homogeneous set of items All item characteristic curves are identical Items only differ by their position on the latent continuum

Two first order tests that we have used are R(1) (developed by Glas (1989) and Q(1) (Van den Wollenberg, 1982) R(1) has been shown to be asymptotically chi square distributed, and whereas the distribution of Q(1) has not yet been derived, simulation studies suggest this statistic to be asymptotically chi square distributed as well

First order tests like R(1) and Q(1), that focus on the role of individual items in the test, are especially sensitive to violations of the monotonicity and sufficiency assumptions For information on the validity of the assumptions of unidimensionality and conditional independence, so-called second order tests have been developed that concentrate on responses to item pairs Assuming the validity of the model, it is possible to calculate the expected frequencies of positive responses to both items i and j in any item pair Comparing these expected frequencies with observed frequencies yields information on the tenability of the assumptions Two second order tests that have been developed are R(2) (Glas, 1989) and Q(2) (Van den Wollenberg, 1982) Like their first order counterparts, Q(2) is assumed to be asymptotically chi square distributed, and R(2) has been theoretically shown to be chi square distributed For our purposes, only Q(2) could be used, since R(2) can be calculated only for a maximum of 15 items (Glas, 1989) There is still some debate as to whether the use of R(2) in addition to R(1) (and that of Q(2) in addition to Q(1)) for the detection of violation of the dimensionality and conditional independence assumptions is really necessary According to Glas (1989), insensitivity of R(1) and Q(1) to violation of dimensionality arises only under very special circumstances, and so in the majority of cases most model violations will be identified by R(1) or Q(1) alone

In order to calculate the R and Q statistics, subject and item parameters of the model have to be estimated for the purpose of calculating expected frequencies Usually parameters are estimated following a maximum likelihood (ML) procedure Various ML estimation procedures exist UML estimation, in which subject and item parameters are jointly estimated, does not yield a consistent esti mate, but CML and MML estimates - where subject parameters are conditioned out or are integrated out - are consistent and efficient (i e possessing minimum variance), furthermore CML estimators are functions of sufficient statistics when these exist, and they are asymptotically normally distributed

The likelihood function to be maximized, is

$$L(X|\underline{\theta},\underline{\varepsilon}) = \prod_{v=1}^{N}\prod_{i=1}^{n} P_{vi}^{\ X_{vi}} Q_{vi}^{\ 1-X_{vi}} \tag{7 1}$$

with X a Nxn matrix of item responses, $\underline{\theta}$ the vector of abilities for the N subjects, $\underline{\varepsilon}$ the vector of item difficulties for the n items, P_{vi} the probability of subject v responding correctly (or positively) to item i, Q_{vi} equals $(1-P_{vi})$, and X_{vi} denoting the subject's response ($X_{vi} = 0,1$) Usually, the likelihood function is expressed logarithmically, and is then known as the log likelihood function

$$\ln L(X|\underline{\theta},\underline{\varepsilon}) = \sum_{v=1}^{N}\sum_{i=1}^{n}\left[X_{vi}\ln P_{vi} + (1-X_{vi})\ln Q_{vi}\right] \tag{7 2}$$

The UML estimates of $\underline{\theta}$ and $\underline{\varepsilon}$ are the values of these parameters that jointly maximize the log likelihood function For the Rasch model, there are in all a total of N+n-1 parameters to be estimated (as identifiability constraint, the mean of all item parameters is set to zero, and so one less parameter has to be estimated)

When one group of parameters, say the item parameters, are known, the ML estimate of the other group of parameters can be attained by satisfying the equation

$$\frac{d}{d\hat{\theta}} \ln L\ (X|\hat{\theta},\varepsilon) = 0 \tag{7 3}$$

Since it is nonlinear, solution of this so-called likelihood equation requires an iterative procedure for its solution Usually, a method known as the Newton-Raphson procedure is employed This procedure involves the calculation of progressively more accurate solutions until a convergence criterion is met The initial estimate θ(m) is followed by a more accurate estimate θ(m+1)

$$\theta_{m+1} = \theta_m - \left[\frac{d^2}{d\theta^{\,2}}\ln L(X|\underline{\theta}\,)\right]_m^{-1}\left[\frac{d}{d\theta}\ln L(X|\underline{\theta}\,)\right]_m \tag{7 4}$$

When the difference θ(m) - θ(m+1) exceeds a predetermined convergence criterion h, a further more accurate solution is calculated as above (see Hambleton & Swaminathan, 1985)

In general, however, neither the item parameters nor the subject parameters are known and so these have to be estimated simultaneously One way to do this follows a procedure known as joint maximum likelihood (JML) estimation (also known as unconditional maximum likelihood - UML - estimation), which maximizes the log likelihood function by simultaneously determining the ML estimates of θ and ε A problem with this estimation procedure relates to a distinction between parameters as either incidental or structural This distinction was first made by Neyman and Scott (1948), who termed parameters structural in case the information on these parameters can be increased by increasing the sample, and incidental in the case that enlarging the sample did not enlarge the information on the parameters In the case of the Rasch model, usually the item parameters are the structural parameters, since researchers will usually resort to an addition of subjects in order to increase the reliability of the item parameter estimates, whereas the subject parameters function as incidental parameters Increasing the sample of subjects also increases the number of subject parameters to be estimated and therefore the estimates of the structural parameters will not become more accurate as the sample size increases Neyman and Scott showed that simultaneous estimation of both structural and incidental parameters may result in inconsistent ML estimators

Andersen (1973) showed that this problem also holds for the Rasch model, and that JML estimation will produce inconsistent estimators Rasch had already proposed an alternative in which only the structural item parameters need to be estimated This alternative method is known as conditional maximum likelihood estimation, and is based on the fact that the sumscore r_v as a sufficient statistic for the ability parameter ξ_v Reparametrizing $\theta_v = \exp(\xi_v)$ and $\varepsilon_i = \exp(-\sigma_i)$, we can express the likelihood of the data, given the correctness of our item response model, as

$$L = p(X|\underline{\theta}, \underline{\varepsilon}) = \prod_{v=1}^{N}\prod_{i=1}^{n}\frac{(\theta_v \varepsilon_i)^{x_{vi}}}{1+\theta_v\varepsilon_i} \tag{7 5}$$

Some algebra enables us to formulate the likelihood function as

$$L = p(X|\underline{\theta}, \underline{\varepsilon}) = \frac{\prod_{v=1}^{N}\theta_v^{n_v}\prod_{i=1}^{n}\varepsilon_i^{n_i}}{\prod_{v=1}^{N}\prod_{i=1}^{n}(1+\theta_v\varepsilon_i)} \tag{7 6}$$

with n_v the sum of positive responses of subject v, and n_i the sum of positive responses to item i

It can be seen that only the marginals of the data matrix function in the likelihood Different matrices having the same marginals will therefore have the same likelihood The number of matrices having the marginals n_v and n_i equals $\begin{bmatrix}\underline{n}_v\\ \underline{n}_i\end{bmatrix}$ and therefore

$$p(\underline{n}_v, \underline{n}_i|\underline{\theta}, \underline{\varepsilon}) = \begin{bmatrix}\underline{n}_v\\ \underline{n}_i\end{bmatrix}\frac{\prod_v\theta_v^{n_v}\prod_i\varepsilon_i^{n_i}}{\prod_v\prod_i(1+\theta_v\,\varepsilon_i)} \tag{7 7}$$

Furthermore, it can be shown (cf Van den Wollenberg, 1979) that

$$p(\underline{n}_v|\underline{\theta}, \underline{\varepsilon}) = \sum_{\underline{n}_i}\begin{bmatrix}\underline{n}_v\\ \underline{n}_i\end{bmatrix}\frac{\prod_v\theta_v^{n_v}\prod_i\varepsilon_i^{n_i}}{\prod_v\prod_i(1+\theta_v\,\varepsilon_i)} \tag{7 8}$$

This allows us to determine the conditional probability

$$p(\underline{n}_i|\underline{n}_v, \underline{\theta}, \underline{\varepsilon}) = \frac{p(\underline{n}_i, \underline{n}_v|\theta, \varepsilon)}{p(\underline{n}_v|\theta, \varepsilon)} \tag{7 9}$$

Substitution of (7.7) and (7.8) in (7.9), and some algebra, yields the conditional likelihood

$$L_c = p(\underline{n}_{.i} | \underline{n}_{v.}, \underline{\theta}, \underline{\varepsilon}) = \frac{\begin{bmatrix} \underline{n}_{v.} \\ \underline{n}_{.i} \end{bmatrix} \prod_i \varepsilon_i^{n_{.i}}}{\sum_{n_{.i}} \begin{bmatrix} \underline{n}_{v.} \\ \underline{n}_{.i} \end{bmatrix} \prod_i \varepsilon_i^{n_{.i}}} \tag{7.10}$$

(cf Van den Wollenberg, 1979). This likelihood is dependent only on the item parameters, and the CML estimation procedure maximizes eq. (7.10) with respect to the item parameters. The resulting item parameter estimators are consistent, and with the item parameters now known the subject parameters can be calculated.

A second alternative to JML estimation is known as marginal maximum likelihood (MML) estimation (Thissen, 1982). Consider the probability of a given subject obtaining response vector $\underline{X}_l$

$$P(\underline{X}_l | \theta, \underline{\varepsilon}) = \prod_{i=1}^{n} P_i^{X_i} Q_i^{1-X_i} \qquad (X_{vi} = 0,1) \tag{7.11}$$

From this equation it follows that

$$P(\underline{X}_l, \theta | \underline{\varepsilon}) = \prod_{i=1}^{n} P_i^{X_i} Q_i^{1-X_i} g(\theta) \tag{7.12}$$

By specifying a distribution of θ, and integrating the above probability function over this distribution, we obtain the marginal probability of obtaining response pattern $\underline{x}_l$

$$P(\underline{X}_l | \underline{\varepsilon}) = \int_{-\infty}^{\infty} \prod_{i=1}^{n} P_i^{X_i} Q_i^{1-X_i} g(\theta) d\theta \equiv \pi_{\underline{x}_l} \tag{7.13}$$

Since n items allow for 2^n different response patterns, the likelihood function is proportional to

$$L_m \propto \prod_{l}^{2^n} \pi_{\underline{x}_l}^{r_{\underline{x}l}} \tag{7.14}$$

with $r(\underline{x}_l)$ the number of subjects with response pattern $\underline{x}_l$. The log likelihood is given by

$$\ln L_m = c + r_{\underline{x}_l} \sum_{l}^{2^n} \ln \pi_{\underline{x}_l} \tag{7.15}$$

MML estimators are obtained by differentiating ln L with respect to ε (see also Hambleton & Swaminathan, 1985).

Advantages of MML estimation over CML estimation are that MML estimates are more efficient in that they use all the information in the data, and that they may also be used for estimating parameters for the two parameter logistic model, and possibly also for the three parameter logistic model. A disadvantage is that it relies on the validity of a specified distribution of ability parameters. Quite often, as in the $R(1)_m$ statistic of Glas, a normal distribution is assumed. An additional R(0)m statistic is used to test this distribution assumption. If this assumption is markedly incorrect, MML estimators may be biased and inefficient (Zwinderman, 1991a).

For our analyses, we have primarily made use of CML estimation, with prior JML estimation for the computation of initial values. Table 7.6 lists the outcome of the first and second order tests that were performed.

TABLE 7.6: FIRST AND SECOND ORDER RASCH ANALYSES - First order tests are sensitive to violations of the assumptions of monotonicity and sufficiency, and second order tests are sensitive to violations of the assumptions of unidimensionality and local stochastic independence.

	CML	MML
First order	R(1c) = 518.84 df = 485 p = .14	R(1m) = 895.73 df = 589 p = .0000
	Q(1) = 89.79 df = 77 p = .15	R(0m) = 336.73 df = 104 p = .0000
Conditional Log-Likelihood	-2876.80	
Second order	Q(2) = 648.92 df = 324 p = .0000	

7.3.4.3 First and second order tests

As can be seen in table 7.6, the two first order tests that were performed, R(1) and Q(1), both show an acceptable goodness of fit. This conclusion applies to the CML estimation procedure as well as to the MML estimation procedure, for if we subtract the $R(0)_m$ statistic from the $R(1)_m$ statistic, we get a result that closely resembles that of $R(1)_c$. This may be taken as additional corroboration of a good fit of the Rasch model. Also, as can be seen from table 7.7, the CML estimators and the MML estimators of item parameters are highly congruous[1)]

As was to be expected, the $R(0)_m$ statistic indicates that the subject parameters are not normally distributed The results of the first order tests indicate that the slopes of the various ICC's do not deviate significantly from each other

However, the second order test, Q(2), clearly indicates some violation of the dimensionality and conditional independence assumptions One should be somewhat cautious in the interpretation of this statistic, since with a set of 52 items the power of this test to detect small violations of conditional independence is very high Nonetheless, a closer view of some of the more conspicuous over-associations seems warranted

The Q(2) output of the RIDA program gives a z-score for each deviation of the expected association between item pairs Table 7 8 lists the results of all item pairs whose association yield a z-score greater than 2, implying a substantial contribution to the overall Q(2) statistic

A number of interesting facts may immediately be noted First, almost all item pairs listed are over-associated This is not too surprising, for violation of local independence will usually manifest itself as over-association, and the compensatory under-associations will more or less be spread out over a lot of different item pairs, yielding few significant negative z-scores Second, almost all over-associations pertain to pairs of A(1) items Since these items generally have low item parameter values (see table 7 7), the expected values tend to be rather low In general, with expected values < 5, the chi square statistic tends to become unreliable What this may lead to can clearly be seen by inspecting some of the over-associations between item pairs of test 2, scoregroup 1

The number of people expected to deliver a positive response to both items 13 and 24, for example, is 031, whereas the actual observed number of persons responding positively to both items equals one Of course, this is a negligible deviation but it does yield a z-score of no less than 5 499 Similarly, and especially for this particular scoregroup (group 1 of test 2), it can be seen that almost all expected values are close to zero and almost all observed values equal one This again stresses the caution with which one should interpret the outcome of the Q(2) statistic Another possible result is that we find a large positive z-score for a given item pair in one test (or scoregroup), but a small or negative z-score for the same item pair in another test (or in another scoregroup)

Over-associations are of interest only if they provide substantive reasons for assuming violation of local independence (possibly caused by multidimensionality) A heuristic method that may be of help in this respect, is the analysis of Q(2) residuals This method amounts to a component analysis of the deviations between n_{rij}, the number of positive responses to both items i and j, given a total number of positive responses r, and $E(N_{rij})$, the expected number of positive responses to both items i and j, given a total number of positive responses r In the case of unidimensionality these deviations are random and do not possess any common variance Multidimensionality will however show up in the extraction of one or more factors For the purpose of this analysis, we decided to analyze the four different item sets rather than the four different test versions Item sets are the sets of items that, because of the linked incomplete design, figure in two different test versions For instance, items 2, 8, 22, 24,

[1)] Due to an error in the construction of the questionnaire, no data were gathered on items 21 and 48

TABLE 7.7: CML AND MML ESTIMATION OF ITEM PARAMETERS - The first two columns give the CML estimation of the item parameters, and the standard error of the estimate, the second two columns give the MML estimation of the item parameters, and the standard error of the estimate. The item parameters should be interpreted as item difficulty.

	CML	s.e.	MML	s.e
Item 1	1.257	.270	1.271	.268
Item 2	-1.049	.198	-1.057	.197
Item 3	.973	.205	.970	.204
Item 4	1.778	.320	1.716	.309
Item 5	-.814	.204	-.854	.202
Item 6	1.048	.261	1.108	.263
Item 7	1.425	.286	1.381	.280
Item 8	-.937	.198	-.945	.197
Item 9	1.273	.273	1.234	.270
Item 10	1.502	.300	1.569	.302
Item 11	-.131	.209	-.168	.209
Item 12	1.116	.266	1.177	.268
Item 13	1.425	.286	1.381	.280
Item 14	-.214	.202	-.177	.203
Item 15	1.347	.279	1.306	.275
Item 16	1.417	.292	1.483	.294
Item 17	.218	.218	.183	.218
Item 18	1.116	.266	1.177	.268
Item 19	1.405	.282	1.417	.279
Item 20	-.553	.196	-.552	.197
Item 22	1.356	.288	1.362	.288
Item 23	-1.013	.205	-1.052	.203
Item 24	1.060	.265	1.067	.265
Item 25	1.568	.298	1.576	.293
Item 26	-.841	.193	-.815	.194
Item 27	1.484	.290	1.494	.286
Item 28	-.900	.198	-.907	.197
Item 29	-.831	.199	-.836	.198
Item 30	-1.317	.162	-1.310	.161

Item 31	-1.872	.207	-1.854	.205
Item 32	-.805	.194	-.779	.194
Item 33	-1.423	.212	-1.456	.208
Item 34	-1.232	.194	-1.212	.194
Item 35	-.062	.206	-.057	.207
Item 36	-1.637	.201	-1.620	.199
Item 37	-.214	.208	-.252	.208
Item 38	-.054	.206	-.014	.207
Item 39	-.337	.206	-.375	.206
Item 40	-.442	.197	-.410	.198
Item 41	-.418	.205	-.456	.205
Item 42	-.253	.201	-.217	.202
Item 43	-.131	.209	-.168	.209
Item 44	-.442	.197	-.410	.198
Item 45	.504	.229	.471	.228
Item 46	-.247	.206	-.248	.206
Item 47	-1.053	.205	-1.092	.203
Item 49	-.982	.199	-.988	.199
Item 50	-.405	.198	-.372	.199
Item 51	-.982	.199	-.988	.199
Item 52	-.675	.199	-.680	.199
Item 53	-.255	.207	-.293	.207
Item 54	-.750	.199	-.756	.198

28, 30, 46, 52, and 54 figure both in test version A and in test version B (see table 6.5, chapter 6). This set of items forms item set A and contains nine items. Likewise, item set B contains the 18 items that test versions A and D have in common, item set C concerns the 18 items that versions B and C have in common, and lastly, item set D contains the nine items that figure in test versions C and D. The advantage of using item sets rather than test versions for the analysis of Q(2)-residuals is that this way, we could perform the analyses on an average of 130 subjects per group, rather than 70 subjects per group as would have been the case had we performed the analyses on the data of separate test versions.

For item set A three factors were extracted. In table 7.9 the items of this item set are ordered with respect to their loadings on the three factors extracted.

TABLE 7.8: SIGNIFICANT DEVIATIONS OF EXPECTED ASSOCIATION - The last column contains the expected frequencies of subjects giving a positive response to both items of the itempair. The second column contains the standard scores under the assumption of local independence, pertaining to the difference between observed and expected frequencies. Only those item pairs have been included in the table that have a standard score > 2 or < -2.

TEST 1

Itempair	Z	obs.	exp.
6 - 22	2.502	3	.84
10 - 12	2.538	5	1.87
10 - 22	2.502	3	.84
20 - 42	-2.219	6	12.09
22 - 24	2.064	3	1.04

TEST 2, GROUP 1

Itempair	Z	obs.	exp.
2 - 33	-2.097	2	6.59
4 - 7	5.499	1	.03
4 - 15	2.967	1	.09
4 - 22	3.762	1	.06
7 - 15	2.967	1	.09
7 - 22	3.762	1	.06
9 - 13	2.480	1	.13
9 - 24	2.480	1	.13
13 - 22	3.762	1	.06
13 - 24	5.499	1	.03
17 - 22	2.371	2	.44
22 - 24	3.762	1	.06
28 - 37	2.368	3	.86
33 - 54	2.371	6	2.48

TEST 2, GROUP 2

Itempair	Z	obs.	exp.

4 - 22	2.095	6	2.85
4 - 43	-2.170	0	3.60
7 - 13	2.361	6	2.58
7 - 22	2.661	8	3.60
7 - 24	2.661	8	3.60
13 - 22	2.095	6	2.85
13 - 24	2.095	6	2.85
13 - 43	-2.170	0	3.60
22 - 24	2.931	9	3.97
22 - 43	-2.153	1	5.04
24 - 43	-2.153	1	5.04

TEST 3

Itempair	Z	obs.	exp.
1 - 9	2.297	3	.89
3 - 4	2.485	3	.82
3 - 7	2.638	4	1.21
3 - 9	2.039	3	1.02
3 - 13	2.004	4	1.59
3 - 19	2.836	5	1.59
4 - 19	2.485	3	.82
7 - 19	2.638	4	1.21
7 - 25	4.391	5	.92
9 - 25	2.608	3	.77
9 - 27	2.091	2	.52
13 - 15	2.638	4	1.21
13 - 19	2.004	4	1.59
13 - 25	2.638	4	1.21
19 - 25	2.638	4	1.21
19 - 27	2.485	3	.82

TEST 4

Itempair	Z	obs.	exp.
1 - 3	2.335	7	3.21
3 - 12	2.222	6	2.67
3 - 19	3.224	7	2.40
10 - 12	2.128	4	1.53
10 - 16	2.666	4	1.21

12 - 19	3.475	6	1.73
18 - 27	2.368	6	2.54
19 - 34	-2.220	1	5.73
20 - 44	-2.469	7	14.19
25 - 27	3.693	7	2.07
29 - 38	2.182	19	12.83
38 - 44	2.022	17	11.51
40 - 42	2.347	18	11.61
40 - 49	2.365	22	14.99

TABLE 7.9: FACTOR ANALYSIS OF Q(2) RESIDUALS, PERFORMED ON ITEM SET A (CONTAINING NINE ITEMS) - For each factor, only those items are presented with factorloadings > .10 or < -.10. The vertical bars with dotted ends connect items with similar structuple profiles. Unmarked bars connect items which differ only on a single facet. Bars marked with a '2' connect items which differ on two facets. The results suggest violation of the local independence assumption due to structuple similarity of the items.

FACTOR I

A1 B3 C2 D1 E2	-.88
A1 B3 C2 D2 E2	-.84
A1 B1 C1 D2 E1	-.67
A2 B3 C1 D1 E2	.36
A2 B1 C1 D1 E2	.36
A2 B3 C3 D1 E2	.31

2

FACTOR II

A2 B3 C3 D2 E2	-.82
A2 B3 C3 D1 E2	-.72
A1 B3 C2 D2 E2	-.24
A1 B1 C3 D2 E1	.42
A1 B1 C1 D2 E1	.33
A2 B1 C1 D2 E2	.26
A2 B1 C1 D1 E2	.20

2

2

FACTOR III

A2 B3 C1 D1 E2	.77
A2 B1 C1 D1 E2	.75
A1 B3 C2 D2 E2	.29
A1 B1 C1 D2 E1	.23
A1 B1 C3 D2 E1	-.22

The first factor can clearly be interpreted as an A-factor, with A(1) items loading negatively and A(2) items positively The second factor might be interpreted as a BC-factor, with B3 C3 (and a single B3 C2) combinations loading positively, and B1 C1 combinations loading negatively Lastly, the third factor could be conceived of as a DE-factor Very conspicuous is the fact that, for each of the three factors, items with comparable loadings have comparable structuple profiles Items 22 and 24, for instance, both loading approximately 85 on the first factor, only differ from each other with respect to facet D It is therefore a clearly recognizable fact that items that look alike in terms of their structuple profile tend to be more associated than they should be if the assumption of local stochastic independence were valid

For each of the other three item sets, three factors were extracted For item sets B and C, an interpretation of the first two factors as respectively corresponding to facets A and C seemed defendable, but the third factor did not permit an easy interpretation For item set D, the first factor seemed to correspond to facets A and E jointly So over the four different item sets, only facets A and C play consistently recognizable roles in determining (over-) associations between pairs of items This corresponds closely to what we found in the context of our similarity analyses (refer back to subsections 7 1 3 2 and 7 1 3 3) In table 7 10 are presented the ordered structuples corresponding to the first factors of the three item sets Again, it may be clearly noticed that items with comparable structuple profiles tend to be over-associated

The conclusion must therefore be that, owing to the template form of our items, which tends to make them look very alike, the assumption of local stochastic independence is violated and strictly speaking our item set is therefore not Rasch homogeneous However, as we saw in table 7 8, the most conspicuous over-associations are not all that remarkable, e g the observation of four observed positive responses to two items where no more than two were expected Because of this, and because of the fact that the first order tests did suggest Rasch homogeneity, we will henceforth treat our set of items as if it were a Rasch homogeneous item set, and see what further structure in the data can be discerned

7 3 5 Situational determinants and the LLTM

What is it that makes one situation elicit more loneliness than another? In chapter 5 we proposed five different situational determinants of the loneliness experience, which were taken up as facets in our mapping sentence Our hypotheses signify that it is possible to predict or reproduce the item parameters from these five different facets Each struct is hypothesized to have a certain effect η_k on the probability that the absence of a certain type of social exchange will be appraised as lonely If $\underline{\eta}$ is a column vector containing the effect or base parameters corresponding to the different structs, and Q a binary indicator matrix, than our hypothesis is that

$$\underline{\sigma} = Q\underline{\eta} \qquad (7\ 16)$$

with $\underline{\sigma}$ being the vector of item parameters So for one particular item i, we hypothesize that it can be

TABLE 7.10: RESULTS OF THE Q(2) ANALYSIS OF RESIDUALS ON THE REMAINING THREE ITEM SETS (ITEM SETS B AND D CONTAINING 18 ITEMS, ITEM SET C CONTAINING NINE ITEMS) - Only the results pertaining to the first factor extracted are presented here. Only those items with factor loadings > .10 or < -.10 are presented. The meaning of the vertical bars is the same as in table 7.9. Again, the results suggest violation of the local independence assumption.

ITEM SET B

A1 B1 C2 D1 E2	-1.00
A1 B2 C2 D1 E2	-.75
A1 B1 C3 D1 E2	-.62
A2 B1 C2 D2 E2	-.46
A1 B2 C2 D2 E2	-.45
A1 B1 C2 D2 E1	-.45
A1 B3 C2 D2 E1	-.36
A2 B2 C2 D2 E1	-.27
A1 B2 C3 D2 E1	-.19
A2 B2 C3 D1 E2	.80
A2 B2 C1 D2 E2	.49
A2 B2 C1 D1 E2	.42
A2 B3 C1 D2 E1	.35
A2 B2 C3 D2 E2	.31

ITEM SET C

A2 B3 C2 D1 E2	.83
A2 B3 C2 D2 E2	.47
A1 B3 C3 D2 E2	-.65
A1 B1 C1 D2 E2	-.64
A1 B3 C1 D1 E2	-.61
A2 B1 C3 D2 E1	-.53
A1 B1 C1 D1 E2	-.52
A1 B3 C3 D1 E2	-.51
A2 B1 C1 D2 E1	-.38

ITEM SET D

A1 B2 C1 D2 E2	-.80
A1 B3 C1 D2 E1	-.66
A1 B2 C1 D1 E2	-.57
A1 B3 C3 D2 E1	-.45
A1 B2 C3 D1 E2	-.40
A1 B1 C2 D2 E2	-.39
A1 B2 C3 D2 E2	-.37
A1 B2 C2 D2 E1	-.17
A2 B1 C2 D1 E2	.62
A2 B1 C3 D2 E2	.52
A2 B1 C3 D1 E2	.50
A2 B2 C2 D2 E2	.48
A2 B2 C2 D1 E2	.45
A2 B3 C2 D2 E1	.37
A2 B2 C3 D2 E1	.25
A2 B1 C2 D2 E1	.22

reproduced out of the effect parameters as

$$\sigma_i = \sum_k q_{ik} \eta_k \tag{7 17}$$

with q_{ik}=1 if struct k figures in item i, and q_{ik}=0 if it does not This imposing of linear constraints on the item parameters turns the one parameter logistic model into the linear logistic test model (Fischer, 1974, 1983)

$$P(X_{vi} = 1|v,i) = \frac{\exp(\xi_v - \sum q_{ik}\eta_k)}{1+\exp(\xi_v - \sum q_{ik}\eta_k)} \tag{7 18}$$

Since

$$\operatorname{logit} P_{vi} = \xi_v - \sum_k q_{ik}\eta_k \tag{7 19}$$

it can be seen that the LLTM is formally equivalent to a logistic regression model for binary dependent variables, with the subject parameter ξ_v as residual term So what we have is a multiple regression model on the item parameters, with the columns of the Q matrix as predictors, the η_k parameters as regression weights, and with repeated measurements in the subjects This formal equivalence of the LLTM with a multiple regression model allows for a test of the hypothesized effects of structs on the item parameters, and also permits an examination of possible interaction effects between structs

Using the LLTM for a test of hypothesized effects of structs requires appropriate structuring of the Q matrix One necessary condition for all LLTM parameters to be identifiable, is that the Q matrix should be of full column rank

7 3 5 1 Structuring the Q matrix

The Q matrix may be compared to a design matrix for the use in ANOVA The structs of the facets, coded in the Q matrix, are analogous to (dummy codes of) the levels of factors in the design matrix In ANOVA it is not the actual effect of a given factor level that is being identified, but rather the effects are contrasted to each other; i e the effects are expressed relative to each other This makes it necessary for a factor of m levels to define m-1 different contrasts the m-th level is set to zero as identifiability constraint Likewise, in the LLTM we express the effects of different structs in terms of each other, and require m-1 contrasts for a facet of m structs

There are various ways of coding contrasts One way is simply to use dummy predictors, i e use zeros and ones as codes For a facet of three structs, this would require two contrasts for instance {0,1,0} and {0,0,1} This way the first contrast contrasts the second struct with the first, and the second contrast contrasts the third struct to the first Alternatively, instead of using zeros and ones, we could code a binary facet X as -1 and +1, so that the regression weight of this contrast expresses the mean difference between X_1 and X_2 items Apart from main effects, interaction effects can also be coded by multiplying the columns corresponding to the two interacting facets

In constructing a Q matrix two conditions should be met First, the different contrasts should be orthogonal, and second, they should be uncorrelated If they are not, then the different main and interaction effects can no longer be independently identified This problem is analogous to what we find in multiple regression analysis when adding or deleting predictors that are correlated Addition or deletion of predictors in a multiple regression equation may drastically change the regression weights of predictors in the equation Likewise, if different contrasts are correlated, then their corresponding effects cannot be determined independently

In particular, confounding of effects will occur when not all the possible combinations of structs are actually represented in the item set, or when different numbers of subjects have responded to different structuples In our case we had omitted the A1 D1 E1 and A2 D1 E2 combinations, and 0,1 coding of all the presumed main effects led to correlated contrasts Table 7 11 lists the coding that we initially used for seven contrasts, corresponding to five main effects The η estimates are given in the same table Using these η estimates, we calculated the estimated item parameters $\hat{\sigma}$ (=Q*η) ANOVA on the estimated item parameters with the facets A, B, C, and E led to results presented in table 7 12 As can be seen in this table, the sum of squares for A*E interaction is not zero, even though this interaction effect was not coded in the Q matrix A confounding of main and interaction effects has occurred[2)]

TABLE 7.11: INITIAL CONTRAST CODES

		Contrast						
		A	B1	B2	C1	C2	D	E
	1	0	0	0	0	0	0	0
Facet Levels	2	1	1	0	1	0	1	1
	3	-	0	1	0	1	-	-

To ensure orthogonal and uncorrelated contrasts, the effect of facet E could not be estimated as a main effect, but only separately for A1 and A2 items Likewise, the effect of facet D could only be estimated for those items were a distinction between 'saying' and 'doing' could be made For those items which occurred only in a D2 version (i e in the A1 E1 and A2 E2 combinations), an estimate for the effect of facet D could not be made

2) In this analysis facet D had to be omitted to prevent empty cells occurring

TABLE 7.12: ANOVA ON ESTIMATED ITEM PARAMETERS

Facet	df	sum of squares
A	1	10.135
B	2	3.960
C	2	.363
E	1	13.356
AxE	1	.878
Other interactions	28	0.000
Residual (D)	18	.146

Assuming that the actual numerical value of the η estimates is of no importance (as in our case, where our hypotheses pertain to the ordering of the different η_k's) it does not really matter exactly how one codes the contrasts, as long as they are uncorrelated. This will be the case when the contrasts are orthogonal and the mean of each contrast (with one exception permitted) equals zero. To ensure this, we coded our contrasts as in table 7.13.

Since the E-effect cannot be estimated by itself, but only within A1 and A2 separately, we term the AE effect a pseudo main effect. Likewise, the effect of facet D can also be regarded as a pseudo main effect.

7.3.5.2 Results of the LLTM analyses

LLTM analyses were performed with the CLR algorithm. This algorithm was developed by Zwinderman to perform a logistic regression for correlated binary observations. The program maximizes the conditional likelihood of the data with respect to the η parameters, given the number of positive responses per subject. Our basic hypothesis was that the item parameters could be modelled as an additive function of the facets, with no interaction effects. The linear logistic model with no interaction effects yielded a log likelihood of -2929.84. A test to determine whether this model is indistinguishable from the unconstrained Rasch model (implying that the item difficulties can indeed be adequately modelled as an additive function of facets), is the likelihood ratio test (Fischer, 1974). The likelihood ratio statistic is calculated by taking two times the difference of the log likelihood of the unconstrained Rasch model and the log likelihood of the LLTM. This statistic is asymptotically chi square distributed with a number of degrees of freedom equal to the difference of the degrees of freedom of the unconstrained Rasch model and the degrees of freedom for the LLTM. Since the log

TABLE 7.13: FINAL (ORTHOGONAL) CONTRAST CODES

		Contrasts for main effects				
		A	B1	B2	C1	C2
	1	-1	-1	-1	-2	0
Facet Levels	2	1	2	0	1	-1
	3		-1	1	1	1

		Contrasts for pseudo main effects		
		A1E	A2E	D
	A1 D1 E1	2	0	0
	A1 D1 E2	-1	0	-1
	A1 D2 E1	2	0	0
Facet combinations	A1 D2 E2	-1	0	1
	A2 D1 E1	0	1	-1
	A2 D1 E2	0	-2	0
	A2 D2 E1	0	1	1
	A2 D2 E2	0	-2	0

likelihood of the unconstrained Rasch model was -2876.80, the likelihood ratio statistic equals 106, with 51-8=43 degrees of freedom. This result is highly significant, and therefore this LLTM is not indistinguishable from the unconstrained Rasch model.

This suggests that apart from main and pseudo main effects, there are interaction effects that have to be taken into account. Table 7.14 gives the results of the LLTM with only main and pseudo main effects.

It can be seen that the eta coefficients of the C1 and D contrasts are not or barely significant, and this suggests that a more appropriate model could do without these contrasts.

To explore which interaction effects required to be taken up in the model, we constructed contrasts for all possible interaction effects between our facets (yielding a total of 28 contrasts), and performed a stepwise multiple regression of the facet and interaction contrasts on the unconstrained Rasch parameters. This yielded the results reported in table 7.15.

We can see that 15 contrasts together yield a multiple correlation with the unconstrained Rasch parameters of .985. It may be expected that a model with less than 15 contrasts will suffice to produce a

TABLE 7.14: PARAMETER WEIGHTS OF CONTRASTS IN LLTM

Contrast	Eta	se(eta)
A	.677	.032
B1	-.192	.021
B2	-.145	.036
C1	-.001	.021
C2	-.106	.036
D	.067	.038
A1E	.643	.032
A2E	.101	.027

Rasch model with linear constraints that is statistically indistinguishable from our unconstrained Rasch model We tried out various LLTM models with successively less contrasts included Results of these analyses are reported in table 7 16

The LLTM model with contrasts C1 and D omitted, and with contrasts for ABE and BCE interactions included, yields an acceptable goodness of fit (p= 07) Further inclusion of contrasts for AB interaction even significantly improves the fit, but the regression weights of these further contrasts are small in comparison to their standard errors (AB1 has a weight of - 060 with a standard error of 022, and AB2 has a weight of - 071 with a standard error of 038), so we will consider the LLTM model with 10 contrasts included as the optimal model Table 7 17 lists the parameter weights and standard errors for the contrasts in this model

7 3 5 3 Evaluation of situational hypotheses

Table 7 18 lists the base parameters corresponding to the various main and pseudo main effects
We can now evaluate the hypotheses on situational determinants For the purpose of visualizing the role of the various structs in the determination of the item parameters, we present scattergrams relating the elements of the facets to the unconstrained Rasch parameters

Facet A
It can be seen immediately that on average A2 items have lower item parameters, i e the absence of situations involving a social exchange from the other to the subject tends to elicit more loneliness than the absence of a situation involving a social exchange from the subject to the other

TABLE 7.15: MULTIPLE REGRESSION ON RASCH PARAMETERS, WITH CONTRASTS AS PREDICTORS

Step nr.	Contrast	MR
1	A	.647
2	A1E	.904
3	B1	.933
4	B1A1E	.942
5	B2	.948
6	AB1	.953
7	B1A2E	.959
8	A2E	.963
9	B1C1E	.968
10	B2A2E	.972
11	C2	.976
12	AB2	.978
13	C1E	.981
14	D	.983
15	B1C2E	.985

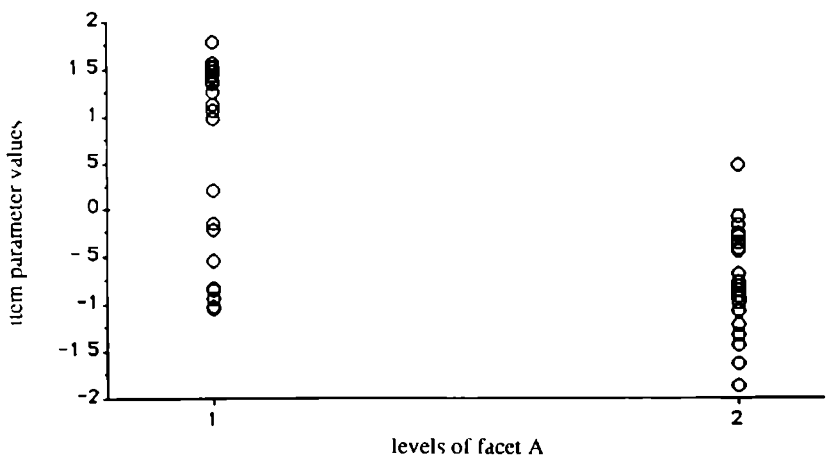


Figure 7.4 - A scattergram, relating the levels of facet A to the Rasch item parameter values The figure shows that the lowest parameter value for A1 items (direction of the exchange from the subject to the other) is approximately -1, whereas the lowest parameter value for A2 items (direction of the exchange from the other to the subject) is approximately -2 On the whole A2 items tend to be 'easier' than A1 items, which means that A2 items tend to elicit loneliness sooner than A1 items This finding is congruent with our hypothesis on the role of the elements of facet A

TABLE 7.16: HISTORY OF LLTM ANALYSES - The first column gives the number of contrasts in the LLTM, the second column gives the log likelihood for the given LLTM, the third column gives the odds ratio of the likelihood of the constraint model to that of the unconstrained model, the last column gives the probability of the odds ratio, given that the two models are actually indistinguishable.

Number of contrasts	ln(L)	$-2\ln(L/L_u)$	df	p
13	-2895.52	37.44	38	.50
12	-2898.69	43.78	39	.28
11	-2900.49	47.38	40	.20
10	-2904.37	55.14	41	.07
9	-2909.16	64.72	42	.01

Unconstrained: -2876.80

TABLE 7.17: PARAMETER WEIGHTS OF CONTRASTS IN OPTIMAL LLTM

Contrast	Eta	se(eta)
A	.671	.032
B1	-.175	.022
B2	-.157	.036
C2	-.112	.036
A1E	.642	.032
A2E	.095	.027
B1A1E	-.068	.022
B1A2E	-.061	.019
B2A2E	-.121	.033
B1C1E	.069	.016

TABLE 7 18: BASE PARAMETERS OF MAIN AND PSEUDO MAIN EFFECTS - In contrast to the item parameters of previous tables, the base para- should be interpreted as item easiness.

Struct	η	struct combination	η
A1	-.671	D1	0.000
A2	.671	D2	0.000
B1	.332	A1 E1	.613
B2	-.350	A1 E2	-1.313
B3	.018	A2 E1	.766
C1	0.000	A2 E2	.481
C2	.112		
C3	-.112		

Facet B

Figure 7 5 shows that the hypothesis regarding the elements of facet B is also clearly corroborated Situations involving a social exchange focussing on a problem tend to elicit more loneliness than situations involving a social exchange focussing on a positive experience, which in turn elicit more loneliness than situations involving a social exchange focussing on an attitude

Facet C

As can be seen from figure 7 6 and contrary to our expectation, it is not the absence of social exchange with a partner that elicits loneliness more strongly than any of the other categories of facet C, but instead the absence of social exchange with relatives which does so It must be noted that none of the base parameters corresponding to the elements of facet C are very high All base parameters are rather close to zero and indeed the scattergram shows that all facet C structs are spread out over the entire range of the item parameters Nonetheless, the absence of social exchange with relatives is noticeably stronger related to loneliness than absence of social exchange with either of the other two partners of the social exchange It seems reasonable to assume that the greater role of relatives in connection to feelings of loneliness is related to the fact that the present sample of respondents consists of fairly young subjects, for whom relations with relatives are more focal than a relation with a partner, or with friends

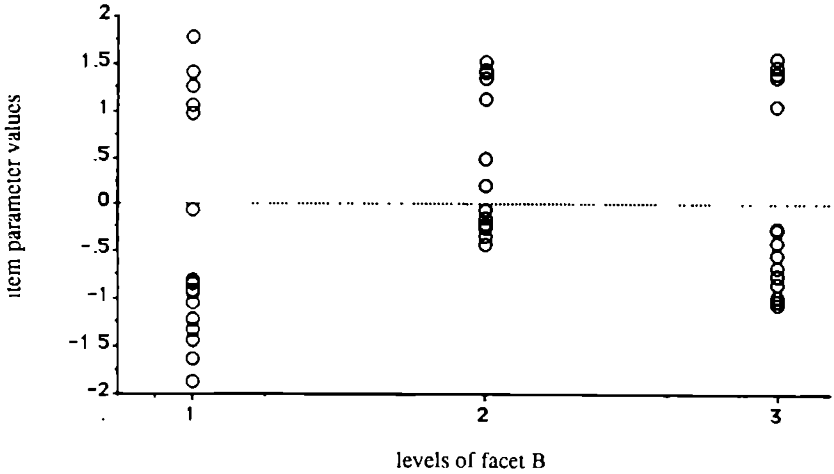


Figure 7.5 - A scattergram, relating the three levels of facet B to the Rasch item parameter values The figure shows that the 'easiest' items are B1 (a problem as focus of exchange) items, followed by a group of B3 (an experience as focus of exchange) items, while the B2 (an attitude as focus of exchange) items tend to elicit loneliness only difficultly. This finding corroborates our hypothesis on the role of the elements of facet B.

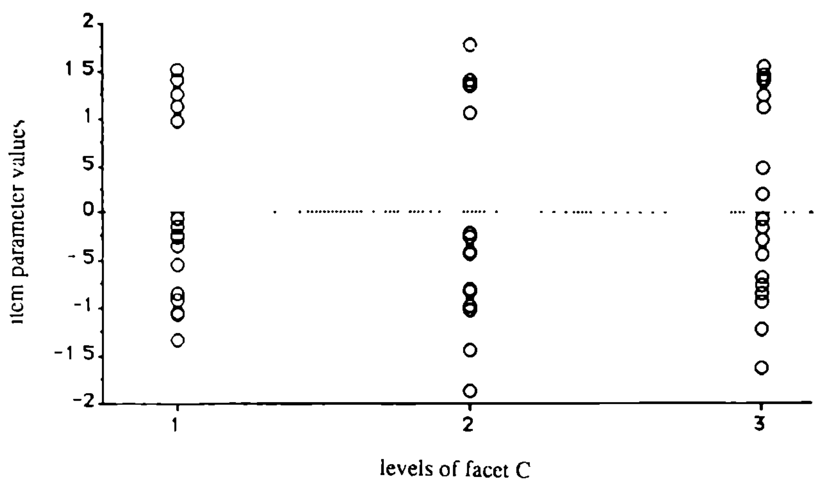


Figure 7.6 - A scattergram, relating the three levels of facet C to the Rasch item parameter values The figure shows that all three levels of facet C have an approximately equal potential of eliciting loneliness, with C2 (relatives as partners of the exchange) items slightly easier than the other items. This finding contradicts our hypothesis on the role of the elements of facet C. We had hypothesized that C1 (marital partner as partner of the exchange) items would elicit a loneliness response easier than C3 (a friend as partner of the exchange) items, and that C2 items would have the highest item difficulties

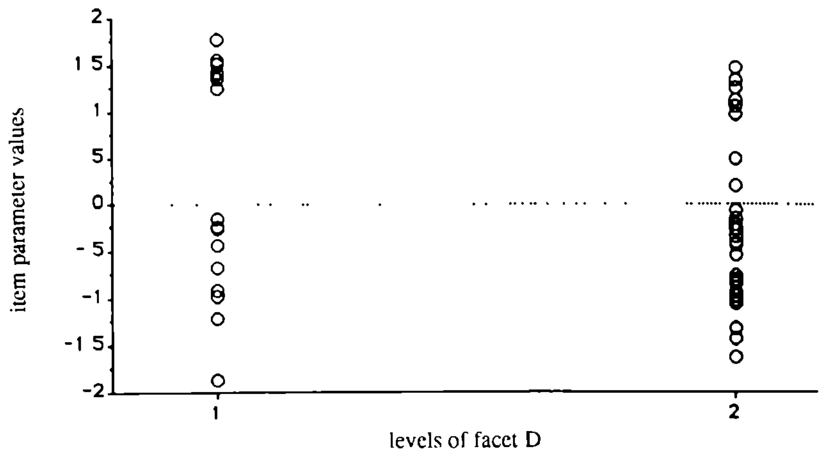


Figure 7.7 - A scattergram, relating the two levels of facet D to the Rasch item parameter values The figure shows that there is no distinction between the two levels This contradicts our hypothesis that D1 (doing) items would elicit a response of loneliness easier than D2 (saying) items.

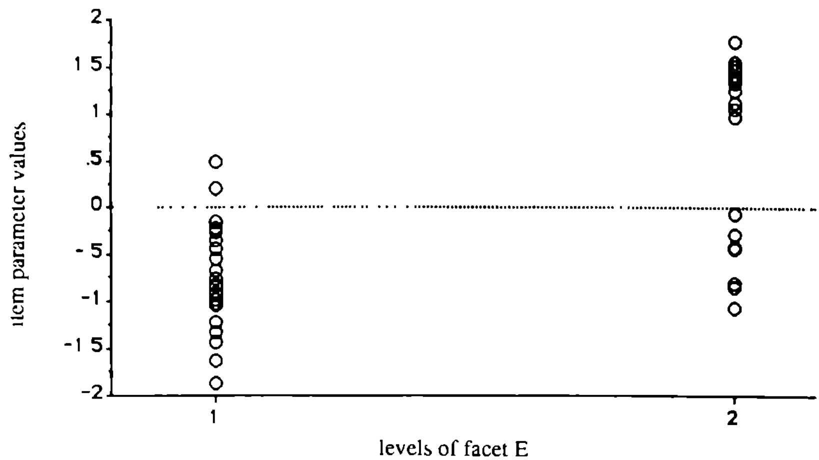


Figure 7.8 - A scattergram, relating the two levels of facet E to the Rasch item parameter values. The findings corroborate our hypothesis that E(1) (focus of the exchange pertains to the subject) items tend to elicit a response of loneliness easier than E(2) (focus of the exchange pertains to the other) items

Facet D

As the regression weight of the D contrast did not deviate significantly from zero, the base parameters for the elements of facet D are both zero too. Neither D1, nor D2 contributes significantly to the value of the unconstrained Rasch parameter, and so, contrary to our hypothesis, they cannot be distinguished from each other (although it should be remarked that we have only been able to test this hypothesis with the facet combinations A1E2 and A2E1.

Facet E

As we discussed in subsection 7.3.5.1, the main effect of facet E cannot be estimated independently from facet A. Nonetheless, the scattergram relating structs E1 and E2 to the unconstrained Rasch parameters immediately suggests a dominant role for struct E1, as expected. If we take a look at the base parameters corresponding to the pseudo main effect AE, this suggestion is further born out. The ordering of AE combinations is primarily determined by facet E, with the E1 combinations having higher base parameters. The hypothesis that absence of social exchange focussing on a problem, attitude, or experience of oneself causes more loneliness than absence of social exchange focussing on a problem, attitude or experience of the other, is clearly confirmed.

7.3.5.4 A look at the interactions

Our model contains interaction effects between facets A, B, and E, and between facets B, C, and E. An ANOVA performed on the unconstrained Rasch parameters, with respectively facets A, B and E, and facets B, C and E as independent variables yielded interaction tables that may assist us in understanding the nature of the interactions. These tables are presented below.

TABLE 7.19: ABE-INTERACTION TABLE - The cells contain the number of subjects who responded to the items with the given ABE structuple profile (upper right value), and the mean parameter value for items with this ABE structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	A	level 1		level 2		Totals
	E'	level 1	level 2	level 1	level 2	
B	level 1	3	6	6	3	18
		- 936	1 289	-1 392	- 563	- 284
	level 2	3	6	6	3	18
		- 045	1 323	- 148	- 302	333
	level 3	3	5	5	3	16
		- 8	1 374	- 727	- 575	- 055
Totals		9	17	17	9	52
		- 594	1 326	- 757	- 48	-1 923E-6

Inspection of the ABE interaction table reveals the following. In A1 E1 situations, the ordering of the elements of facet B conforms closely to our hypothesis for facet B. When the focus is an attitude, an A1 E1 (not initiating exchange concerning oneself) situation scarcely has any effect on loneliness at all. If you do not discuss your attitudes with somebody else, you may feel that the other will not be interested or that he is not clever enough to follow the argument, but it will not lead you to feel lonely. However, if you decide not to discuss your problems or your personal experiences to somebody else, this seems contrary to a natural inclination, and therefore suggests a faulty relationship with the other. Feelings of loneliness seem probable in this case. On the other hand, if one chooses not to respond to the problems, attitudes, or experiences of the other (A1 E2), this does not seem to have any bearing on loneliness, as we expected.

In A2 E1 situations, the ordering of the elements of facet B again closely conforms to our hypothesis concerning facet B. In A2 E2 situations, however, situations where the other does not say anything to you about his or her problems, attitudes, or experiences, there is scarcely any difference in importance between problems and experiences as foci. Even more conspicuous is the fact that in these situations, attitudes seem to contribute substantially to the probability of a subject feeling lonely. Apparently, if the other does not discuss either problems, attitudes, or experiences with you, this suggests a lack of confidence and therefore a faulty relationship. In such a case one is likely to feel lonely.

TABLE 7.20: BCE-INTERACTION TABLE - The cells contain the number of subjects who responded to the items with the given BCE structuple profile (upper right value), and the mean parameter value for items with this BCE structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	C	level 1		level 2		level 3	level 3	Totals
	E*	level 1	level 2	level 1	level 2	level 1	level 2	
B	level 1	3	3	3	3	3	3	18
		-1 087	465	-1 372	677	-1 261	.874	- 284
	level 2	3	3	3	3	3	3	18
		- 236	862	- 295	777	189	704	.333
	level 3	2	2	3	3	3	3	16
		- 395	171	- 996	673	- 752	929	- 055
Totals		8	8	9	9	9	9	52
		- 595	54	- 888	709	- 608	.836	-1 923E-6

Since we know that facet C plays only a minor role as determinant of loneliness, it is of primary interest to see how B, C and E interaction affects the ordering of facet B. It can be seen that for each of the C E1 (locus: the subject) combinations, the ordering of the elements of facet B is as expected: B1 < B3 < B2. However, when the partner of social exchange is the subject's partner, the difference between B3 (a positive experience or activity) and B2 (an attitude) is very small, and the distinction really lies between B1 (a problem) on the one hand and B2 and B3 on the other.

In the E2 (locus: the other) cases, a different ordering of B elements is produced. In the C1 E2 combinations, the ordering of B elements is B3 < B1 < B2. However, in the case of relatives (C2 E2) problems and experiences have indistinguishable effects Lastly, in the C3 (friends) E2 case, all effects are fairly alike, with that of B2 somewhat greater than that of B1 and B3

7 3 5 5 Alternative coding of contrasts

Our best fitting LLTM model required ten main and interaction effects to be included As we discussed in subsection 7 3 5 1, the main (and pseudo main) effects are taken up in the model by coding contrasts in such a way that they are both orthogonal and uncorrelated Appropriate contrasts for interaction effects may be obtained by multiplying the contrasts for the corresponding main effects Of course there are several ways in which one can code contrasts so that they be both orthogonal and uncorrelated Any linear transformation of a set of orthogonal and uncorrelated contrast codes will result in an alternative set of orthogonal and uncorrelated contrast codes

Two contrasts are necessary for incorporating the effects of a facet with three elements For facet B, we chose {-1,2,-1}, contrasting B2 with the average of B1 and B3, and {-1,0,1} contrasting B1 with B3 This way the effects of B1, B2, and B3 could be identified Referring back to table 7 17, it can be seen that the base parameters of the B-structs were B1 = 332, B2 = - 350, and B3 = 018 The effect of B3 is negligible, the interesting effects are produced by B1 and B2 Looking at these base parameters suggests and alternative set of contrast codes, that may possibly allow us to eliminate one term in our best fitting LLTM model By coding the first contrast {-1,1,0}, contrasting B1 with B2, and coding the second contrast {0,0,1}, contrasting B3 with the average of B1 and B2, we obtain two new contrasts of which the second may no longer obtain a significant regression weight, enabling us to reduce the LLTM model by one term

Working with these new contrasts, it would seem natural also the construct new contrasts for the interaction effects involving B However, a look at the marginals of the interaction tables for A1 BE and A2 BE suggests otherwise

TABLE 7 21 BE-INTERACTION FOR A1 ITEMS - The cells contain the number of subjects who responded to the items with the given A1 BE structuple profile (upper right value), and the mean parameter value for items with this A1 BE structuple profile (lower right value) The mean parameters should be interpreted as item difficulty

B focus	locus E	subject	other	Totals
	problem	3 - 936	6 1 289	9 548
	opinion	3 - 045	6 1 323	9 867
	experience	3 - 8	5 1 374	8 559
Totals		9 - 594	17 1 326	26 661

For A1 BE, we see that the interesting difference is between B2 and the other elements This suggests that in this case it is most appropriate to retain the original contrast coding for B {-1,2,-1}, contrasting B2 with the mean of B1 and B3 For A2 BE, we see that the effects of B2 and B3 (given by the marginals) resemble each other, so contrasting B1 with B3 (-1,0,1), seems appropriate

TABLE 7 22 BE-INTERACTION FOR A2 ITEMS - The cells contain the number of subjects who responded to the items with the given A2 BE structuple profile (upper right value), and the mean parameter value for items with this A2 BE structuple profile (lower right value) The mean parameters should be interpreted as item difficulty

	locus E	subject	other	Totals
B focus	problem	6 -1 392	3 - 563	9 -1 116
	opinion	6 - 148	3 - 302	9 - 2
	experience	5 - 727	3 - 575	8 - 67
Totals		17 - 757	9 - 48	26 - 661

So the new set of contrasts that we used (which for reasons that are of no interest to the reader we called J-contrasts) are equal to our original set of contrasts, with the exception of new codes for the main effect of facet B With these J-contrasts we tested a number of LLTM models, respectively containing 11, 10, and 9 contrasts The results are reported in table 7 23
It can be seen that we have succeeded in reducing our original best fitting LLTM model with one term The parameter weights for these contrasts are reported in table 7 24, and the base parameters for main effects are presented in table 7 25

7 3 6 Personal determinants and the LRRM

We may recall that our hypotheses on personal determinants of loneliness focus on three different ratio's m(S)/m(V), m(E)/m(C), and m(C)/m(V), respectively the number of social exchange situations that one values and is satisfied with relative to the number of social exchange situations that one values, the number of valued social exchange situations that one actually engages in relative to the number of valued social exchange situations that one could potentially engage in, and the number of valued social exchange situations that one could potentially engage in relative to the number of social exchange situations that one values The hypotheses concerning subject bound determinants consider the three ratio's as predictors of the criterion variable ξ_v A regression equation could be formulated, involving the three ratio's with appropriate weights for a maximal prediction of ξ_v Since ratio's are measured on a ratio scale, and the subject parameter ξ_v is measured on a difference scale, the ratio's will be transformed by taking their natural logarithms, to ensure that predictors and criterion are

TABLE 7.23. HISTORY OF LLTM ANALYSES, J-CONTRASTS - The first column gives the number of contrasts in the LLTM, the second column gives the log likelihood for the given LLTM, the third column gives the odds ratio of the likelihood of the constraint model to that of the unconstrained model, the last column gives the probability of the odds ratio, given that the two models are actually indistinguishable.

Number of contrasts	ln(L)	$-2\ln(L/L_u)$	df	p
11	-2898.81	44.02	40	31
10	-2900.52	47.44	41	23
9	-2904.49	55.38	42	.08
Unconstrained.	-2876.80			

measured on the same measurement scale

Our hypotheses on the personal determinants of loneliness assume that m(E)/m(C) and m(C)/m(V) will not act as main effects, but as interaction effects with m(S)/m(V) To incorporate interaction effects in the regression model, the intention is to split the three ratio's into three levels each, with the first level comprising the 33% lowest scores, the second level pertaining to the middle 33% of scores, and the third level comprising the highest 33% of scores Having turned our ratio's into three factors of three levels each, contrast codes for main and interaction effects can be constructed in a way analogous to the construction of contrasts for the LLTM

Determining the relationship between ξ_v and a number of predictors requires the prior estimation of the subject parameters Since subject characteristics are conditioned out for the purpose of CML estimation, MML estimation has to be used as alternative Since MML estimates are sensitive to misspecification of the ability distribution, Zwinderman (1991b) suggests the direct estimation of the relation between the latent trait and the predictors via use of the logistic regression model Consider the following linear model for ξ_v

TABLE 7.24: PARAMETER WEIGHTS OF J-CONTRASTS IN LLTM

Contrast	Eta	se(eta)
A	.671	.032
B1	-.170	.018
C2	-.112	.036
A1E	.642	.032
A2E	.094	.027
B1A1E	-.069	.022
B1A2E	-.061	.019
B2A2E	-.121	.033
B1C1E	.069	.016

TABLE 7.25: BASE PARAMETERS OF MAIN AND PSEUDO MAIN EFFECTS - Note: base parameters should be interpreted as item easiness.

Struct	η	struct combination	η
A1	-.671	D1	0.000
A2	.671	D2	0.000
B1	.170	A1 E1	.613
B2	-.170	A1 E2	-1.313
B3	0.000	A2 E1	.765
C1	0.000	A2 E2	.479
C2	.112		
C3	-.112		

$$\xi_v = \underline{\beta}\ \underline{X}_v + \varepsilon_v \tag{7 20}$$

where

X_v = a vector of length p consisting of the observations for individual v on p predictors,

$\underline{\beta}$ = the vector of the unknown regression parameters,

ε_v = residual term

Substituting (7 20) in the unconstrained Rasch model gives

$$P(X_{vi} = 1|\underline{\beta}, \underline{X}_v, \varepsilon_v, \sigma_i) = \frac{\exp(\underline{\beta}\underline{X}_v + \varepsilon_v - \sigma_i)}{1 + \exp(\underline{\beta}\underline{X}_v + \varepsilon_v - \sigma_i)} \tag{7 21}$$

which is a variant of the usual version of the Rasch model known as the logistic regression model (LRRM) This model cannot be estimated uniquely As identifiability constraint, the mean of the item parameters will be set to zero Our three hypotheses concerning the ratio's may be translated into the hypothesis that the β values corresponding with the proposed main and interaction effects will be unequal to zero, whereas all the other possible main and interaction effects will have β's equal to zero Corroboration of hypotheses concerning the personal determinants implies that under these restrictions the model will show an acceptable goodness of fit

7 3 6 1 Frequency distributions of the ratio's

Figures 7 9 - 7 11 present frequency distributions for the three ratio's, m(S)/m(V), m(E)/m(C), m(C)/m(V)[3]

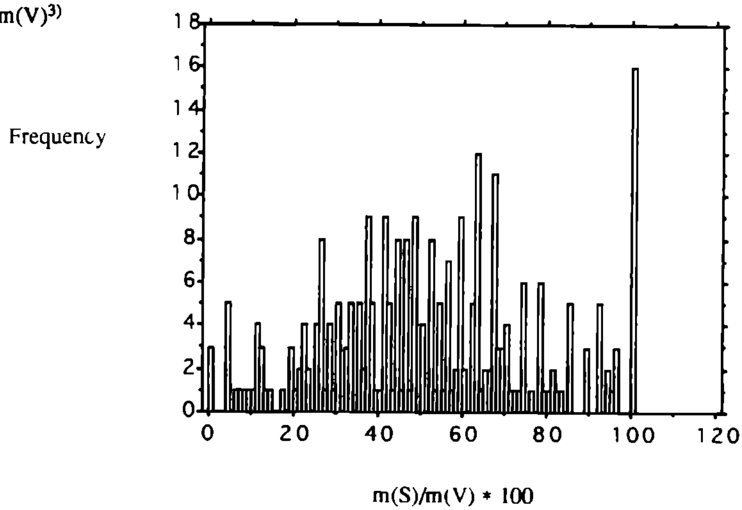


Figure 7.9 - Frequency distribution of the number of valued social exchanges that one is satisfied with, relative to the number of social exchanges that one values, multiplied by 100 (m(S)/m(V) * 100)

[3] All ratio s have been multiplied by 100

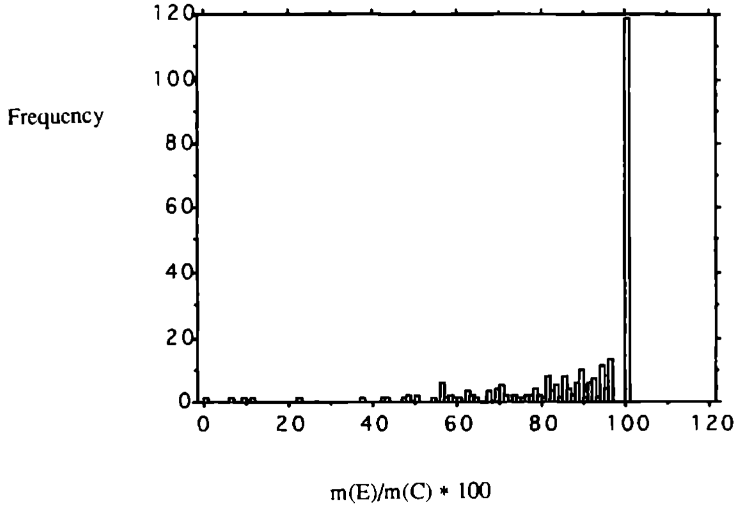


Figure 7.10 - Frequency distribution of the number of valued social exchanges that one actually engages in, relative to the number of social exchanges that one values and could potentially engage in, multiplied by 100 (m(E)/m(C) * 100) It can be seen that nearly all subjects engage in those valued social exchanges that they can potentially engage in

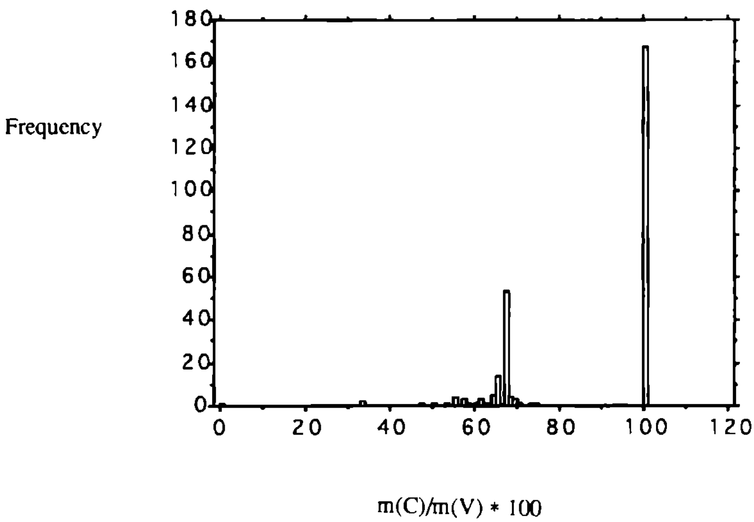


Figure 7.11 - Frequency distribution of the number of valued social exchanges that one could potentially engage in, relative to the number of social exchanges that one values, multiplied by 100 (m(C)/m(V) * 100) It can be seen that nearly all subjects have the opportunity for engaging in the social exchanges that they value

It can immediately be seen that the distribution of the latter two ratio's show little variance. If there is an opportunity to engage in a valued social exchange situation, than in almost every instance our subjects do actually engage in these situations. Also, for almost all situations that are valued by our subjects, there exists the opportunity to realize them. Of course, in practice this means that almost all our subjects have living relatives and at least some friends, which is not surprising given this homogeneous group of young people. Most of the variance in the distribution of the m(C)/m(V) ratio is accounted for by the fact that approximately half of our subjects do, and the other half do not have a partner.

The fact that the two ratio's that were thought to interact with m(S)/m(V) show so little variance, makes it hard to split the distribution of these scores into three. No three score groups can be constructed that differ significantly from each other in mean score level. On the other hand, the ratio that we expected to be a good predictor for proneness to loneliness, m(S)/m(V), does show considerable variance. For these ratio scores, a meaningful distinction between the lowest 33% of scores, the middle group, and the highest 33%, can be made.

7.3.6.2 Association between personal determinants and proneness to loneliness

To explore whether the intended personal determinants of loneliness can be meaningfully used as predictors of proneness to loneliness, correlations between the sum score of loneliness and potential personal determinants have been calculated Below are presented scatterplots of correlations between loneliness and m(S)/m(V), loneliness and m(E)/m(C), loneliness and m(C)/m(V), and between loneliness and age.

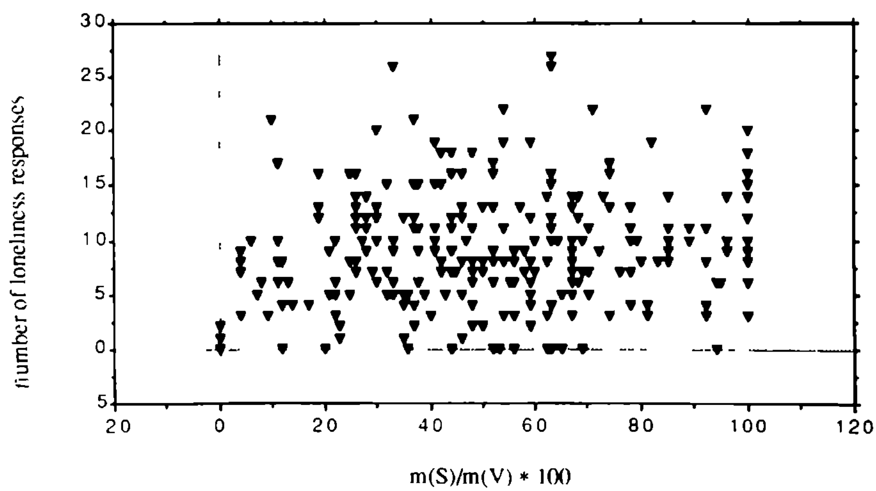


Figure 7.12 - Scatterplot showing the relationship between the sum of loneliness responses and the number of valued social exchanges that one is satisfied with (m(S)), relative to the number of social exchanges that one values (m(V))

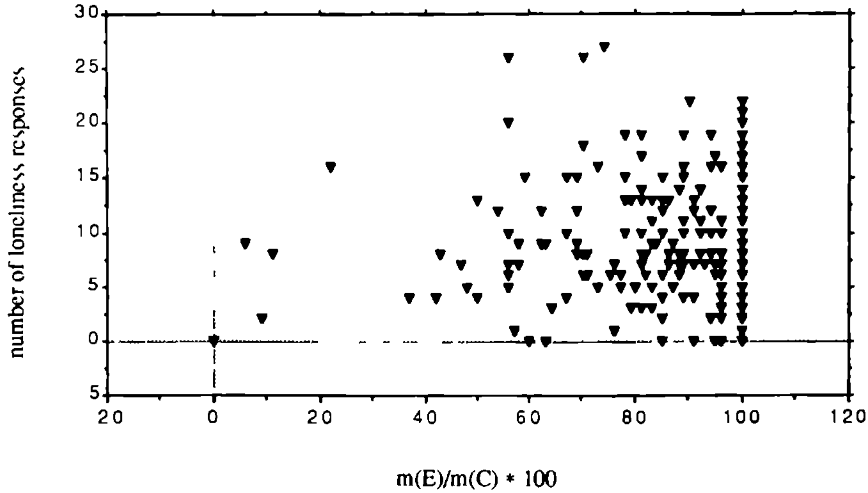


Figure 7.13 - Scatterplot showing the relationship between the sum of loneliness responses and the number of valued social exchanges that one engages in (m(E)), relative to the number of social exchanges that one values and could potentially engage in (m(C))

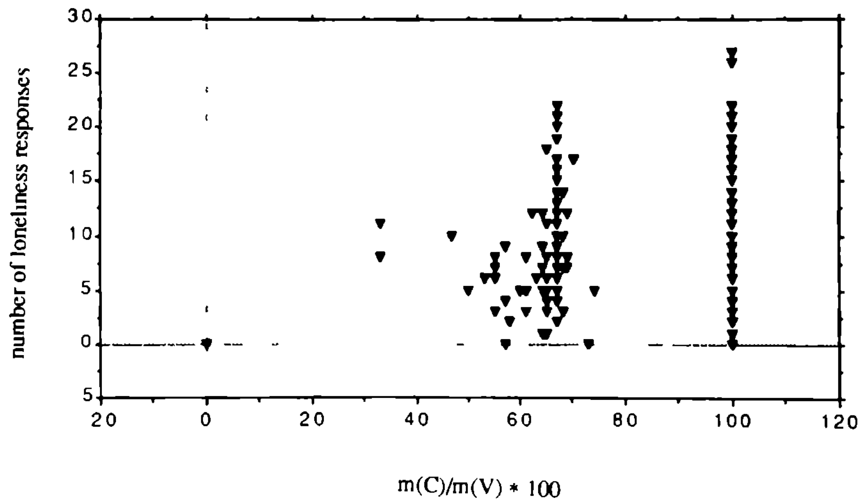


Figure 7.14 - Scatterplot showing the relationship between the sum of loneliness responses and the number of valued social exchanges that one values and could potentially engage in (m(C)), relative to the number of social exchanges that one values m(V))

Of course, the magnitude of the correlations is influenced by the fact that the distributions are markedly skewed and dissimilar Nevertheless, it is at once apparent that there exists no meaningful relationship between proneness to respond with loneliness, and any of the intended personal determinants considered here

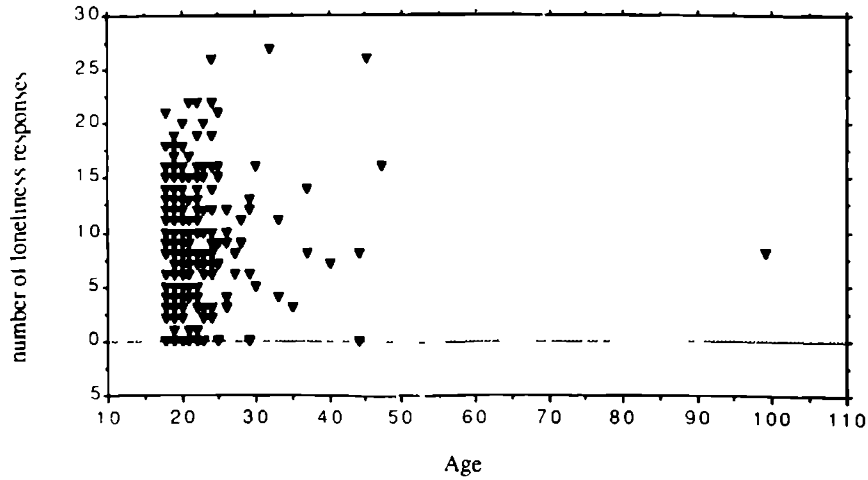


Figure 7.15 - Scatterplot showing the relationship between the sum of loneliness responses and age

To see if any association exists between loneliness and some of the other potential - binary - personal determinants, cross tables between level of loneliness (low, medium, or high) and these variables have been constructed, and tests of statistical independence performed These tables and the corresponding chi-square statistics are produced below (tables 7 26-7 29)

Again, it is apparent that neither civil status, nor sufficiency of number of friends, having a partner, and gender are associated with proneness to loneliness This is a surprising result, that suggests that 'proneness to loneliness' is not directly related to actual social relations

The unrelatedness of all intended predictors of loneliness to the measured level of proneness means that we may skip the LRRM analyses

7.4 Rasch analysis of valuation, satisfaction, and engagement

Although the data on valuation, satisfaction and engagement scores of our subjects cannot be used as predictors of proneness to loneliness, it will be interesting to examine whether these data, like the data pertaining to loneliness, yield measurements, i e whether the structure in these data permits an ordering of items and subjects to be made Since no hypotheses were formulated on these data, we will restrict ourselves to an explorative examination This means that we will restrict ourselves to first order tests for the determination of Rasch homogeneity, and that further examination of the internal structure of the data as related to the facets, will be performed with multiple regression of contrasts on the estimated item parameters

TABLE 7.26 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND CIVIL STATUS

Civil Status	Level of proneness: Low	Medium	High	
Unmarried, not living together	132	87	13	232
Married, or living together	19	15	2	36
	151	102	15	268

Chi square .236 df=2 p=.89

7.4.1 Analysis of valuation data

Valuation data were collected by confronting subjects with items like
'Do you find (a given social exchange situation) important?'
with 'yes' and 'no' as possible response options. Only A2 combinations were used for the construction of these items, yielding a total of 27 items. The RIDA program omits from the analysis all items to which everyone or everyone but one subject responds positively. This meant that items 29, 38, and 47 were left out of the analysis. The first order test on the remaining 24 items returned an R(1) of 55.02, which is not significant at 46 degrees of freedom (p = .17). This suggests Rasch homogeneity, although there is every reason to suspect that items that have very similar structuple profiles will tend to be somewhat over-associated.

The CML estimates of the item parameters for the valuation data can be found in Appendix D. On these parameters we performed a stepwise regression analysis with all the possible contrasts for main and for interaction effects as predictors (main and interaction effects for facet A did not play a part in this analysis, since all the items were A2 items. We did include the A2E contrast, however, for a possible effect of facet E). Table 7.30 gives the result of the regression analysis.
It can be seen that nine contrasts suffice to produce a multiple correlation of approximately .98.

TABLE 7.27 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND RESPONSE TO THE QUESTION 'DO YOU FEEL THAT YOU HAVE A SUFFICIENT NUMBER OF FRIENDS?'

	Level of proneness			
Sufficient friends	Low	Medium	High	
Yes	133	91	15	239
No	17	11	0	28
	150	102	15	267

Chi square 1.88 df=2 p=.39

TABLE 7.28 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND RESPONSE TO THE QUESTION 'DO YOU HAVE A PARTNER?'

	Level of proneness			
Having a partner	Low	Medium	High	
Yes	96	63	10	169
No	56	39	5	100
	152	102	15	269

Chi square .151 df=2 p=.93

TABLE 7.29 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND SEX

	Level of proneness			
Sex	Low	Medium	High	
Male	39	21	1	61
Female	112	81	14	207
	151	102	15	268

Chi square 3.29 df=2 p=.19

TABLE 7.30: MULTIPLE REGRESSION ON VALUATION PARAMETERS, WITH CONTRASTS AS PREDICTORS

Step nr.	Contrast	MR
1	C1E	.731
2	D	.818
3	C2	.869
4	B2D	.901
5	B1	.932
6	B2	.948
7	B1A2E	.961
8	B1D	.971
9	B2C1D	.978

It is apparent from these results, that facets B, C, and D each play a significant part in the determination of the value of a given social exchange The scattergrams for these facets are reproduced below

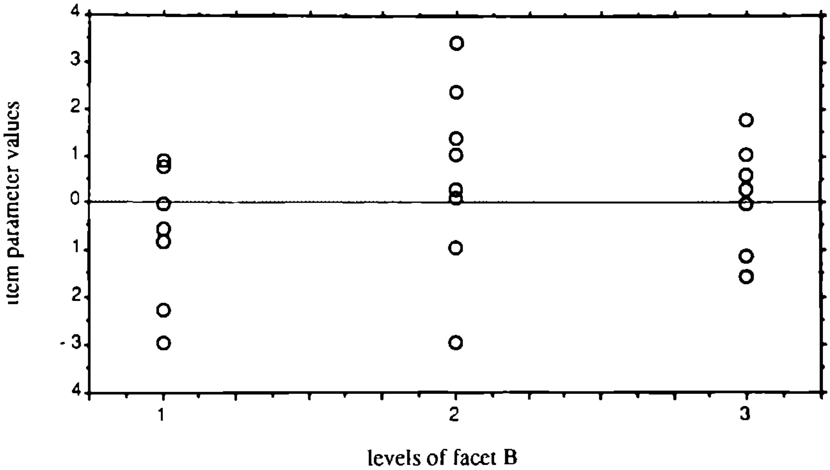


Figure 7.16 - A scattergram, relating the three levels of facet B to the Rasch item parameter values pertaining to valuation items The figure shows that the 'easiest' items are B1 (problem focus) items, followed by B3 (focus formed by an experience) items, while the B2 (attitude as focus) items tend to be appraised as important only difficultly (with a marked exception for one particular B2 item)

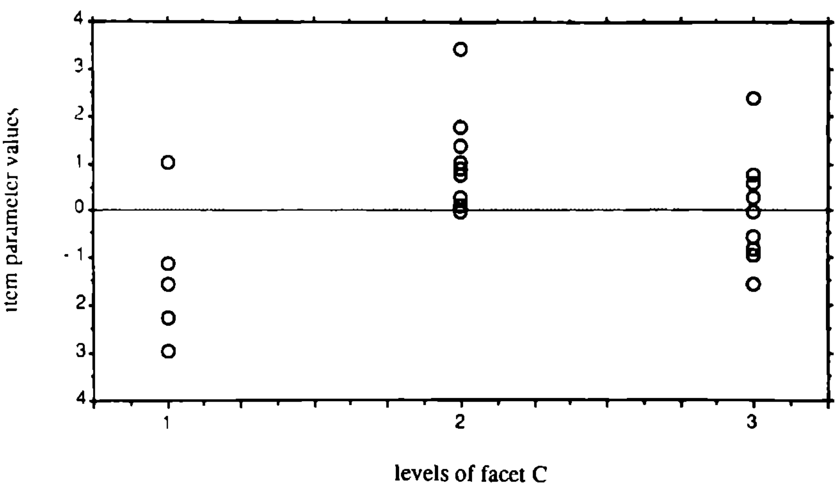


Figure 7.17 - A scattergram, relating the three levels of facet C to the Rasch item parameter values pertaining to valuation items The figure shows that C1 (marital partner as partner of the exchange) items tend to be more highly valued than C3 (a friend as partner of the exchange) items, and that C2 (relatives as partners of the exchange) items are considered as least important

The ordering of elements of facet B is identical to the ordering of these facet elements in the context of loneliness It seems plausible that the same rationale that led us to hypothesize the ordering of ele ments of facet B in the context of loneliness also applies to the ordering that we find in the context of valuation people attach more importance to social exchange regarding emotional issues than regarding cognitive issues, and since 'problems' reflect an emergency situation, social exchange on this particular emotional focus will be valued most of all

With regard to facet C, it is conspicuous that social exchange with relatives is generally conside red as of minor importance This is somewhat striking, since earlier we found that relatives play the most prominent part in the determination of loneliness This fact we attributed to the specific age distribution of our present sample of subjects most of them still have close ties with their elderly homes Possibly, therefore, the minor importance given to social exchange with relatives is due to the fact that these social exchanges are already guaranteed, whereas most subjects are still engaged in a continuous process of realizing satisfactory social exchanges with a partner and with friends That social exchange with a partner should be valued more highly than social exchange with friends comes as no surprise we may expect it to be related to the unique intimate character of a partner relationship

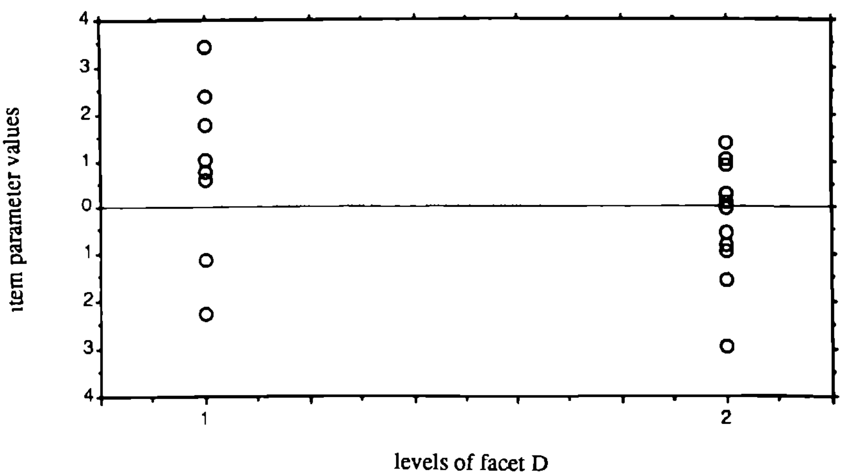


Figure 7.18 - A scattergram relating the two levels of facet D to the Rasch item parameter values pertaining to valuation items The figure shows that D2 (saying) items are valued more highly than D1 (doing) items

Very interesting is the observation that talking together (D2) is considered more important than doing something (D1) It demonstrates that a distinction between doing and saying is clearly made by our subjects, although it did not result into any significant effect in the determination of loneliness

Tables 7.31 - 7.33 show the two way interactions that play a part in the structure of valued social exchanges for this group (note that the B1A2E contrast reflects a two way BE interaction, since facet A does not play a part in the valuation items). Of course, with so few observations per cell, the interaction tables have only crude heuristic value. The CE interaction table shows that in case the focus is that of the subject, exchange with a partner is considered of prime importance. When the focus is that of the other, exchange with friends is considered as most important. Possibly this is because we expect our friends to share their problems, attitudes and positive experiences with us: it more or less defines the idea of friendship.

TABLE 7.31: BE-INTERACTION FOR VALUATION ITEMS - The cells contain the number of subjects who responded to the items with the given BE structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	E*	level 1	level 2	Totals:
B	level 1	6 - 556	2 - 411	8 - 52
	level 2	6 925	2 - 407	8 592
	level 3	6 116	2 - 638	8 - 073
Totals		18 162	6 - 485	24 4 1667E-5

TABLE 7.32: BD-INTERACTION FOR VALUATION ITEMS - The cells contain the number of subjects who responded to the items with the given BD structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	D	level 1	level 2	Totals:
B	level 1	3 - 242	5 - 687	8 - 52
	level 2	3 2 28	5 - 42	8 592
	level 3	3 416	5 - 366	8 - 073
Totals		9 818	15 - 491	24 4 1667E-5

If friends leave us out of there inner worlds, than the friendship is meaningless. Interestingly, the reverse seems not true: we do not consider it particularly important to share our preoccupations with friends.

TABLE 7.33: CE-INTERACTION FOR VALUATION ITEMS - The cells contain the number of subjects who responded to the items with the given CE structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	E*:	level 1	level 2	Totals:
C	level 1	6 -1.637	0 •	6 -1.637
	level 2	6 1.544	3 .125	9 1.071
	level 3	6 .578	3 -1.095	9 .021
Totals:		18 .162	6 -.485	24 4.1667E-5

The BD interaction table shows that when the focus of the exchange concerns a problem, subjects do find it important that some sort of physical action is undertaken. This in contrast to situations focussing on attitudes or positive experiences. The different role of the problem focus with respect to facet D is likely to be related to the fact that problems reflect emergency situations. If a subject finds himself in need of some sort of physical support, then this means that he will value the exchange situation that provides this support to him.

The final interaction table involves the interaction between B and E. We can see that social exchange on problems is always valued, regardless whether the problems are those of the subject or of the other. Somewhat remarkable is the fact that attitudes and experiences seem to be only important as an object of social exchange when they are related to the other person. When our own attitudes and experiences are involved, social exchange on them is not considered particularly important.

7.4.2 Analysis of satisfaction data

Satisfaction data were collected by confronting subjects with questions like
'Are you satisfied with (a given social exchange situation) ?'
with response options 'Yes, mostly', 'Yes, sometimes', and 'No, mostly not'. We dichotomized these data by coding a 'Yes, mostly' response as one, and any of the two other responses as zero. The decision to code 'Yes, sometimes' as zero was motivated by our desire to differentiate between clear, structural satisfaction with a given type of social exchange, and otherwise. 'Yes, sometimes' we consider as reflecting some dissatisfaction with the situation portrayed.

Data analyses returned an R(1) for the satisfaction data of 153 98 Since there are 104 degrees of freedom, the associated probability is somewhat low (p = 0011) We must remember, however, that with 27 items and 273 subjects (which is the number of subjects that were retained after removal of subjects with missing values on the satisfaction data) the power of such a test is rather high Small deviations of ICC holomorphism may lead to significant results

An independent check on the Rasch homogeneity of the data may be obtained by splitting up the total group of subjects in a group of low scores (n ≤ 13) and a group of high scores (n ≥ 14) CML estimation of item parameters for each independent group should yield estimates that correlate highly between the two groups We have performed this analysis and as the scattergram below shows, the estimates are indeed very similar

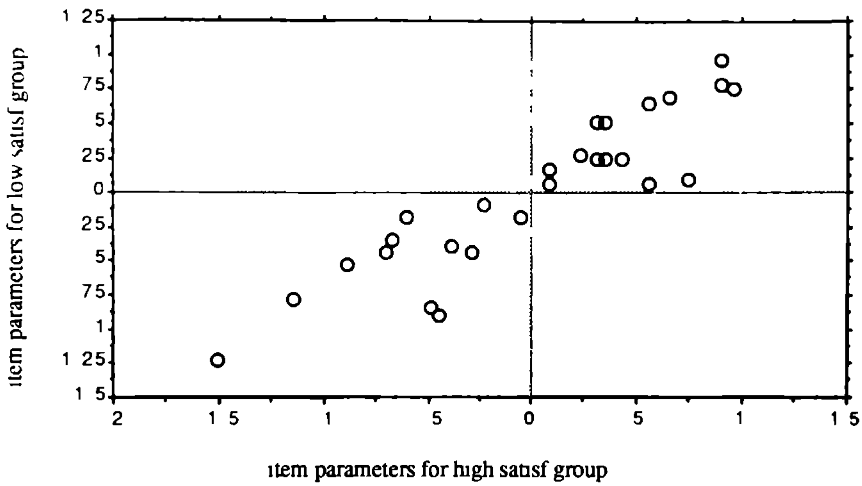


Figure 7.19 - A scatterplot showing the relationship between item parameters pertaining to satisfaction parameters for the group of subjects with a low sum total of satisfaction responses (< 14), and the item parameters pertaining to satisfaction parameters for the group of subjects with a high sum total of satisfaction responses (> 13)

For the present purposes we may therefore consider the data as Rasch homogeneous

Estimates of item parameters for the satisfaction data are given in Appendix E On these parameters, we performed stepwise multiple regression analysis Table 7 34 lists the results of this analysis A regression equation with seven contrasts as predictors yields a multiple correlation of approximately 97 There are main effects for facets B, C, and D, and some interactions involving facet E The scattergrams below give us some insight into the nature of the main effects The scattergram for facet B shows that a social exchange is appraised as satisfactory most easily when it is focussed on a problem, and least easily when it is focussed on attitudes The scattergram on facet C shows a particularly orderly pattern Situations are appraised as satisfactory most easily when they involve exchanges with general friends, somewhat less easily when they involve social exchange with relatives, and least easily when they involve social exchange with partners This is an interesting fact which seems to corroborate our earlier contention that a smaller psychological distance (i e more intimacy in the relationship) entails more expectancies and therefore a greater risk of dissatisfaction. For facet D, the pattern is less clear. The range of parameter values for D2 items is somewhat greater, but if we leave out the three items with the most extreme parameter values, D1 and D2 situations meet

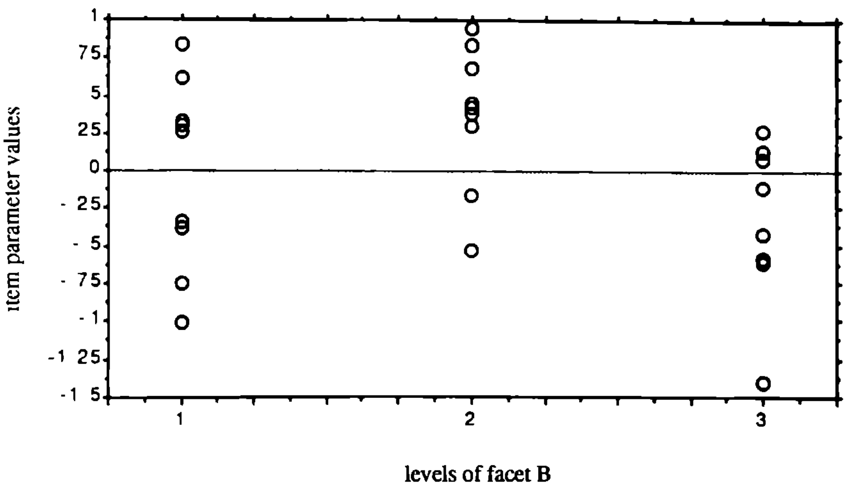


Figure 7.20 - A scattergram, relating the three levels af facet B to the Rasch item parameter values pertaining to satisfaction items. The figure shows that the 'easiest' items are B1 (problem focus) items, followed by B3 (focus formed by an experience) items, while the B2 (attitude as focus) items tend to elicit satisfaction only difficultly.

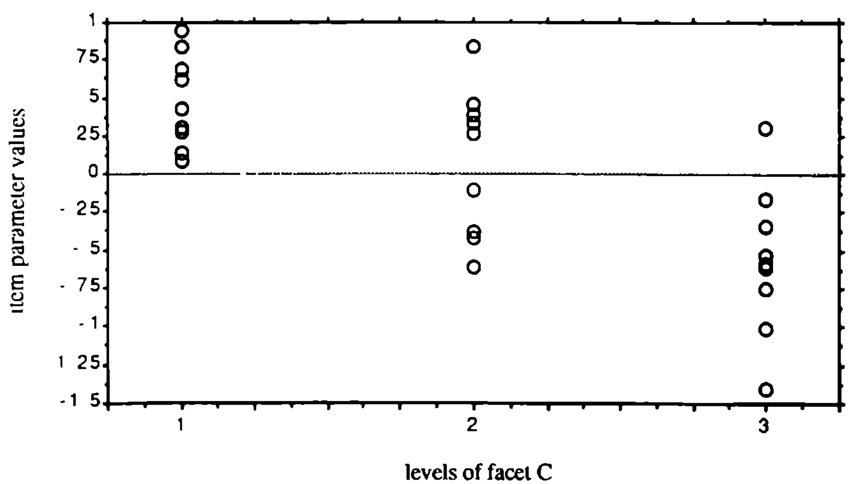


Figure 7.21 - A scattergram, relating the three levels of facet C to the Rasch item parameter values pertaining to satisfaction items. The figure shows that subjects tend to appraise exchanges as satisfactory the most frequently when a friend (C3) forms the partner of the exchange, followed by exchanges in which relatives (C2) form the partners of the exchange. The last frequently appraised as satisfactory are exchanges with the marital partner (C1).

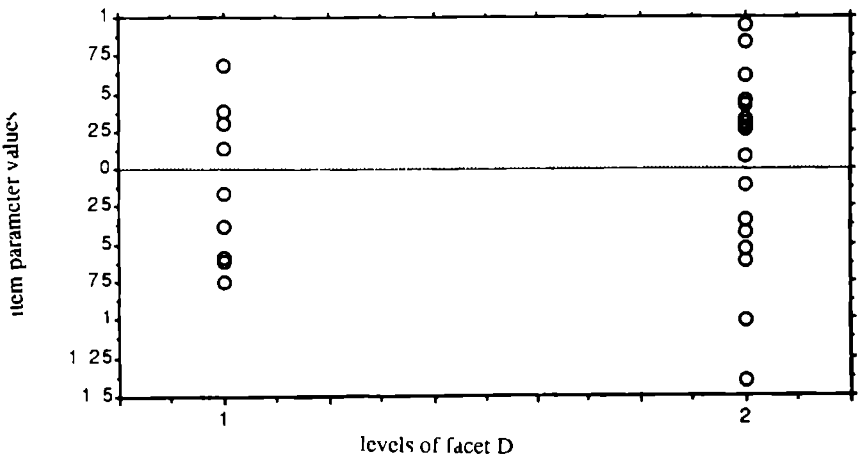


Figure 7.22 - A scattergram, relating the two levels of facet D to the Rasch item parameter values pertaining to satisfaction items The figure shows that D2 (saying) items are appraised as satis factory more easily than D1 (doing) items

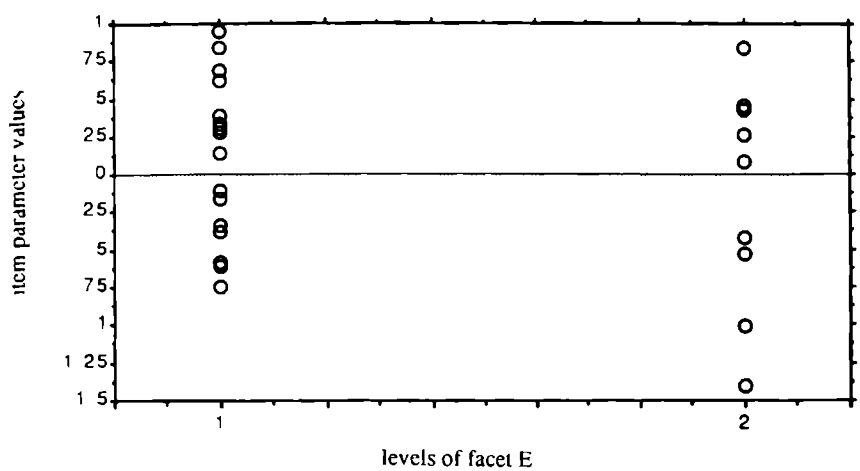


Figure 7.23 - A scattergram, relating the two levels of facet E to the Rasch item parameter values pertaining to satisfaction items The figure shows that exchanges with a focus pertaining to the other (E2) are appraised as satisfactory more frequently than exchanges with a focus pertaining to the subject (E1)

TABLE 7.34: MULTIPLE REGRESSION ON SATISFACTION PARAMETERS - WITH CONTRASTS AS PREDICTORS

Step nr.	Contrast	MR
1	C1	.569
2	B2	.759
3	C2	.881
4	D	.915
5	C2E	.939
6	A2E	.954
7	B1A2E	.968

with comparable levels of satisfaction. Finally, we have included a scattergram showing the role of facet E in the determination of satisfaction. In general, situations are appraised less easily as satisfactory when they are focussed on the problems, attitudes and experiences of the subjects, than situations that are focussed on problems, attitudes and experiences of the other.

Interactions

Tables 7.35 and 7.36 reflect the BE and CE interactions.

TABLE 7.35: BE-INTERACTION FOR SATISFACTION ITEMS - The cells contain the number of subjects who responded to the items with the given BE structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	E*	level 1	level 2	Totals
B	level 1	6 - 035	3 032	9 - 012
B	level 2	6 499	3 117	9 372
B	level 3	6 - 248	3 - 583	9 -.359
Totals		18 072	9 - 145	27 -1 61E-20

Social exchange on attitudes seems to meet with little satisfaction, but where problems are concerned, situations are sooner appraised as satisfactory when the problems are the subject's, than in the case that the problems are those of the other person. Possibly this suggests that whereas we all feel the need to discuss our problems, we are reluctant to be confronted with those of others. In the case of experiences, the situation is reversed: social exchanges focussing on experiences of the other are more easily appraised as satisfactory than social exchanges focussing on experiences of our own. The CE interaction table reflects the general trend for facet C: social exchanges with the partner are not easily appraised as satisfactory, but social exchanges with friends are appraised as satisfactory very easily, especially in the case where the focus of the exchange concerns that of our friends. Concerning their appraisal as satisfactory, social exchanges with relatives fall in between these two extremes.

TABLE 7.36: CE-INTERACTION FOR SATISFACTION ITEMS - The cells contain the number of subjects who responded to the items with the given CE structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	C	level 1	level 2	level 3	Totals
E	level 1	6 493	6 08	6 - 356	18 072
	level 2	3 45	3 098	3 - 982	9 - 145
Totals		9 479	9 086	9 - 565	27 -1 61E-20

7.4.3 Analysis of engagement data

Engagement data were collected by confronting subjects with a question like:

'Does (a given social exchange situation) occur sufficiently often?'

with response options 'Yes', 'No', and 'This question does not apply to me: I have no partner/relatives/friends'. The initial first order test of these data indicated that the set of items was clearly not Rasch homogeneous. We decided to leave out the worst fitting items, to see if a deletion of one or more items would result in a data structure that approximates a Rasch scale. The results of successive analyses are reported in table 7.37.

After having removed four items, the item set does not become increasingly Rasch homogeneous, but instead becomes progressively worse. Of course, it is actually extremely unlikely that the failure or success to engage in a valued social exchange situation would be determined by some sort of unidimensional latent trait. It is probable that a multitude of different factors determines whether or not a subject will succeed in engaging in a given social exchange situation. The engagement data cannot be adequately described by a unidimensional item response model, and we will not examine these data

TABLE 7.37: FIRST ORDER ANALYSES ON ENGAGEMENT ITEMS

Nr of items in analysis	R(1)	df	p
27	473.74	52	.000
26	913.72	75	.000
25	918.69	72	.000
24	933.51	69	.000
23	935.68	66	.000
22	966.99	63	.000

any further.

7.5 Rasch analysis of alternative response categories

The data on loneliness were collected by dichotomizing the polytomous response format into a binary response. Subjects could respond to situations of the type
'If (a given social exchange situation) seldom happens, you would feel...'
with response options 'lonely', 'angry', 'indifferent', and 'uncertain'. Their responses were subsequently coded one in case they indicated that they would feel lonely, and zero if they indicated otherwise. We have seen that the data on loneliness are approximately Rasch homogeneous. It will be of interest to examine whether the other response categories also yield a Rasch scale. This can be examined by alternative dichotomization of the data. We can examine the angryness data on Rasch homogeneity by coding an 'angry' response as one, and any other response as zero. Likewise, we may obtain appropriate data for the 'uncertain' and 'indifferent' data. Since the scrutiny of the data on the alternative response categories is of a purely explorative nature, we will restrict our analyses to first order tests for the determination of Rasch homogeneity, and to regression analyses for an exploration of the inner structure of the data.

Tables 7.38 to 7.40 list the first order tests that were performed on respectively the uncertainty, the indifference, and the angryness data. It can be seen immediately that the full collection of 52 items did not reveal Rasch homogeneity for any of the alternative categories. Subsequent deletion of items led to improvement in the data structure as indicated.
Of the three alternative response categories, the uncertainty data give the best approximation to a Rasch scale, according to the first order analyses. Deletion of six items results in a R(1) value with a

TABLE 7.38: FIRST ORDER ANALYSES ON UNCERTAINTY ITEMS

Nr of items in analysis	R(1)	df	p
52	513	434	.0053
51	467	401	.0119
50	437	369	.0083
49	445	385	.0183
48	417	355	.0122
47	406	348	.0171
46	374	341	.1051
45	358	334	.1721

probability of .10. Second best, although a lot less clear, are the angryness data. Here, 15 items have to be deleted in order to reach an acceptable goodness of fit ($p = .08$). The indifference data, lastly, do not progressively develop into a Rasch structure as more items are deleted. Deletion of 14 items did not result in any improvement of the goodness of fit, and further analyses for these data were abandoned.

Of course, deletion of items in order to reach a Rasch homogeneous item set, always carries the risk of capitalization on chance. Cross validation with the data from the second sample will be necessary to see whether the structure for the given set of items can be replicated. Whatever the result of this cross validation, however, it is clear that the loneliness responses provide the best approximation to Rasch homogeneity, since in this case no items had to be deleted at all. This is a very interesting observation, for it provides additional confirmation for the correctness of our domain definition of loneliness, and on the fruitfulness of the subsequent articulation of this domain definition into an observation scheme for actual research. It is interesting to recall that the traditional facet theoretical approach, with its analyses of similarity data, suggested an opposite conclusion.

We will now examine more closely the inner structure of the data sets on uncertainty and angryness.

7.5.1 Analysis of uncertainty data

Stepwise regression of contrasts for all main, pseudomain, and interaction effects on estimated Rasch parameters (see Appendix G) yielded the results presented in table 7.41.

TABLE 7.39: FIRST ORDER ANALYSES ON INDIFFERENCE ITEMS

Nr of items in analysis	R(1)	df	p
52	752	460	.0000
51	698	451	.0000
50	661	465	.0000
49	613	455	.0000
48	585	423	.0000
47	532	409	.0000
46	636	423	.0000
45	602	413	0000
44	507	382	.0000
43	482	373	.0001
42	484	364	.0000
41	481	355	.0000
40	488	346	.0000
39	507	373	.0000

There are main effects for facets B, C, and D, and interaction effects between facets A and B, between facets A, B and E, and between facets B, C and E For an indication of the nature of the main effects, scattergrams depicting relationships between facets and item parameters are presented For facet B, it is clear that - exactly contrary to what we found for the data on loneliness - it is especially the 'attitudes' category that most easily elicits feelings of uncertainty This is understandable, especially in view of the fact that in this first main study we are dealing with university students Students have to assert themselves intellectually They have to prove that they can cultivate and express opinions of their own If people fail to take notice of their attitudes, or if people do not share their attitudes with them, this will easily give rise to intellectual uncertainty Contrary to what we found in the context of loneliness, relatives least easily elicit feelings of uncertainty Again, this seems understandable considering the student status of our subjects The intellectual competitiveness which so easily gives rise to feelings of uncertainty, will be absent in the parental homes You do not have to prove yourself to your parents or your siblings In the relationship with your partner and your friends, however, feelings of uncertainty are equally likely to arise The clear distinction between the two D cate gories again clearly shows that our subjects did differentiate between 'doing' and 'saying' It can be

TABLE 7.40: FIRST ORDER ANALYSES ON ANGRYNESS ITEMS

Nr of items in analysis	R(1)	df	p
52	513	358	.0000
51	490	351	.0000
50	461	320	.0000
49	440	313	.0000
48	442	331	.0000
47	433	324	.0000
46	411	318	.0003
45	386	311	.0022
44	381	305	.0018
43	365	278	.0003
42	363	272	.0002
41	339	266	.0014
40	275	214	.0029
39	268	209	.0036
38	219	186	.0463
37	208	181	.0821
36	189	163	.0804

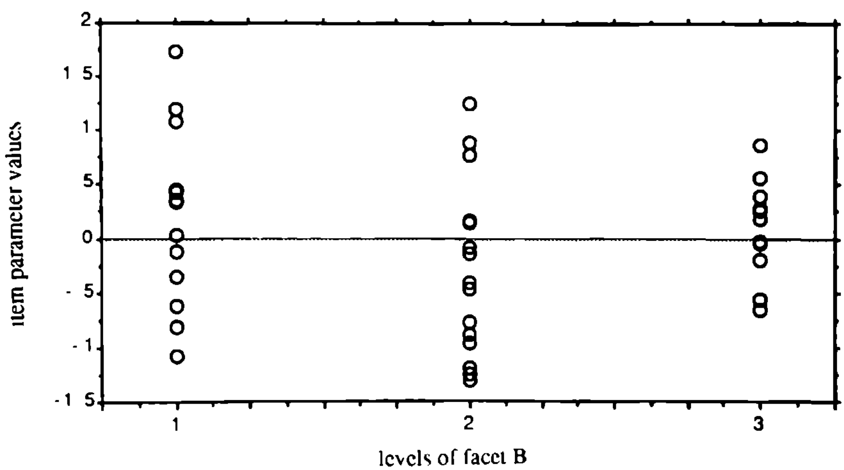


Figure 7.24 - A scattergram, relating the three levels of facet B to the Rasch item parameter values pertaining to uncertainty items The figure shows that the 'easiest' items are B2 (attitude as focus) items, followed by B1 (problem focus) items, while the B3 (experience as focus) items tend to elicit uncertainty neither very difficultly nor very easily

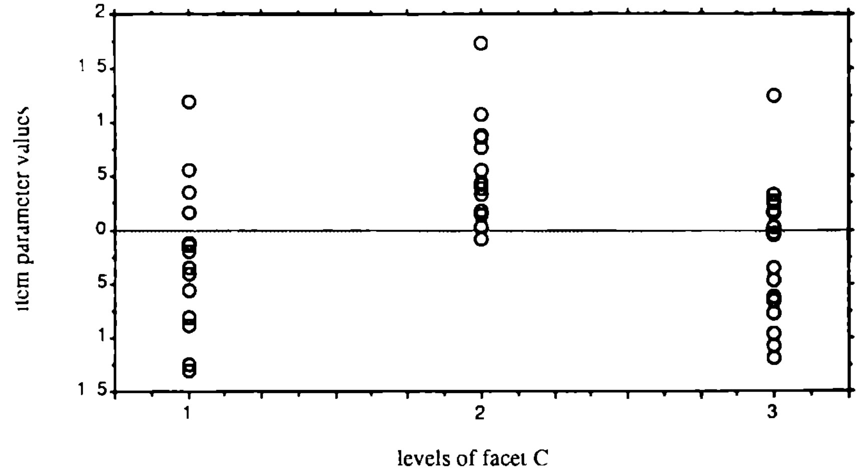


Figure 7.25 - A scattergram, relating the three levels of facet C to the Rasch item parameter values pertaining to uncertainty items The figure shows that subjects do not tend to appraise themselves as uncertain in situations involving relatives (C2) as partners of exchange However, they appraise themselves as uncertain easily when exchanges involve the marital partner (C1) or a friend (C3)

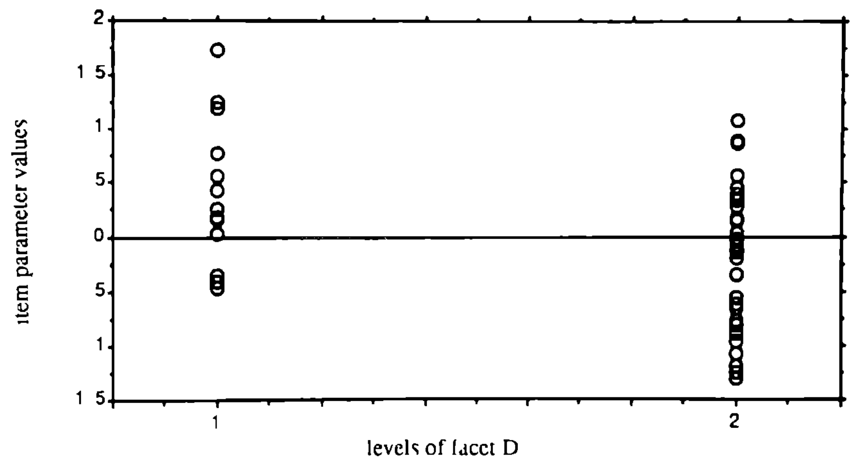


Figure 7.26 - A scattergram, relating the two levels of facet D to the Rasch item parameter values pertaining to satisfaction items The figure shows that D2 (saying) items are appraised as uncer tain more easily than D1 (doing) items

TABLE 7.41: MULTIPLE REGRESSION ON UNCERTAINTY PARAMETERS, WITH CONTRASTS AS PREDICTORS

Step nr.	Contrast	MR
1	C2	.441
2	A2E	.584
3	C1	.666
4	AB1	.723
5	D	.767
6	B1A2E	.805
7	B2C2E	.833
8	B2A1E	.857
9	B1	.874
10	B1C2E	.889
11	AB2	.904
12	B2	.919

seen that failure to communicate verbally more easily elicits uncertainty than the absence of physical undertakings Again, it is plausible to relate this to intellectual competitiveness, where verbal expression and defense of opinions is the most dominating factor in the development of self confidence and of uncertainty

Interactions

For a closer examination of the interactions between facets A and B, and the interactions between facets A, B and E, and between facets B, C and E, we consider the interaction tables below Table 7 42 again reflects the predominant influence of attitudes in the determination of uncertainty However, it is clear from this interaction table that this influence is mainly manifest in A2 situations, i e in situations where it is the other who does not react to your attitudes, or who fails to discuss his attitudes with you

Table 7 43 shows that most of the uncertainty occurs under A2 situations In the case of problems, uncertainty is most likely to arise when the other does not confide in you and keeps his problems to himself In the case of attitudes, both failure of the other to respond to your attitudes, and failure of the other to communicate his attitudes to you are likely to cause uncertainty, but the former situation elicits feelings of uncertainty much easier. In A1 situations, it is especially your failure to communicate your problems that may lead to feelings of uncertainty. Not discussing positive experiences neither easily nor difficultly elicits feelings of uncertainty.

In table 7.44, we see that in E1 situations uncertainty is exclusively associated with attitudes. However, when relatives form the social exchange partner, failure to discuss attitudes does not (easily) elicit feelings of uncertainty. In E2 situations, failure to communicate with your partner on any of the foci - problems, attitudes, or positive experiences - is likely to result in feelings of uncertainty. Conversely, when the social exchange partner is a relative, none of the foci will give rise to feelings

TABLE 7.42: AB-INTERACTION FOR UNCERTAINTY ITEMS - The cells contain the number of subjects who responded to the items with the given AB structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	B	level 1	level 2	level 3	Totals
A	level 1	9	9	7	25
		- 094	153	275	.098
	level 2	8	7	6	21
		394	- 785	- 02	- 117
Totals		17	16	13	46
		136	- 257	139	-4 348E-5

TABLE 7.43: ABE-INTERACTION FOR UNCERTAINTY ITEMS - The cells contain the number of subjects who responded to the items with the given ABE structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	B	level 1		level 2		level 3	level 3	Totals
	E'	level 1	level 2	level 1	level 2	level 1	level 2	
A	level 1	3	6	3	6	3	4	25
		- 224	- 028	- 324	392	.315	244	098
	level 2	5	3	4	3	3	3	21
		942	- 518	- 846	- 704	235	- 275	- 117
Totals		8	9	7	9	6	7	46
		505	- 192	- 622	027	.275	022	-4 348E-5

of uncertainty. Curiously, in the case of social exchange with friends, failure to discuss attitudes is the only focus that does not result in uncertainty.

TABLE 7.44: BCE-INTERACTION FOR UNCERTAINTY ITEMS - The cells contain the number of subjects who responded to the items with the given BCE structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	E*	level 1			level 2		level 2	Totals*
	C	level 1	level 2	level 3	level 1	level 2	level 3	
B	level 1	3 403	3 947	2 -6 500E-3	3 429	3 409	3 - 554	17 136
	level 2	3 - 872	1 887	3 - 876	3 - 411	3 275	3 216	16 - 257
	level 3	2 19	1 863	3 136	1 - 564	3 383	3 - 145	13 139
Totals		8 - 128	5 918	8 - 279	7 441	9 356	9 - 161	46 -4 348E-5

Relation with loneliness

Lastly, it is interesting to study how the Rasch parameters for uncertainty relate to those for loneliness. The scatterplot below gives an interesting impression of this relationship.

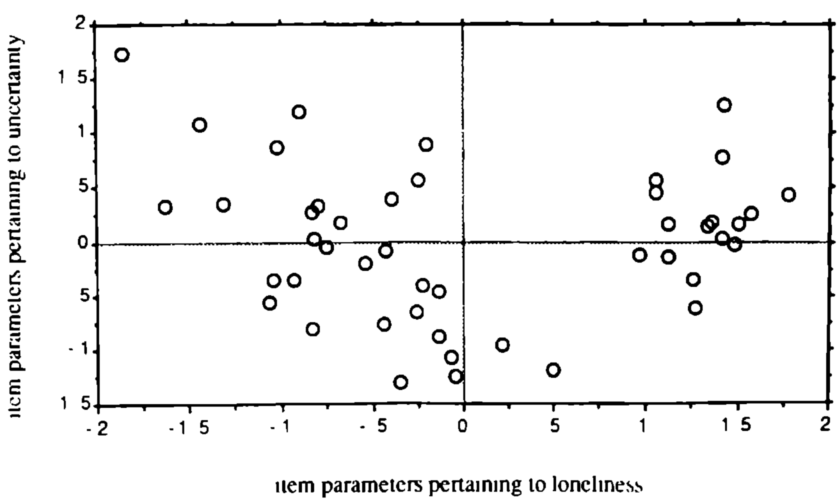


Figure 7.27 - A scatterplot showing the relationship between Rasch item parameters pertaining to loneliness items (X-axis) and Rasch item parameters pertaining to uncertainty items (Y-axis)

Although the overall correlation between loneliness parameters and uncertainty parameters is zero, it can clearly be seen from the scatterplot that there exists a negative linear relationship between loneliness and uncertainty for those situations where loneliness is easily elicited (item parameters for loneliness less then zero), and a positive linear relationship for those situations that do not easily elicit loneliness The negative linear relationship seems to be accounted for by the fact that these are predominantly A2 situations, and as we can see in the AB interaction table it is mostly the A2 B2 situations (i e with attitudes as focus) that tend to arouse feelings of uncertainty Conversely, the attitude focus hardly if ever gives rise to feelings of loneliness On the other hand, the problem focus is not related to feelings of uncertainty, but very much related to loneliness The positive linear relationship deals primarily with A1 situations Looking again at the AB interaction table for uncertainty data, we can see that the predominant role of attitudes is not manifest for A1 situations, but that instead for these situations it is the problem focus that seems somewhat more related to uncertainty So in A1 situations, the role of the foci resembles that which we find for the loneliness data

7 5 2 Analysis of angryness data

14 items were deleted to reach a Rasch homogeneous data structure pertaining to angryness CML estimates of item parameters for the angry data are presented in Appendix F Stepwise regression analysis of contrasts on these item parameters yielded the results reported in table 7 45

TABLE 7 45: MULTIPLE REGRESSION ON ANGRYNESS PARAMETERS, WITH CONTRASTS AS PREDICTORS

Step nr.	Contrast	MR
1	A	.510
2	A1E	.685
3	D	.791
4	C1	.846
5	B2	.892
6	A2E	.920
7	B2C2E	.933
8	B2D	.942
9	B1A1E	.952

There are main effects for all facets, and there are several interaction effects. The scattergrams below give us an impression of the internal structure of the angryness data.

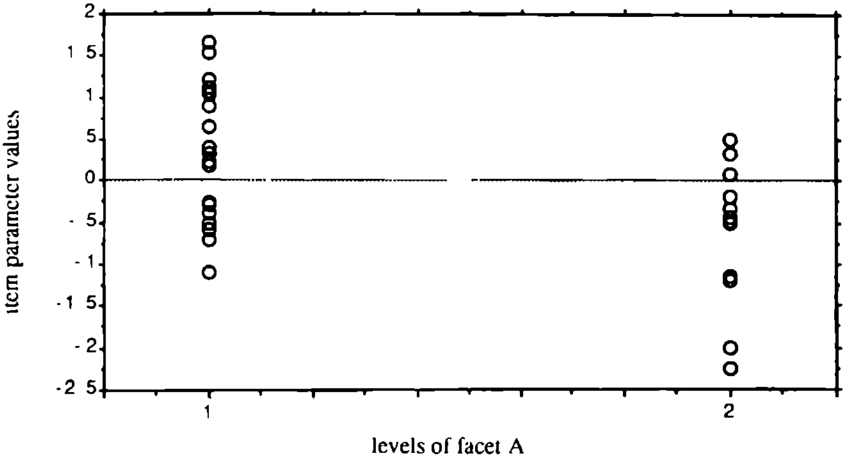


Figure 7.28 - A scattergram, relating the two levels of facet A to the Rasch parameters pertaining to angryness items It can be seen that absence of exchanges with a direction from the other to the subject (A2 items) tends to elicit angryness more strongly than absence of exchanges with a direction from the subject to the other (A1 items)

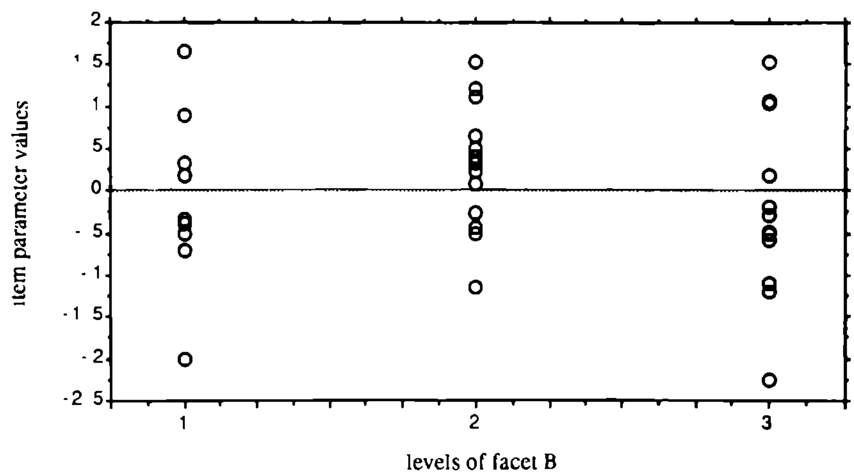


Figure 7.29 - A scattergram, relating the three levels of facet B to the Rasch parameters pertaining to angryness items Absence of exchanges focussing on either a problem (B1) or on positive experiences (B3) elicit feelings of angryness equally strongly angryness equally strongly However, absence of exchanges focussing on attitudes does not easily lead to a response of angryness

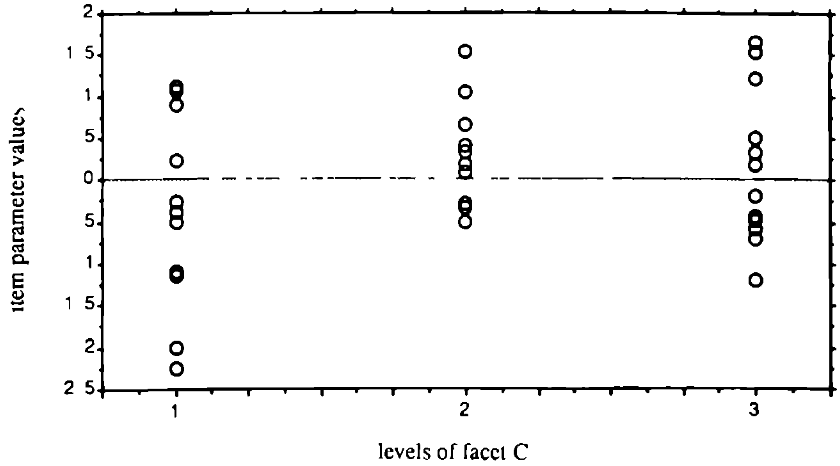


Figure 7.30 - A scattergram, relating the three levels of facet C to the Rasch parameters pertaining to angryness Absence of social exchange with a marital partner (C1) will result in a response of angryness the most frequently, followed by absence of social exchange with a friend (C3) Absence of social exchange with relatives (C2) does not easily lead to a response of angryness

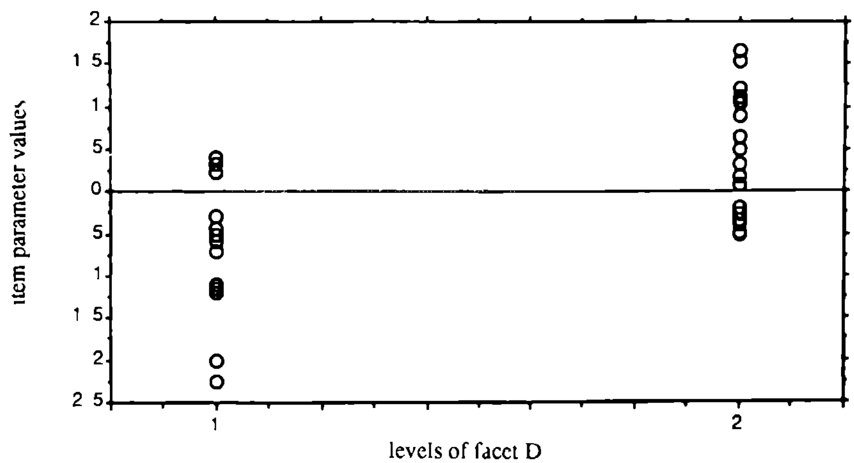


Figure 7.31 - A scattergram, relating the two levels of facet D to the Rasch parameters pertaining to angryness Not 'doing' (D1) anything for somebody else elicits more angryness than not 'saying' (D2) anything to somebody else

Figure 7.28 shows that in congruence with what might be expected, A2 situations evoke more angryness than A1 situations. It can be seen from figure 7.29 that absence of social exchange on problems gives approximately equal rise to feelings of angryness than absence of social exchange on positive experiences. However, a lack of communication on attitudes seems to give no reason for angry feelings. In comparison to what we found for the loneliness data, figure 7.30 shows that the role of relatives is completely reversed. Where absence of interactions with relatives was shown to give rise to loneliness, it is not likely to give rise to angryness. On the other hand, a failing relationship with the partner will often result in angry feelings. Earlier on, we stated the assumption that, owing to the intimate nature of the relationship, people tend to expect a lot from their partners. When reality falls short of expectation, angryness is likely to result. Again we find a significant effect for facet D. Figure 7.31 shows that this time, contrary to what we found in the context of uncertainty, it is especially the absence of physical undertakings ('doing') that gives rise to angryness. Possibly, if somebody fails to do something for you, this is experienced as lazyness or unwillingness on the part of the other, rather than that it is taken as a sign that the other does not value you as a person.

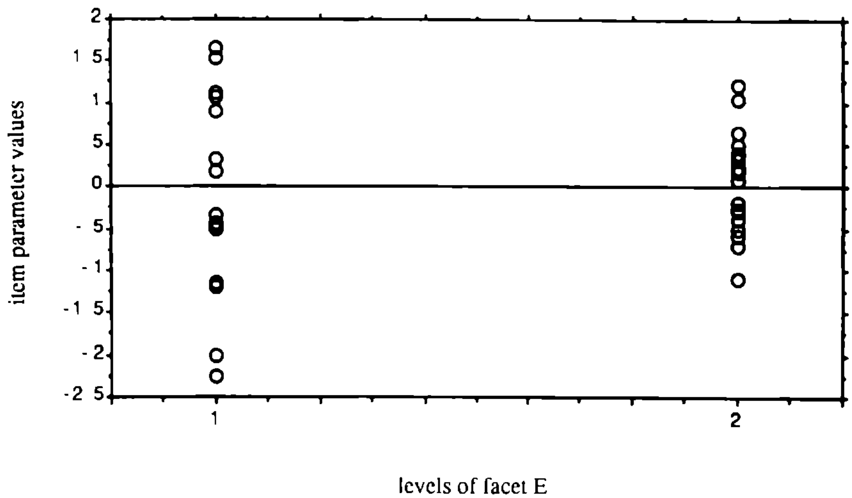


Figure 7.32 - A scattergram, relating the two levels of facet E to the Rasch parameters pertaining to angryness. Absence of social exchange with a focus pertaining to the subject (E1) will more frequently evoke angryness than absence of social exchange with a focus pertaining to the other (E2)

As expected, we find that absence of social exchange concerning our problems, attitudes or experiences is taken as more seriously than absence of social exchange concerning the problems, attitudes, or experiences of the other. In this case, E1 situations lead to angryness more often than E2 situations.

Interactions

Interactions occur between facets B and D, between facets A, B, and E, and between facets B, C, and E. The relevant interaction tables are presented below. Table 7.46 shows that in D2 situations, neither of the three different foci have much of an effect on angryness. In the D1 case however, absence of social exchange on problems and experiences have a significantly greater impact on angryness than absence of social exchange on attitudes.

TABLE 7.46: BD-INTERACTION FOR ANGRYNESS ITEMS - The cells contain the number of subjects who responded to the items with the given BD structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	D	level 1	level 2	Totals.
B	level 1	4 - 924	6 382	10 - 14
B	level 2	5 - 125	9 516	14 287
B	level 3	5 -1 086	8 352	13 - 201
Totals		14 - 696	23 424	37 5 4054E-5

TABLE 7.47: ABE-INTERACTION FOR ANGRYNESS ITEMS - The cells contain the number of subjects who responded to the items with the given ABE structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	A	level 1		level 2		Totals
	E*	level 1	level 2	level 1	level 2	
B	level 1	2 1 268	6 266	2 -1 173	0 - •	10 -.14
B	level 2	2 1 322	6 421	4 - 435	2 293	14 287
B	level 3	3 924	5 - 154	3 -1 309	2 342	13 -.201
Totals		7 ‘ 136	17 9 235E 3	9 89	4 - 024	37 5 4054E-5

As can be seen from table 7.47, in the A1 E1 situations, neither of the three foci has much effect on angryness, but in the E2 case, there is some effect of B1 (problems) and B3 (experiences), but not of B2 (attitudes). This may be related to the fact that it is natural to respond to the emotional life of others (especially their problems), and that the failure to do so may be attributed to irritation or hostility towards the other. In the A2 E1 situations, all foci may result in feelings of angryness, but it is particularly so where people fail to respond to our problems, or experiences.

TABLE 7.48: BCE-INTERACTION FOR ANGRYNESS ITEMS - The cells contain the number of subjects who responded to the items with the given BCE structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	E*:	level 1			level 2		level 2	Totals:
	C:	level 1	level 2	level 3	level 1	level 2	level 3	
B	level 1	2 -.555	1 -.347	1 1.648	2 -.444	2 -.09	2 -.263	10 -.14
B	level 2	3 -.17	2 .918	1 -.423	2 -.019	3 .373	3 .677	14 .287
B	level 3	2 -.586	1 .178	3 -.054	2 -.798	2 .371	3 -.2	13 -.201
Totals:		7 -.399	4 .417	5 .213	6 -.421	7 .24	8 .113	37 5.4054E-5

In E1 situations, we tend to become particularly angry when our friends do not respond to our attitudes. However, in all other situations absence of social exchange on attitudes hardly has any bearing on angryness. Furthermore, in E1 situations we expect our partner and our relatives to respond to our problems, but the failure of our friends to do so will not make us angry. Conversely, if our friends do not engage into social exchange with us with reference to their problems (E2), we may get angry.

Relation with loneliness

The scatterplot in figure 7.33 depicts the association between Rasch parameters calculated for loneliness data and Rasch parameters calculated for angryness data. As we can see, there is no relationship between the two types of data. Loneliness and angryness refer to unrelated latent traits. The two types of data taken together do not yield a unidimensional ordering of items.

7.6 Summary and conclusions

Although this research was conducted mainly for the purpose of evaluating the possibility of a formalized, empirical entry approach to the study of appraisive judgements, as a side step we have also followed a more traditional facet theoretical approach. We analyzed similarity data to see what results the facet theoretical approach would yield, and how these would compare to the results yielded by our own approach.

Both spatial and network representations of our similarity data did not permit retrieval of the facet structure that we put into our domain definition Facet A was clearly recognizable, and facet C could be retrieved to some extent, but none of the other three facets showed up in any of the representations

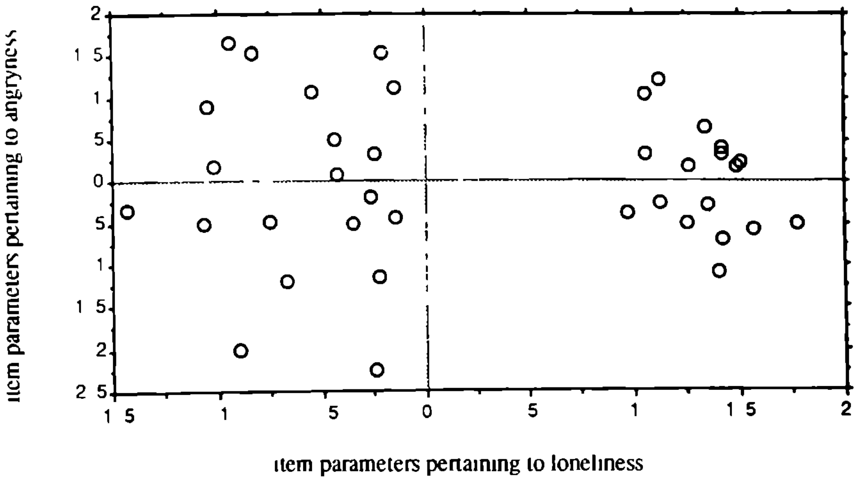


Figure 7.33 - A scatterplot showing the relationship between Rasch item parameters pertaining to loneliness items (X axis) and Rasch item parameters pertaining to angryness items (Y-axis)

A traditional facet theorist would have to conclude that the domain was ill defined However, we had substantive reasons to suspect a different kind of structure, that was not determined by the simple principle of contiguity The alternative structure that we hypothesized, the unidimensional ordering of subjects and items along a single latent trait, with identifiable roles for the different facets, has been retrieved to a significant degree This means that our own conclusion concerning the fruitfulness of the chosen domain definition is exactly opposite to that of the facet theorist

One concrete example of where we successfully predicted a structure that could not be predicted on the basis of the contiguity principle, concerns the role of facet E in the A1 situations In table 7 14 it can clearly be seen that most of the A1 situations have a positive item parameter (signifying low elicitation of loneliness), but that at regular intervals some structuples have a negative item parameter These conspicuous structuples clearly do not resemble their immediate neighbouring structuples Closer inspection of the structuple profiles reveals that the A1 situations with negative item parameters are all E1 situations, i e the subject is not discussing his problems, attitudes or positive experiences with anyone Of course such situations reflect a sort of social isolation, and it is therefore very plausible that such situations would be likely to elicit loneliness (as we predicted) A regional hypothesis within the context of facet theory could not have predicted such a deviating role for these particular structuples

In chapter 2, we criticized the use of similarity analyses because such analyses do not yield information on substantive hypotheses, specific to a particular domain At best, we believed similarity analyses to be of use only for checking on the fruitfulness of the formulated domain definition The present results indicate that the usefulness of similarity analysis in this respect may be of limited value as well The successful results obtained with our own approach indicate that a domain definition may be very well chosen even if its empirical realization (in terms of similarities) does not permit a retrieval of regions corresponding to the different facets In fact, Roskam (1989a) argued that in the case of a Rasch homogeneous data structure in a faceted domain, SSA on tetrachoric correlations will return a degenerate solution

The Rasch analysis of our data on loneliness yielded satisfying results However, the considera ble power of the Q(2) test for the given data (52 items and 304 subjects) did lead to an indication of violation of the assumptions of unidimensionality and local independence As table 7 8 showed, the most conspicuous over-associations were modest, but analysis of residuals revealed them to be clearly related to structuple similarity When two structuples look very alike, violation of local stochastic independence is likely, owing to the similarity of content and to memory effects (enhanced by the fact that, since these respondents filled out the questionnaire at home, they could consult their answers to other questions) Nonetheless, we decided to consider our data as approximately Rasch homogeneous This seemed justified since the high power of the Q(2) test would yield a significant p-value even at slight deviations of the predicted data structure Since the over-associations were seen to be only modest, it is reasonable to assume that the deviation from a true Rasch homogeneous data set is only slight This assumption seems especially reasonable in the light of the favorable results obtained with first order analyses

Posing linear constraints on the item parameters permitted tests of the hypotheses on the situational determinants of loneliness By appropriate structuring of the Q-matrix it can be shown that the item parameters can be decomposed into the effects of a number of structs (A, B, and E) and the effect of some interactions between facets We found that the structuring of the Q-matrix could not be done by simple dummy coding Since our facet design was not orthogonal (several structuples involving D1 combinations were left out), use of simple zero-one codes led to correlations among the contrasts, which meant that the contrast parameter weights, corresponding to the effects of main and interaction effects could not be estimated independently of each other - deletion or addition of con trasts could significantly alter the parameter weights of contrasts taken up in the model

We therefore constructed alternative codes that were orthogonal and uncorrelated Since any linear transformation of such codes will result in another set of codes that are also uncorrelated and orthogonal, several different sets of codes are possible The choice of a particular set of codes should be motivated by the main and interaction effects that can be observed in the data (a simple ANOVA with facets as independent variables and estimated Rasch parameters as dependent variable will uncover these) In our study we used two different sets of contrast codes, of which the second set was carefully constructed with an eye on the effects such as they manifested themselves in the ANOVA tables This second set of codes allowed us to reduce the best fitting LLTM model by one term

A satisfactory LLTM with nine contrasts produced effect (base) parameters for the different structs that permitted us to evaluate our hypotheses on situational determinants Our hypotheses on the role of facets A, B, and E were confirmed, but, contrary to our expectation, facet D did not produce any effect neither the absence of physical activities nor the absence of verbal communication in relationships had any effect on the probability of a subject feeling lonely. For facet C, little effect was found, and the effect that we found was also somewhat contrary to expectation. Instead of the partner playing the most dominant role in the determination of loneliness, it was the absence of social exchanges with relatives that had the greatest effect on the probability of a subject feeling lonely. This greater importance of relatives over a partner we attributed to the fact that our present sample of subjects consisted mainly of young people for whom family ties still provide important social relations, and for whom partner relationships are not yet fully matured.

The successful results we obtained with regard to the situational hypotheses were not followed by equally successful results with regard to the hypotheses on the proposed personal determinants. Partly this was due to the fact that we were dealing with a highly homogeneous group of subjects, resulting in little or no variance in most of the intended predictors of proneness to loneliness. Effectively, only six variables could be used: the ratio m(S)/m(V), age, gender, civil status, having a partner or not, and having a sufficient number of friends or not. Neither of these variables showed any significant association with proneness to loneliness, as measured by our questionnaire. Since a number of these variables are per definition strongly related to feelings of subjective social isolation, the conclusion must be that proneness to loneliness and actual social relations are unrelated in this age group of predominantly female students.

Apart from our loneliness data, we also analyzed data on valuation, satisfaction, engagement, uncertainty, angryness and indifference to examine if these data sets satisfied the criteria of a Rasch scale. Since analyses of these data served purely exploratory purposes, we restricted ourselves to first order tests for an indication of Rasch homogeneity, and to multiple regression of contrasts on estimated item parameters for an examination of the internal structure of these data. Apart from the engagement and indifference data, all data sets could be considered approximately Rasch homogeneous. Further analyses of the internal structure of these data sets revealed some interesting facts, the most notably concerning the active role of facet D in the context of valuation, uncertainty, and angryness. The results showed that subjects differentiated clearly between 'doing' and 'saying', which means that the failure to find an effect of facet D with regard to loneliness cannot be attributed to a failure of our students to distinguish the two categories.

Further analyses of these data showed an interesting relationship between loneliness and uncertainty, and various interpretable interaction effects. Since all conclusions pertaining to these data were based on an exploration of the data, it is important to examine to what extent the structures that we found can also be retrieved in a second sample. Our second main study serves this purpose, as well as the purpose of cross validating the positive results regarding our hypotheses on situational determinants of loneliness.

8 SECOND MAIN STUDY: HETEROGENEOUS CALIBRATION SAMPLE

8.1 Introduction

This chapter presents the results of the second main study, in which we have attempted to replicate the findings of the first study Unlike the previous study, we have not supplemented our own methodological approach with the traditional facet theoretical approach Since the SSA and Addtree analyses of the data from the student sample did not yield any interesting results, we decided to omit these analyses in the second study

8.2 Method

8 2 1 Subjects

Our second sample consisted of a random sample of inhabitants from Nijmegen The random selection of subjects was made by the municipal office of Nijmegen The random selection ensured that our second sample consisted of a heterogeneous group of subjects, with approximately equal numbers of male and female subjects, and considerable variance in the distribution of almost all variables

8 2 2 Procedure

Each selected subject received a letter from the university and from the municipal office informing them that they had been randomly selected for participation in a research project on social relations, and that they could shortly expect a visit from a research assistant, who would provide them with all the necessary information During this visit, the assistant explained that the purpose of the research was to investigate how people perceived and judged various types of social exchanges (no more details were given), and the subject was requested to participate in this research The assistent stressed that the subject was totally free to decide whether or not he or she wanted to participate, and that even if the subject agreed to take part in the study, he or she could withdraw cooperation at any time

When a subject agreed to participate, the assistant made an appointment to call on him/her again at a time considered suitable to the subject, and during this second visit the assistant administered the questionnaire The task of the assistant consisted of explaining carefully to the subject how the questionnaire should be filled out, of going through the short assignment with the subject, and of administering the first 12 (exercise) items to the subject, to see whether he or she had properly understood the instruction After that, the subject was asked to finish the questionnaire in the presence of the assistant, who would remain present to answer any questions or to help with any problems that the subject might have

Each assistant was trained carefully for his task during three separate sessions of approximately 1,5 hours each The administration of the questionnaire with the help of assistants was considered necessary, since in the pilot study we had found that older or less educated subjects might have difficulties with the correct handling of the questionnaire

8.3 Results and discussion

8 3 1 Frequencies

Tables 8 1 - 8 11 list the frequencies of a number of person characteristics (like we did in chapter 7, the frequencies of the ratios that form the subject of the hypotheses concerning personal determinants are given and discussed in subsection 8 4 4 1 As was to be expected for a more heterogeneous sample of subjects, almost all variables show considerable variance There are approximately an equal number of male and female subjects There are subjects from all age groups ranging from 20 to 70, although the younger people (age 35 and younger) are slightly overrepresented (60% of all subjects) The remaining 40% of subjects is spread out evenly across the age continuum, so the available data allows for a clear differentiation between younger and older age groups

It is a conspicuous fact that the majority of our subjects have received higher education (60% has either a polytechnic or a university degree) Although this overrepresentation of higher educated subjects may appear strange for a randomly selected sample of subjects, it is a known fact that this effect is likely to occur when one is working with strict volunteers (see Rosenthal & Rosnow, 1975) In noticeable contrast, half of our subjects has a minimum income

TABLE 8.1: FREQUENCY DISTRIBUTION OF SEX

Sex	Freq	Valid Percent	Cum Percent
Male	90	44.8	44.8
Female	111	55.2	100.0
Total	201	100.0	

Approximately equal numbers of subjects are either living together or living alone, with a small number of subjects being either widowed or divorced About a quarter of our subjects has children

TABLE 8.2: FREQUENCY DISTRIBUTION OF AGE

Value	Freq	Valid Percent	Cum Percent
20	7	3.5	3.5
21	6	3.0	6.5
22	11	5.5	12.1
23	8	4.0	16.1
24	12	6.0	22.1
25	11	5.5	27.6
26	5	2.5	30.2
27	13	6.5	36.7
28	6	3.0	39.7
29	5	2.5	42.2
30	5	2.5	44.7
31	6	3.0	47.7
32	4	2.0	49.7
33	2	1.0	50.8
34	7	3.5	54.3
35	9	4.5	58.8
36	2	1.0	59.8
37	5	2.5	62.3
38	5	2.5	64.8
39	5	2.5	67.3
40	7	3.5	70.9
41	3	1.5	72.4
42	3	1.5	73.9
43	2	1.0	74.9
44	2	1.0	75.9
45	3	1.5	77.4
46	4	2.0	79.4
47	4	2.0	81.4
48	4	2.0	83.4
49	2	1.0	84.4
50	1	.5	84.9
51	4	2.0	86.9
52	1	.5	87.4

53	1	.5	87.9
54	2	1.0	88.9
55	1	.5	89.4
56	2	1.0	90.5
57	1	.5	91.0
58	1	.5	91.5
59	2	1.0	92.5
60	2	1.0	93.5
61	1	.5	94.0
62	4	2.0	96.0
64	2	1.0	97.0
65	5	2.5	99.5
70	1	.5	100.0
Missing	2		
Total	201		100.0

TABLE 8.3: FREQUENCY DISTRIBUTION OF EDUCATIONAL LEVEL

Value Label	Freq	Valid Percent	Cum Percent
LO/LBO	22	11.3	11.3
MAVO	23	11.8	23.1
HAVO/VWO	35	17.9	41.0
HBO	40	20.5	61.5
University	75	38.5	100.0
Out of range	6		
Total	201	100.0	

TABLE 8.4: FREQUENCY DISTRIBUTION OF INCOME LEVEL

Value Label	Freq	Valid Percent	Cum Percent
< 25.000	90	47.9	47.9
25.000-35.000	30	16.0	63.8
35.000-55.000	36	19.1	83.0
> 55.000	32	17.0	100 0
Out of range	13		
Total	201	100.0	

TABLE 8.5: FREQUENCY DISTRIBUTION OF CIVIL STATUS

Value Label	Freq	Valid Percent	Cum Percent
Unmarried, living alone	88	43.8	43.8
Married, living together	100	49.8	93.5
Widowed or divorced	13	6.5	100.0
Total	201	100.0	

living at home, and a fifth has children living outdoors Only 10% of our subjects claims to have an insufficient number of friends, which provides an indication of subjective social isolation Of course, such a small number is what one would expect for a random sample of subjects In contrast to our first sample, most of the subjects of our second sample (over 75%) has a partner As was to be expected, only few people have no living relatives (2%) or claim to have no friends at all (3,5%)

TABLE 8.6: FREQUENCY DISTRIBUTION OF CHILDREN AT HOME

Value Label	Freq	Valid Percent	Cum Percent
Children at home	58	29.0	29.0
No children at home	142	71.0	100.0
Out of range	1		
Total	201	100.0	

TABLE 8.7: FREQUENCY DISTRIBUTION OF CHILDREN AWAY FROM HOME

Value Label	Freq	Valid Percent	Cum Percent
Children away from home	41	20.4	20.4
No children away from home	160	79.6	100.0
Total	201	100.0	

8.4 Rasch analysis

8 4 1 Frequency distribution of sumscores

Table 8 12 lists the frequency distribution of sumscores As was to be expected, and like we found for the first sample, the distribution is strongly skewed to the right Few people have a high proneness to respond with loneliness

TABLE 8.8: FREQUENCY DISTRIBUTION OF HAVING SUFFICIENT FRIENDS

Value Label	Freq	Valid Percent	Cum Percent
Having sufficient friends	177	88.5	88 5
Not having sufficient friends	23	11.5	100.0
Out of range	1		
Total	201	100.0	

TABLE 8.9: FREQUENCY DISTRIBUTION OF HAVING A PARTNER

Value Label	Freq	Valid Percent	Cum Percent
Having a partner	156	77.6	77.6
Not having a partner	45	22.4	100.0
Total	201	100.0	

8 4 2 First and second order tests of Rasch homogeneity

Table 8 13 lists the outcome of first and second order tests that were performed

Both the R(1c) and the Q(1) tests yield a very high probability, close to one Such a result would normally be expected only when performing a statistical test with very low power Although one would expect a test on a data matrix of 52 items by 201 subjects to have high power, closer examination of the R(1) and Q(1) algorithms suggests that the power may indeed have been much lower than we expected Both the R(1c) and the Q(1) algorithms determine the item fit by partitioning the total

TABLE 8.10: FREQUENCY DISTRIBUTION OF HAVING LIVING RELATIVES

Value Label	Freq	Valid Percent	Cum Percent
Having living relatives	197	98.0	98.0
Having no living relatives	4	2.0	100.0
Total	201	100.0	

TABLE 8.11: FREQUENCY DISTRIBUTION OF HAVING ANY FRIENDS

Value Label	Freq	Valid Percent	Cum Percent
Having any friends	194	96.5	96.5
Having no friends at all	7	3.5	100.0
Total	201	100.0	

group of subjects (for a given test version) into a number of subgroups corresponding to specific sumscore levels For the above analysis, the data of three of the four test versions were split into five subgroups, and the data of the remaining version was partitioned into six subgroups For each subgroup, scaled deviation scores are calculated for all items, that are summed to give the overall contribution to R(1) (or Q(1)) for the given test version It is a fact worth noting that, whereas the R(1) and Q(1) tests assume the number of subjects per subgroup to be large in comparison to the number of items, in the analysis of our data this assumption was strongly violated per subgroup the number of

TABLE 8.12: FREQUENCY DISTRIBUTION OF LONELINESS SUMSCORES

Sum Score	Freq	Percent
0	14	7.0
1	13	6.5
2	6	3.0
3	11	5.5
4	14	7.0
5	13	6.5
6	14	7.0
7	12	6.0
8	14	7.0
9	13	6.5
10	9	4.5
11	7	3.5
12	11	5.5
13	13	6.5
14	10	5.0
15	3	1.5
16	2	1.0
17	9	4.5
18	2	1.0
19	0	0.0
20	1	0.5
21	2	1.0
22	2	1.0
23	1	0.5
24	0	0.0
25	1	0.5
26	0	0.0
27	4	2.0
Total	201	100.0

TABLE 8.13: FIRST AND SECOND ORDER RASCH ANALYSES - First order tests are sensitive to violations of the assumptions of monotonicity and sufficiency, and second order tests are sensitive to violations of the assumptions of unidimensionality and local stochastic independence.

	CML	MML
First order	R(1c) = 393.39 df = 474 p = .99	R(1m) = 706.93 df = 576 p = .0001
	Q(1) = 48.05 df = 73 p = .99	R(0m) = 182.45 df = 102 p = .000
Conditional Log-likelihood -1998.32		
Second order	Q(2) = 744.17 df = 550 p = .000	

subjects was considerably smaller than the number of items ($N \approx 9$ vs $n = 27$). Van den Wollenberg[1] suggested that this could have an unforeseen effect on the power of the test, and advised the analysis to be repeated on the item sets (see the discussion on item sets in subsection 7.3.4.3, chapter 7) instead of the test versions. If the overall set of items is Rasch homogeneous, then so must a subset of the items be. The itemsets contain subsets of the total number of items, comprising nine or 18 items. Because each itemset is answered by approximately 100 subjects, a partitioning of subjects is possible that will ensure that the number of subjects substantially exceeds the number of items. The first item set contained nine items that were answered by 108 subjects, the second item set contained 17 different items (due to an error in the process of constructing the questionnaire one item appeared twice,

[1] Personal communication

and we randomly discarded one of the duplicates) and was answered by 92 different subjects, the third item set also had 17 different items (the eighteenth item formed a duplicate of one of the other items) answered by 109 subjects, and lastly the fourth item set had eight different items that were answered by 93 subjects. We performed a Q(1) analysis on each separate item set with the RADI program, using a high vs low partitioning that resulted in a number of subjects per subgroup that was indeed substantially larger than the number of items (on average 45 subjects against either nine or 17 items). The results of these Q(1) analyses are reported in table 8.14.

TABLE 8.14: FIRST ORDER ANALYSES ON SEPARATE ITEMSETS - Item sets are sets of items that appear in two different test versions. Due to the incomplete design, all test versions have nine items in common with one other test version, and eighteen items in common with a second test version. Since item sets appear in two different test versions, they yield data on approximately twice as much subjects as the separate test versions do. Due to an error in the process of constructing the questionnaire, one item from item sets B, C and D had to be omitted from the analysis.

Itemset A	Itemset B	Itemset C	Itemset D
Q(1) = 4.44	Q(1) = 19.13	Q(1) = 11.86	Q(1) = 4.79
df = 8	df = 16	df = 16	df = 7
p = .82	p = .26	p = .75	p = .67

The probabilities, indicating the goodness-of-fit, are smaller now, but they are still not significant.

Referring back to table 8.13, we can see that the R(1m) analysis yields a poor result, which is partly due to the fact that the ability distribution differs markedly from normality (as we could see in table 8.12), and as is indicated by the R(0m) test. Unlike what we found in the first sample, subtraction of R(0m) from R(1m) does not yield a result comparable to R(1c), but the CML and MML estimates of item parameters, presented in table 8.18, do correspond rather closely. The conclusion is that first order analyses of our data indicate our set of items to be Rasch homogeneous.

The Q(2) value reported in table 8.13 is highly significant, suggesting a violation of the assumption of local independence. To examine over-associations between items more closely, we performed separate Q(2)-analyses on the item sets. These analyses performed with RADI, led to the results reported in table 8.15.

TABLE 8.15· SECOND ORDER ANALYSES ON SEPARATE ITEMSETS

Itemset A	Itemset B	Itemset C	Itemset D
Q(2) = 57.50	Q(2) = 200.59	Q(2) = 178.40	Q(2) = 38.67
df = 27	df = 119	df = 119	df = 20
p = .007	p = .0003	p = .005	p = .07

Again, all Q(2)-analyses are significant Table 8 16 lists the chi-square contributions of item-pairs to Q(2), for those over-associated pairs with a chi-square value greater than three Between brackets are denoted the number of structs in which the two items in an over-associated pair differ

As can be seen, of the 29 over-associated item pairs with a chi-square greater than three, no less than 24 differ by no more than two structs The result replicates our finding in the first study, that much of the violation of conditional independence is caused by the great resemblance between our template items People obviously tend to remember what they responded on a previous item, and this codetermines responses on very similar items

We have also performed analyses of residuals for each of the item sets, to see whether the predominance of A and C factors, found in the first study, would also be found for the second sample Table 8 17 lists an ordering of structuples with regard to their loadings on the first factor extracted for each itemset

For item sets B and D, the first factor extracted could be considered an A factor The first factor of item set C resembles a C factor, whereas the first factor of item set A cannot be interpreted in terms of a facet The second factor that was extracted for set A was clearly an A factor, however, and a third factor could clearly be interpreted as a BE factor For item set B, the second factor resembled a C factor, and the second factor of item set D could be interpreted as a B factor

These data strongly suggest that the violation of local independence is indeed primarily due to structuple similarity, a problem inherent in the way we have formulated our items Of course this is a finding that we also found in our first study, and also the predominance of A and C factors in the analysis of residuals forms a replication of what we found in our first study Like we did then, we will again ignore the observed violations of conditional independence and consider our data to be approximately Rasch homogeneous, enabling us to further explore the inner structure of our data

That this decision is reasonable, may be supported by considering the correlation between the item parameters as estimated with CML for the first sample, and the item parameters as estimated for the second sample Figure 8 1 shows a scatterplot relating the two sets of parameters to each other

TABLE 8.16: OVER-ASSOCIATED ITEM PAIRS WITH CHI-SQUARE > 3 - Two items are over-associated when the number of subjects that respond positively to both items exceeds or stays below the expected number of subjects to respond positively to both items, given that the Rasch model provides a valid description of the data.

Itemset A	chi-sq.	Itemset B	chi-sq.
2 and 8 (1)	8.65	6 and 10 (3)	5.78
22 and 24 (1)	6.73	6 and 12 (2)	6.56
28 and 30 (1)	5.50	6 and 16 (3)	3.50
30 and 46 (2)	4.50	10 and 12 (1)	13.96
52 and 54 (1)	4.01	10 and 16 (1)	8.04
		12 and 16 (2)	4.63
		20 and 36 (4)	3.92
		31 and 32 (2)	15.87
		36 and 44 (3)	3.72
		40 and 42 (1)	5.73
		42 and 50 (2)	3.81

Itemset C	chi-sq.	Itemset D	chi-sq.
4 and 5 (2)	3.47	25 and 27 (1)	3.12
4 and 13 (1)	5.01	49 and 51 (1)	6.83
5 and 33 (2)	7.50		
7 and 9 (1)	3.95		
7 and 13 (2)	8.24		
9 and 13 (3)	5.01		
13 and 15 (1)	4.74		
33 and 41 (2)	6.85		
37 and 47 (3)	4.21		
39 and 45 (1)	3.43		
39 and 47 (2)	5.41		

TABLE 8.17: FIRST FACTORS EXTRACTED IN RESIDUAL ANALYSIS - The three columns respectively give item number, structuple profile and factor loading.

Itemset A

Item	Structuple	r
30	A2 B1 C1 D2 E2	.80
22	A1 B3 C2 D1 E2	.79
46	A2 B3 C1 D1 E2	.57
28	A2 B1 C1 D1 E2	.42
24	A1 B3 C2 D2 E2	.30
2	A1 B1 C1 D2 E1	.00
54	A2 B3 C3 D2 E2	-.22
8	A1 B1 C3 D2 E1	-.52

Itemset D

Item	Structuple	r
51	A2 B3 C2 D2 E2	.89
49	A2 B3 C2 D1 E2	.40
35	A2 B1 C3 D2 E1	.04
27	A1 B3 C3 D2 E2	-.28
1	A1 B1 C1 D1 E2	-.41
19	A1 B3 C1 D1 E2	-.49
29	A2 B1 C1 D2 E1	-.69
25	A1 B3 C3 D1 E2	-1.00

Itemset B

Item	Structuple	r
50	A2 B3 C2 D2 E1	.43
31	A2 B1 C2 D1 E2	.39
42	A2 B2 C2 D2 E2	.38
40	A2 B2 C2 D1 E2	.36
44	A2 B2 C3 D2 E1	.31
32	A2 B1 C2 D2 E1	.22
18	A1 B2 C3 D2 E2	.21
36	A2 B1 C3 D2 E2	.20
14	A1 B2 C2 D2 E1	.04
26	A1 B3 C3 D2 E1	.03
34	A2 B1 C3 D1 E2	-.32
20	A1 B3 C1 D2 E1	-.36
38	A2 B2 C1 D2 E1	-.45
16	A1 B2 C3 D1 E2	-.50
6	A1 B1 C2 D2 E2	-.75
10	A1 B2 C1 D1 E2	-.93
12	A1 B2 C1 D2 E2	-.94

Itemset C

Item	Structuple	r
53	A2 B3 C3 D2 E2	.88
43	A2 B2 C3 D1 E2	.51
45	A2 B2 C3 D2 E2	.37
17	A1 B2 C3 D2 E1	.24
41	A2 B2 C2 D2 E1	.05
37	A2 B2 C1 D1 E2	-.01
11	A1 B2 C1 D2 E1	-.06
39	A2 B2 C1 D2 E2	-.09
9	A1 B1 C3 D2 E2	-.12
23	A1 B3 C2 D2 E1	-.17
47	A2 B3 C1 D2 E1	-.21
5	A1 B1 C2 D2 E1	-.30
33	A2 B1 C2 D2 E2	-.31
15	A1 B2 C2 D2 E2	-.47
7	A1 B1 C3 D1 E2	-.49
4	A1 B1 C2 D1 E2	-.75
13	A1 B2 C2 D1 E2	-.98

As we can see, there exists a strong relationship between the two sets of parameters, suggesting a definite empirical regularity. If the Rasch model were markedly invalid, the parameter estimates would be meaningless and the two sets of parameters would not be expected to be related in a significant sort of way.

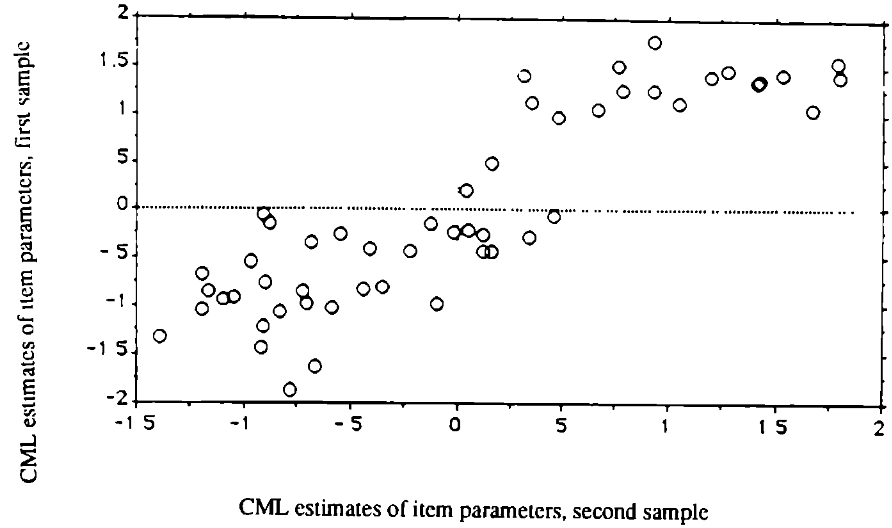


Figure 8.1 - A scatterplot showing the relationship between CML estimates of item parameters for the first sample (y-axis) and CML estimates of item parameters for the second sample (x-axis).

CML and MML estimates of item parameters for the second sample are reported in table 8.18.

8.4.3 Replication of the LLTM

In our first study we found that our unconstrained Rasch model could be reduced to a Rasch model with linear constraints containing nine different contrasts, pertaining to three main effects (facets A, B and C), one pseudo-main effect (facet E, conditional upon facet A), and two interaction effects (ABE and BCE). For the main part, our second study served as a replication study.

Using J-contrasts (see chapter 7, subsection 7.3.5.5), we analyzed our data with the CLR-program to see whether the LLTM model of our first study could be succesfully replicated. As we can see in table 8.19, the log likelihood of an LLTM model with nine contrasts equals -2065.31. Table 8.20 reports the accompanying likelihood ratio statistic, which proves to be highly significant. Our original LLTM model is not indistinguishable from the unconstrained Rasch model for our second sample.

TABLE 8.18: CML AND MML ESTIMATION OF ITEM PARAMETERS - The first two columns give the CML estimation of the item parameters, and the standard error of the estimate, the second two columns give the MML estimation of the item parameters, and the standard error of the estimate. The item parameters should be interpreted as item difficulty.

	CML	s.e.	MML	s.e
Item 1	.788	.300	.836	.299
Item 2	-1.205	.229	-1.246	.229
Item 3	.470	.265	.528	.267
Item 4	.921	.295	.987	.294
Item 5	-.443	.230	-.426	.235
Item 6	1.677	.395	1.635	.381
Item 7	1.194	.319	1.259	.314
Item 8	-1.105	.229	-1.145	.229
Item 9	.921	.295	.987	.294
Item 10	.765	.306	.745	.305
Item 11	-.883	.224	-.887	.229
Item 12	.351	.282	.327	.282
Item 13	1.786	.385	1.825	.368
Item 14	.059	.270	.030	.271
Item 15	1.405	.340	1.465	.332
Item 16	1.532	.377	1.498	.366
Item 17	.038	.244	.078	.248
Item 18	1.056	.329	1.035	.325
Item 19	.316	.274	.354	.276
Item 20	-.962	.253	-1.004	.252
Item 22	1.417	.352	1.406	.341
Item 23	-.592	.227	-.583	.232
Item 24	.658	.283	.662	.283
Item 25	1.785	.393	1.823	.381
Item 26	-.717	.254	-.758	.254
Item 27	1.275	.338	1.324	.333
Item 28	-1.055	.228	-1.095	.229
Item 29	-1.166	.248	-1.175	.251
Item 30	-1.409	.231	-1.449	.231

Item 31	-.778	.253	-.820	.253
Item 32	-.341	.259	-.378	.260
Item 33	-.931	.224	-.937	.228
Item 34	-.901	.253	-.943	252
Item 35	.464	.281	.506	.282
Item 36	-.655	.254	-.696	.254
Item 37	-.019	.242	.019	.246
Item 38	-.901	.253	-.943	.252
Item 39	-.690	.226	-.686	.230
Item 40	.130	.273	.102	.273
Item 41	.154	.249	.200	.253
Item 42	.130	.273	.102	.273
Item 43	-.129	.238	-.097	.243
Item 44	-.211	.262	-.246	.263
Item 45	.154	.249	.200	.253
Item 46	-.551	.232	-.580	.234
Item 47	-.835	.225	-.837	.229
Item 49	-.699	.248	-.696	.251
Item 50	-.405	.258	-.443	.258
Item 51	-.090	.259	-.065	.262
Item 52	-1.205	.299	-1.246	.229
Item 53	.339	.258	.392	.261
Item 54	-.905	.299	-.943	.230

Looking again at table 8 19, we can see that a number of contrasts have nonsignificant parameter weights In particular, it is noteworthy that the C2 contrast, contrasting struct C2 with struct C3, does not have a significant eta value We may remember that in the first study the dominating importance of the C2 category (relatives) contradicted our hypothesis regarding facet C We had expected the C1 category (partner) to be of much more importance, but its role proved to be of secondary importance Our suggestion was that the importance of the C2 category was related to the homogeneity in age of our group of subjects Since most of our subjects were students of about 22 years of age, their primary relations were still with their parental homes, and this we believed to account for the surprising importance of the C2 category In our present sample of subjects, the age distribution has a much greater range and a greater variance. This suggests that our original hypothesis of the greater importance of the C1 category is likely to be corroborated for this sample Following this assumption, we performed a second analysis with the C2 contrast replaced by the C1 contrast (contrasting struct C1 with the average of structs C2 and C3), and a third analysis with C1 instead of C2, and with

TABLE 8.19: PARAMETER WEIGHTS OF CONTRASTS IN LLTM REPLICATION

Contrast	Eta	se(eta)
A	.475	.037
B1	-.122	.022
C2	.033	.043
A1E	.547	.037
A2E	.076	.033
B1A1E	-.031	.025
B2A1E	-.001	.042
B2A2E	-.030	.041
B1C1E	.034	.018

interaction contrasts B2A1E and B2A2e omitted

Table 8 20 gives the log likelihood of our second and third analyses Although the fit has improved markedly, the models still are not equivalent to the unconstrained Rasch model (both likelihood ratio tests yield chi-square values that correspond with a z-score of approximately 3 60, p < 001)

Via a stepwise multiple regression procedure with all possible contrasts as predictors and the unconstrained Rasch parameters as criterion, we aimed to find out what the best fitting LLTM model for the second sample would be, and to see how this model would compare to our best fitting LLTM for the first sample The results of this stepwise multiple regression procedure are listed in table 8 21 It can be see that from the eighth step, further inclusion of contrasts hardly yields an increase of the multiple correlation We therefore decided to test the LLTM with the eight contrasts of table 8 21, that together correlate 947 with the unconstrained Rasch parameters

The likelihood ratio test comparing this LLTM model to the unconstrained Rasch model, yields a chi-square value of 58 73 With 43 degrees of freedom, the probability is greater than 05, indicating that this LLTM cannot be significantly distinguished from the unconstrained model Table 8 22 presents the parameter weights for the contrasts in this model Since various contrasts have barely significant regression weigths, we tried further reduction of the model by deletion of several contrasts However, any such reduction led to a significant deterioration of the goodness of fit of the model For our second sample, we have therefore succeeded in reducing our original Rasch model to an LLTM model with eight contrasts

Comparing this best fitting model to the best fitting LLTM model found in the first study, we can

TABLE 8.20: HISTORY OF LLTM REPLICATION ANALYSES - The first column gives the number of contrasts in the LLTM, the second column gives the log likelihood for the given LLTM, the third column gives the ratio of the likelihood of the constrained model to that of the unconstrained model, the last column gives the probability of the ratio, given that the two models are actually indistinguishable.

Number of contrasts	ln(L)	$-2\ln(L/L_u)$	df	p
9	-2065.31	133.98	42	.000
9	-2039.54	82.44	42	.000
7	-2039.64	82.64	44	.000

Unconstrained: -1998.32

conclude that we have been fairly succesful in replicating the original LLTM.

All the differences between the original and the replicated LLTM pertain to the role of facet C. Instead of a significant C2 contrast, we now have a significant C1 contrast. This is clearly related to the fact that our second sample is more heterogeneous in age. Furthermore, the BCE interaction effect now presents itself in the model via the B1C2E contrast, whereas in the original model we had a B1C1E contrast. It is conceivable that this change is likewise related to the difference in the age distribution of the two samples. Lastly, for our second sample we needed to add a C1E interaction contrast. In subsection 8.4.3.3 we will discuss the nature of these interaction effects.

8.4.3.1 Comparing the LLTM parameters of the first and the second sample

Table 8.23 compares the parameter weights of the contrasts appearing in both the LLTM model for the first sample and the LLTM model for the second sample.

If we take into consideration the standard errors of the parameter weights, than we notice that two out of five contrasts have a similar parameter value in both samples, whereas a third contrast (B1) is almost similar. The parameters of A1 and A1E are markedly lower in the second sample, however, and in addition their relative importance in the model has interchanged.

TABLE 8.21: MULTIPLE REGRESSION ON RASCH PARAMETERS, WITH CONTRASTS AS PREDICTORS

Step nr.	Contrast	MR
1	A1E	.635
2	A	.839
3	C1	.893
4	B1	.918
5	B1A2E	.929
6	C1E	.936
7	B1C2E	.942
8	A2E	.947
9	C2E	.951
10	B1A1E	.954
11	C1D	.956
12	B2	.959
13	D	.962
14	AB1	.964

8 4 3 2 Evaluation of hypotheses on situational determinants

If we look at table 8 24 we can see how the base (effect) parameters of the different structs compare over the two samples

Facet A

The eta weights of structs A1 and A2 are considerably smaller for the second sample than they were in the first, but again they are relatively large, demonstrating the great importance of facet A Again, the ordering of the two base parameters corroborates our hypothesis that absence of social exchange situations involving a social exchange from the other to the subject elicites more loneliness than absence of social exchange situations involving a social exchange from the subject to the other

Facet B

The base parameters for facet B in the second sample closely resemble the parameter estimates from the first sample The ordering of the base parameters for facet B again corroborates our hypothesis, indicating that absence of social exchange on problems does indeed elicit more feelings of loneliness

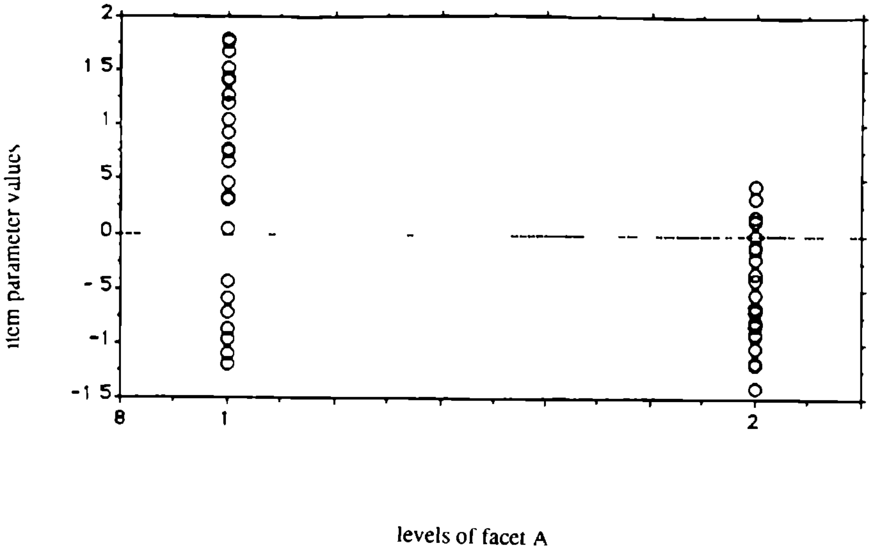


Figure 8.2 - A scattergram, relating the levels of facet A to the Rasch item parameter values The figure shows that A2 items tend to have exclusively low item parameter values indicating that such items tend to elicit a response of loneliness easily as we hypothesized

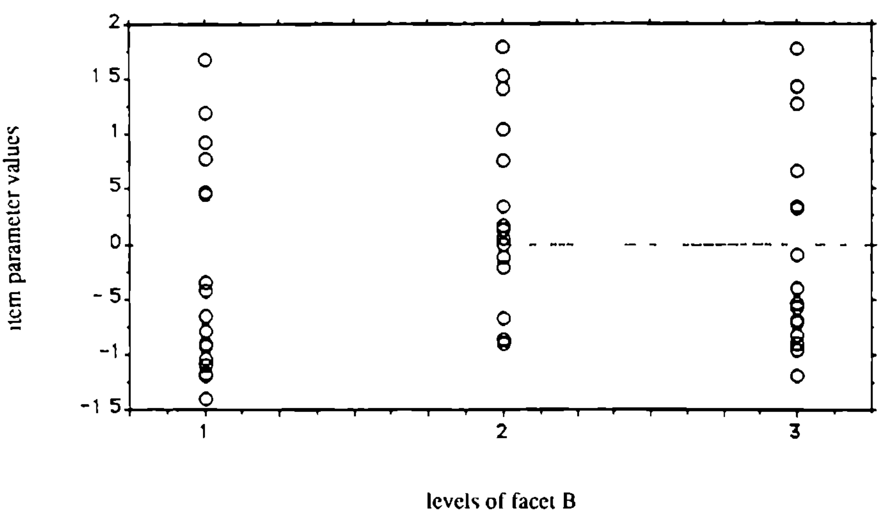


Figure 8.3 - A scattergram, relating the levels of facet B to the Rasch item parameter values The figure shows that a problem focus (B1 items) tends to elicit a loneliness response slightly easier than a positive experience as focus, and that an attitude as focus will less easily result in a loneliness response

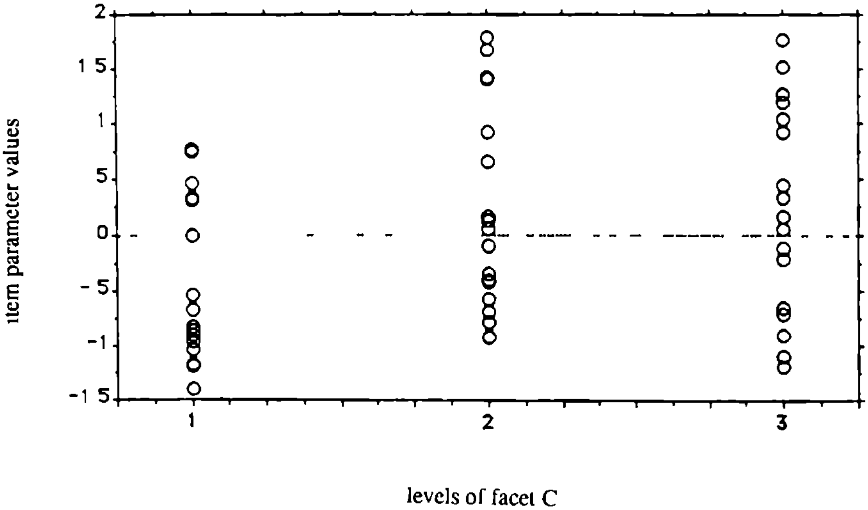


Figure 8.4 - A scattergram, relating the levels of facet C to the Rasch item parameter values The figure shows that absence of social exchange with a marital partner (C1) will elicit a loneliness response easier than absence of social exchanges with friends (C3), which in its turn will elicit a loneliness response easier than absence of social exchanges with relatives (C2)

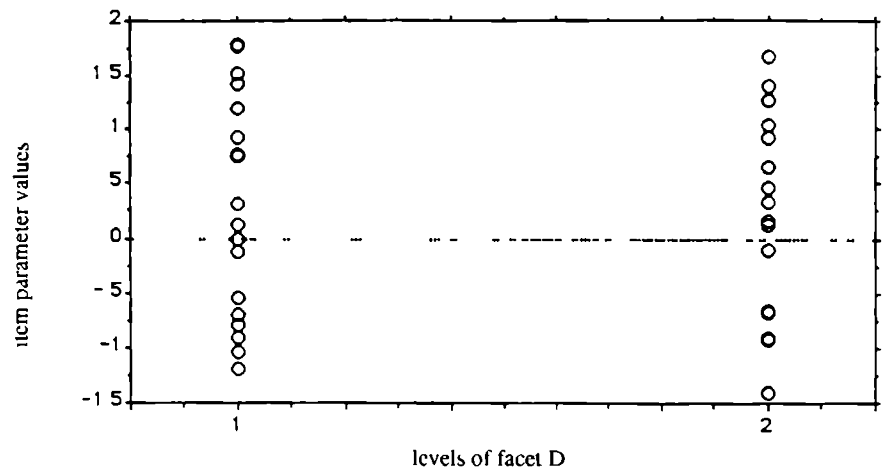


Figure 8.5 - A scattergram, relating the levels of facet D to the Rasch item parameter values The figure shows that no difference exists in the roles of D1 ('doing') and D2 ('saying')

TABLE 8.22: PARAMETER WEIGHTS OF CONTRASTS IN OPTIMAL LLTM

Contrast	Eta	se(eta)
A	.488	.037
B1	-.122	.021
C1	-.195	.025
A1E	.555	.037
A2E	.081	.034
B1A2E	-.083	.024
C1E	-.088	.026
B1C2E	.093	.038

TABLE 8.23: COMPARISON OF CONTRAST PARAMETER WEIGHTS - Contrast parameter weight estimates (eta) and their corresponding standard errors, found in the first and in the second sample.

	First sample		Second sample	
Contrast	Eta	se(eta)	Eta	se(eta)
A	.671	.032	.488	.037
B1	-.170	.018	-.122	.021
A1E	.642	.032	.555	.037
A2E	.094	.027	.081	.034
B1A2E	-.061	.019	-.083	.024

than absence of social exchange on positive experiences, which in its turn elicits more feelings of loneliness than absence of social exchange on attitudes.

TABLE 8.24: COMPARISON OF BASE (EFFECT) PARAMETERS FOUND IN THE TWO SAMPLES - effect parameters (eta) for each separate struct are given. Note: the effect parameters should be interpreted as item easiness.

First sample		Second sample	
Struct	eta	Struct	eta
a(1)	-.671	a(1)	-.488
a(2)	.671	a(2)	.488
b(1)	.170	b(1)	.122
b(2)	-.170	b(2)	-.122
b(3)	0.00	b(3)	0.00
c(1)	0.00	c(1)	.390
c(2)	.112	c(2)	-.195
c(3)	-.112	c(3)	-.195
d(1)	0.000	d(1)	0.000
d(2)	0.000	d(2)	0.000
a(1)e(1)	.613	a(1)e(1)	.622
a(1)e(2)	-1.313	a(1)e(2)	-1.043
a(2)e(1)	.765	a(2)e(1)	.569
a(2)e(2)	.479	a(2)e(2)	.326

Facet C

Our hypothesis was that the ordering of the elements of facet C would be determined by the psychological distance between the subject and the social exchange partner. The smaller this distance, the greater the intimacy of the relationship, and therefore the greater the probability of loneliness when a social exchange with such a social exchange partner is absent. Following this hypothesis, we expected the most important role for the partner, with relatives second in place, and friends being the least important. Somewhat surprisingly, in the first sample we found relatives to be of predominant importance. Our explanation for this unexpected result was that it was contingent upon the relative young age of our group of student subjects. At such an age, partner relationships have not yet been fully developed, and the primary relations are predominantly with the parental family For our second sample, we expected this predominance of relatives to have vanished, since the average age for this sample is much higher and the variance of the age distribution much greater The results show that this is indeed the case The expected predominance of the partner is now manifest, and it is noteworthy that the role of relatives is now indistinguishable from that of friends Our present result tallies closely with a result that has also been reported in other literature (e g De Jong Gierveld, 1984), showing the overriding importance of having a partner in the domain of loneliness research Taking the results of the first and second samples together, our data suggest that for mature people missing a partner is the most important predictor of loneliness, but for younger people it is the relationship with relatives that determines whether or not one is likely to feel lonely

Facet D

Just like we found for the first sample, there exists no significant difference between absence of something being done and absence of something being said as determinant of the probability of a loneliness response

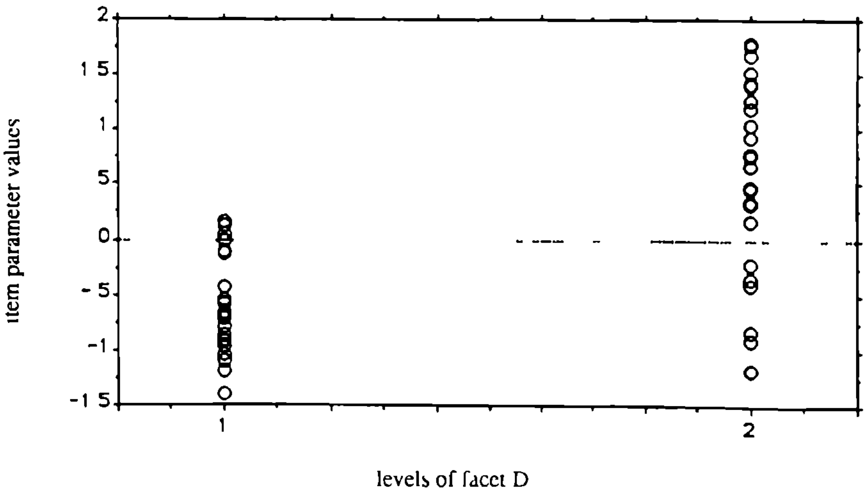


Figure 8.6 - A scattergram, relating the levels of facet E to the Rasch item parameter values The figure shows that E1 items (the focus of the exchange pertaining to the subject) always elicit loneliness easily However, some E2 situations (the focus pertaining to the other) will elicit loneliness easily, whereas others will not, depending on the role of other facets

Facet E

Again, the scattergram relating the elements of facet E to the unconstrained Rasch parameters, reveals struct E1 (the locus of the focus being the subject) to be stronger related to loneliness than struct E2 Inspection of the base parameters corresponding to AE combinations confirms this Like we found in the first sample, A1 E2 situations do not easily elicit loneliness, A2 E2 situations also difficultly elicit loneliness responses, but less difficult than the former Contrary to what we found in the first sample, however, we now find that A1 E1 combinations (the subject not saying anything to the other about his problems, attitudes or experiences) more easily elicit loneliness than A2 E1 situations (the other not responding to the subject about problems, attitudes, or positive experiences of the subject), which forms a somewhat counter-intuitive result

8 4 3 3 A look at the interactions

TABLE 8.25: ABE INTERACTION FOR LONELINESS PARAMETERS - The cell entries are mean item parameter values.

	A1		A2	
	E1	E2	E1	E2
B1	-.936	1.289	-1.392	-.563
	-.866	.799	-.404	-.896
B2	-.045	1.323	-.148	-.302
	-.378	1.287	-.414	-.159
B3	-.800	1.374	-.727	-.575
	-.622	1.043	-.160	-.652

Table 8 25 shows the interaction effect between facets A, B, and E The upper values in the cells of the table refer to the result of the first sample, the lower values pertain to the second sample Inspection of the ABE interaction table shows that the interaction effect has remained virtually unchanged over the two samples Some relationships have become stronger (i e more positive or negative) or weaker (i e somewhat closer to zero), but on the whole, the pattern has remained the same

The BCE interaction table shows that the BCE interaction effect has also largely remained the same The most conspicuous difference between the two samples is that in the C1 case almost all the mean parameter values have shifted in the more negative direction (i e the relationship with loneliness has become stronger), and that in the C2 case all the mean parameters (with the exception of the B3 C2 E2 case) have shifted in the more positive direction (i e these situations have become less likely to elicit loneliness) These changes are of course related to the general change of the role of structs C1 and C2

TABLE 8.26: BCE INTERACTION FOR LONELINESS PARAMETERS - The cell entries are mean item parameter values.

	C1		C2		C3	
	E1	E2	E1	E2	E1	E2
B1	-1.087	.465	-1.372	.677	-1.261	.874
	-1.025	-.438	-.440	.147	-.440	.147
B2	-.236	.862	-.295	.777	.189	.704
	-.786	.174	-.201	.759	-.201	.759
B3	-.395	.171	-.996	.673	-.752	.929
	-.781	-.195	-.196	.391	-.196	.391

8 4 3 4 Reproduction of Rasch parameters out of base parameters

The good fit of the LLTM model with eight different contrasts should permit us to reproduce the original unconstrained Rasch parameters to a high degree of accuracy As figure 8 7a shows, the estimated Rasch parameters correlate approximately 95 with the original Rasch parameters It is also interesting to see to what extent the contrasts of the LLTM for the second sample allow us to reproduce the unconstrained Rasch parameters for the first sample Figure 8 7b presents a scattergram showing the correlation between the estimated Rasch parameters based on the LLTM for the second sample, and the unconstrained Rasch parameters as determined with the first sample The correlation is approximately 90, providing additional support for the contention that the LLTM model for the first sample has been replicated to a satisfactory degree

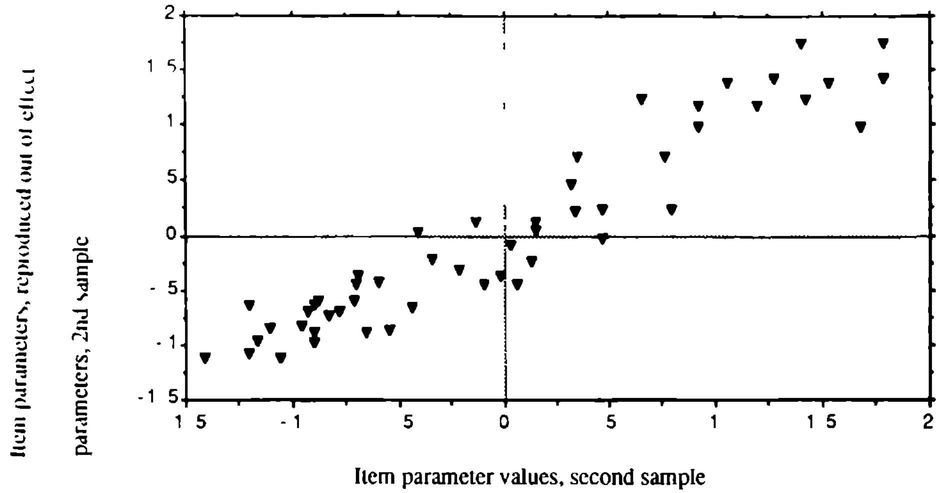


Figure 8.7a - A scatterplot showing the relationship between estimated item parameters for the unconstrained Rasch model, based on the second sample (x-axis), and the item parameters as reproduced out of the effect parameters, estimated by the LLTM (y-axis) The correlation equals 95

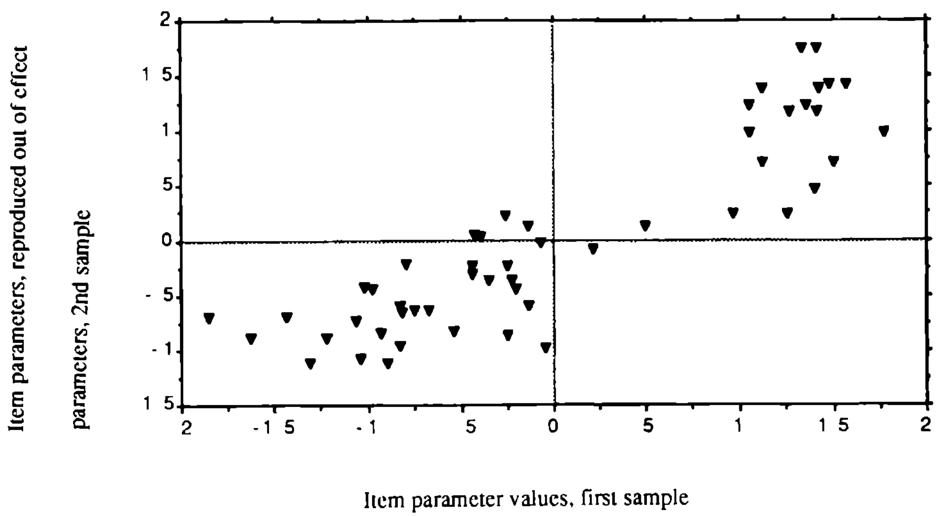


Figure 8.7b - A scatterplot showing the relationship between estimated item parameters for the unconstrained Rasch model, based on the first (student) sample (x-axis), and the item parameters as reproduced out of the effect parameters, estimated by the LLTM (y axis) The correlation is approximately 90

8 4 4 The role of personal determinants in the second sample

8 4 4 1 Frequency distribution of the ratios

Figures 8 8 - 8 10 present the frequency distribution of the three ratios, intended as person bound predictors of loneliness The frequency distribution of the three ratios is much the same as it was for the first sample, which means that m(E)/m(C) and m(C)/m(V) cannot be used for differentiating between 'low', 'medium', and 'high' scorers most people score very high on these two variables The third ratio, m(S)/m(V), does permit a reasonable distinction between a low, a middle, and a high group of scorers

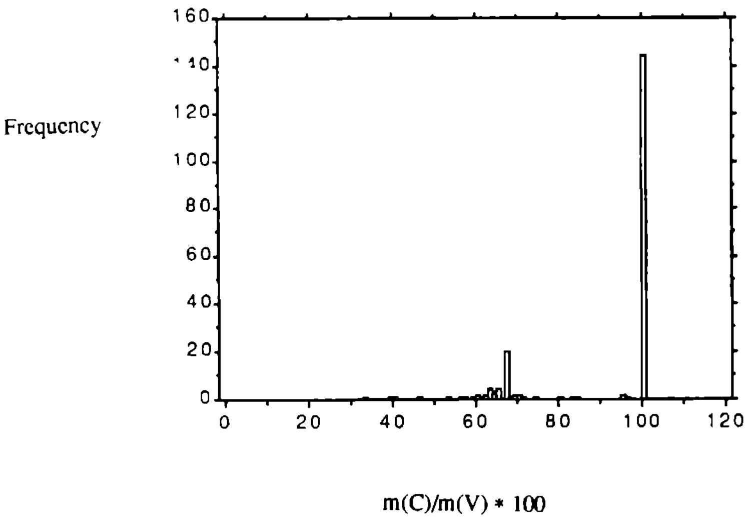


Figure 8.8 - Frequency distribution of the number of valued social exchanges that one could potentially engage in, relative to the number of social exchanges that one values, multiplied by 100 (m(C)/m(V) * 100) It can be seen that nearly all subjects have the opportunity for engaging in the social exchanges that they value

8 4 4 2 Association between personal determinants and sumscore on loneliness

The correlation between the three ratios and the sumscore on loneliness is expressed in the scatterplots pictured in figures 8 11 - 8 13 It is apparent from these figures and the accompanying correlation coefficients that there exists no relationship between the three ratios and proneness to loneliness This replicates our finding in the first study If proneness to loneliness, as measured by our questionnaire, had anything to do with actual loneliness or subjective social isolation, we would expect at least a negative correlation of some magnitude between m(S)/m(V) and the sumscore on our questionnaire The results, however, force us to conclude that actual loneliness and proneness to loneliness are unrelated to each other

To see whether any of the other personal determinants of loneliness has any bearing on proneness to loneliness, we have subdivided the sumscores on loneliness in a low (sumscore ≤ 9),

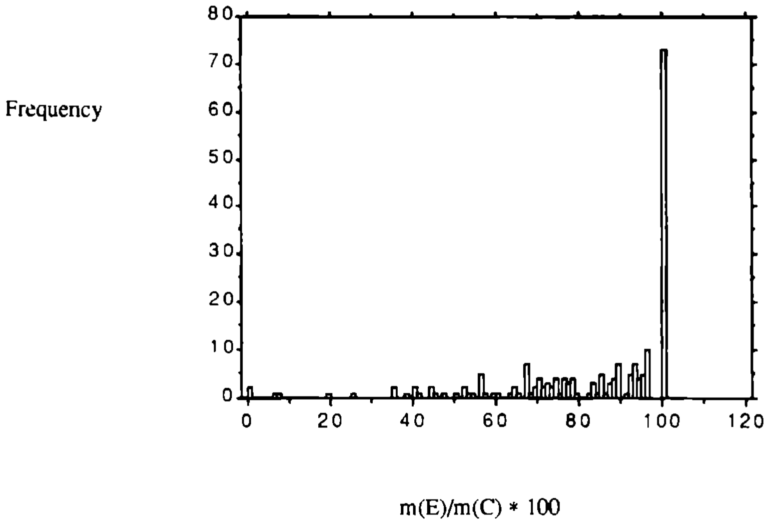


Figure 8.9 - Frequency distribution of the number of valued social exchanges that one actually engages in, relative to the number of social exchanges that one values and could potentially engage in, multiplied by 100 (m(E)/m(C) * 100) It can be seen that nearly all subjects engage in those valued social exchanges that they can potentially engage in

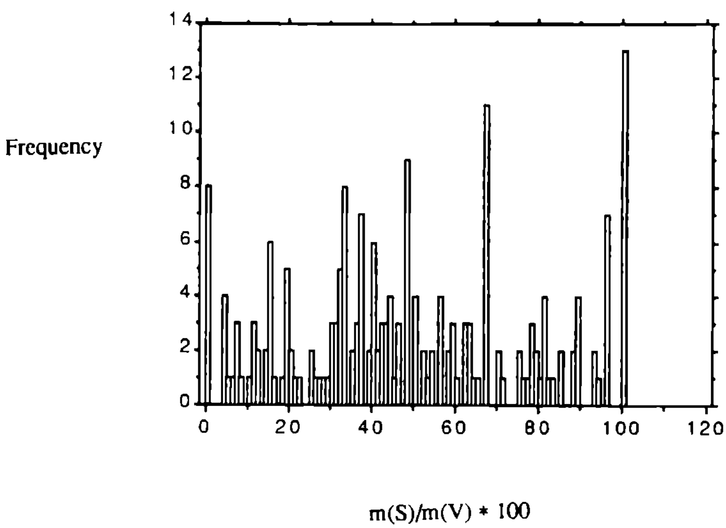


Figure 8.10 - Frequency distribution of the number of valued social exchanges that one is satisfied with, relative to the number of social exchanges that one values, multiplied by 100 (m(S)/m(V) * 100)

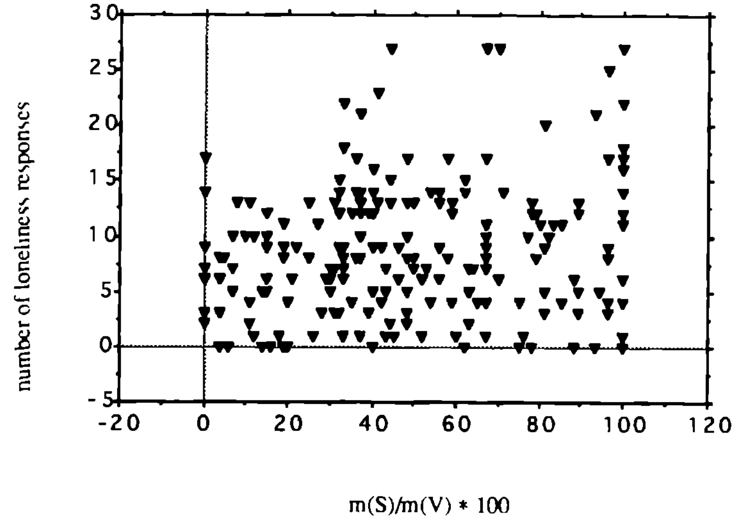


Figure 8.11 - Scatterplot showing the relationship between the sum of loneliness responses and the number of valued social exchanges that one is satisfied with (m(S)), relative to the number of social exchanges that one values (m(V))

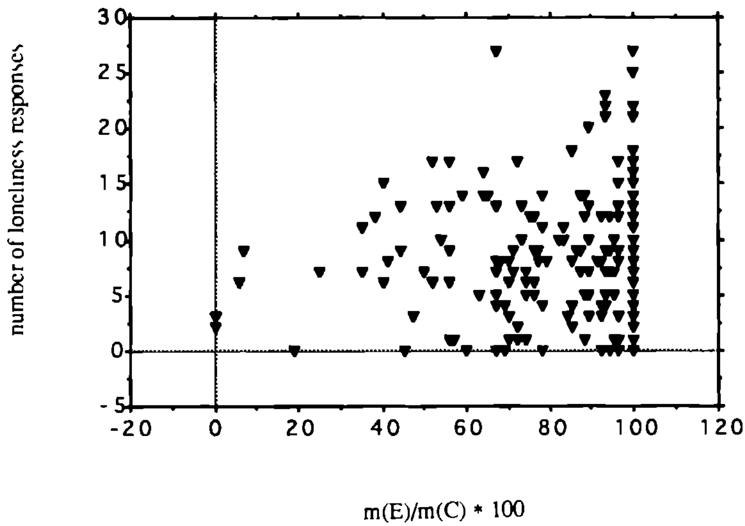


Figure 8.12 - Scatterplot showing the relationship between the sum of loneliness responses and the number of valued social exchanges that one engages in (m(E)) relative to the number of social exchanges that one values and could potentially engage in (m(C))

a middle (9 < sumscore ≤ 18), and a high (18 < sumscore ≤ 27) group, and crosstabulated this 'level of proneness to loneliness' variable with sex, age group, educational level, income level, civil status, sufficiency of number of friends, having a partner, having children at home, and having children away from home

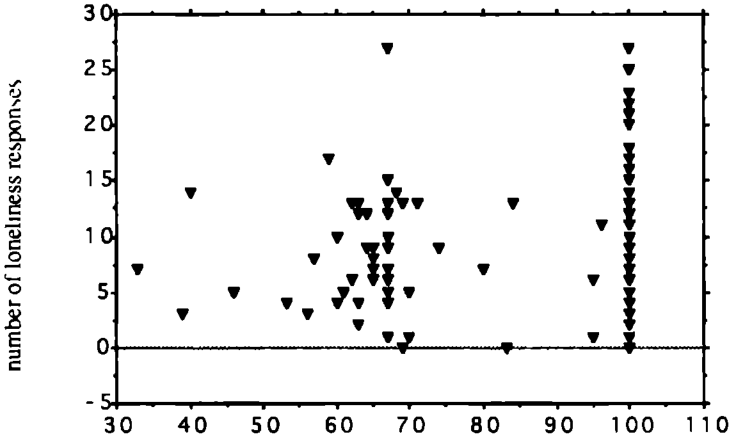


Figure 8.13 - Scatterplot showing the relationship between the sum of loneliness responses and the number of valued social exchanges that one could potentially engage in (m(C)), relative to the number of social exchanges that one values (m(V))

The results are presented in tables 8 27 - 8 35 below

The only significant chi-square value pertains to an association between sex and level of proneness We can see from table 8 27 that, compared to male subjects, female subjects are underrepresented in the low proneness category, and overrepresented in the middle and high categories This result corresponds with the general finding that women sooner admit that they feel lonely (see e g De Jong Gierveld, 1984) Whether this means that men are generally less lonely or, in our case, less prone to become lonely, or whether men are less likely to admit that they have or might have such negative emotional experiences remains an open question A possible interpretation is that women value social contacts more highly, or are emotionally more strongly affected by social contacts Another possibility is that men are emotionally less sensitive to social contacts because they (believe to be able more easily to) find compensation

None of the other personal determinants appears to be significantly associated with proneness to loneliness

8 4 4 3 Using sex as a predictor for proneness to loneliness

Having established a meaningful relationship between sex and proneness to loneliness, we aimed to investigate whether sex could be meaningfully taken up in a logistic regression model (LRRM) To

TABLE 8.27 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND SEX

Sex	Level of proneness: Low	Medium	High	
Male	66	21	3	90
Female	59	44	8	111
	125	65	11	201

Chi square 8.70 df=2 p=.013

TABLE 8.28 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND AGE

Agegroup	Level of proneness: Low	Medium	High	
< 25 yrs	30	25	2	57
25-30 yrs	26	6	2	34
31-40 yrs	30	12	3	45
41-50 yrs	20	11	3	34
> 50 yrs	19	11	1	31
	125	65	11	201

Chi square 8.82 df=8 p=.357

TABLE 8.29 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND EDUCATION LEVEL

Educ.level	Level of proneness: Low	Medium	High	
LO/LBO	17	4	1	22
MAVO	14	7	2	23
HAVO/VWO	21	12	2	35
HBO	22	15	3	40
UNIVERSITY	47	25	3	75
	121	63	11	195

Chi square 3.99 df=8 p=.858

TABLE 8.30 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND INCOME LEVEL

Income level	Level of proneness: Low	Medium	High	
< 25.000	57	31	2	90
25.000-35.000	22	5	3	30
35.000-55.000	21	11	4	36
> 55.000	17	13	2	32
	117	60	11	188

Chi square 8.89 df=6 p=.179

TABLE 8.31 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND CIVIL STATUS

Civil Status	Level of proneness: Low	Medium	High	
Unmarried, not living together	55	30	3	88
Married, or living together	63	29	8	100
Divorced, or widowed	7	6	0	13
	125	65	11	201

Chi square 3.92 df=4 p= 417

this end, we created a contrast for sex, using -1 as a code for a male subject, and 1 as a code for a female subject Since the number of male and female subjects is approximately equal, such coding yields a contrast that is virtually orthogonal and uncorrelated with all the other contrasts

Having created such a contrast, we also constructed contrasts for all possible interaction effects between sex and any of the other situational determinants Subsequently, we performed a stepwise multiple regression analysis with sex, the situational determinants, and every possible interaction effect as predictors and with the unconstrained Rasch parameters, separately estimated for male and female subjects, as criterion variable The results are reported in table 8 36 As we can see, sex plays only a minor role in the determination of proneness, manifesting itself only in a (small) interaction effect with facet C Table 8 37 presents the Facet C x Sex (S) interaction table It can be seen from this table that the most significant difference between male and female subjects concerns their appraisal of absence of social exchange with friends Whereas men have a small tendency to appraise themselves as lonely under such circumstances, women do not Furthermore, women appraise absence of social exchange as lonely more easily then men do Therefore, a loneliness questionnaire asking for social exchanges with friends and/or partner would be slightly sex-biased

TABLE 8.32 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND RESPONSE TO THE QUESTION 'DO YOU FEEL THAT YOU HAVE A SUFFICIENT NUMBER OF FRIENDS?'

	Level of proneness			
Sufficient friends	Low	Medium	High	
Yes	109	59	9	177
No	15	6	2	23
	124	65	11	200

Chi square .854 df=2 p=.652

TABLE 8.33 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND RESPONSE TO THE QUESTION 'DO YOU HAVE A PARTNER?'

	Level of proneness			
Having a partner	Low	Medium	High	
Yes	98	48	10	156
No	27	17	1	45
	125	65	11	201

Chi square 1.69 df=2 p=.429

TABLE 8.34 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND RESPONSE TO THE QUESTION 'DO YOU HAVE CHILDREN AT HOME?'

	Level of proneness			
Children home	Low	Medium	High	
Yes	31	22	5	58
No	93	43	6	142
	124	65	11	200

Chi square 3.15 df=2 p=.207

TABLE 8.35 - RELATIONSHIP BETWEEN LEVEL OF PRONENESS TO LONELINESS AND RESPONSE TO THE QUESTION 'DO YOU HAVE CHILDREN AWAY FROM HOME?'

	Level of proneness			
Children out of home	Low	Medium	High	
Yes	28	11	2	41
No	97	54	9	160
	125	65	11	201

Chi square .825 df=2 p=.661

TABLE 8.36: MULTIPLE REGRESSION ON RASCH PARAMETERS - The cell entries are mean item parameter values.

Step nr.	Contrast	MR
1	A1E	.607
2	A	.812
3	C1	.858
4	B1	.880
5	C2S1	.890
6	B1A2E	.899
7	C1E	.906
8	A2E	.911
9	C1S1	.914

TABLE 8.37: INTERACTION FOR SEX AND LEVELS OF FACET C - The first column contains mean parameter values of female subjects on the C1, C2 and C3 items, respectively. The second column gives the mean parameter values on C1, C2 and C3 items for the male subjects. It can be seen that female subjects tend to respond with loneliness in the case of absence of social exchange with a friend, whereas male subjects do not.

	S	level 1	level 2	Totals.
FC	level 1	16 - 307	16 - 54	32 - 423
	level 2	18 353	18 159	36 256
	level 3	18 - 08	18 322	36 121
Totals		52 -1 923E-5	52 3 8462E-5	104 9 6154E-6

TABLE 8.38: MULTIPLE REGRESSION ON VALUATION PARAMETERS, WITH CONTRASTS AS PREDICTORS

	First sample		Second sample	
Step nr.	Contrast	MR	Contrast	MR
1	C1E	.731	C1	.723
2	D	.818	C2	.799
3	C2	.869	B2	.859
4	B2D	.901	A2E	.903
5	B1	.932	D	.940
6	B2	.948	B1A2E	.960
7	B1A2E	.961	B1D	.971
8	B1D	.971	B2D	.978
9	B2C1D	.978		

In view of the smallness of the contribution of the sex variable as personal determinant of loneliness, we will not pursue to incorporate this effect in an LRRM model

8.5 Analysis of valuation and satisfaction data

In our first study, we exploratively examined the valuation, satisfaction, and engagement data The items pertaining to valuation of and satisfaction with social exchange situations were shown to be Rasch homogeneous, and upon subsequent analysis revealed a clearly recognizable and interpretable internal structure We will now examine whether analysis of these data, obtained from the second sample, will reveal similar structures

8 5 1 Analysis of valuation data

A first order analysis was performed on 26 items asking for subjects' valuation of social exchange situations (item 47 was responded to affirmatively by all subjects, and was therefore left out of the analysis) R(1) equalled 72 84, which at 50 degrees of freedom is barely significant (p = 02), and suggests the data to be approximately Rasch homogeneous The CML estimates of item parameters for the valuation data are reported in Appendix D. Figure 8.14 presents a scatterplot of the correlation between the estimated parameters for the first sample and the estimated parameters for the second sample. The correlation is high (r = .91), indicating comparable results for the two samples.

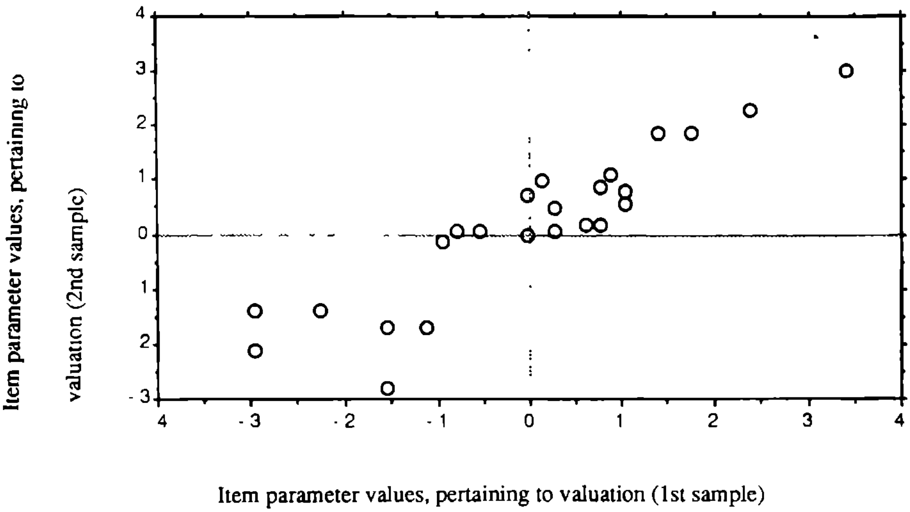
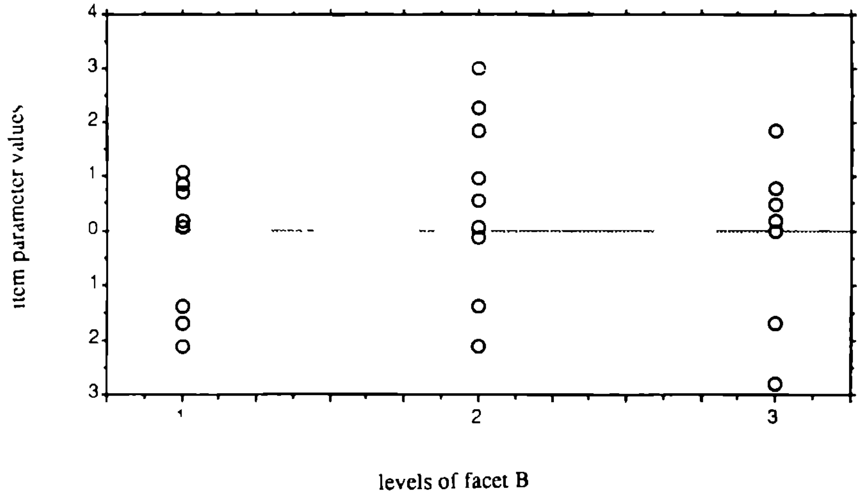


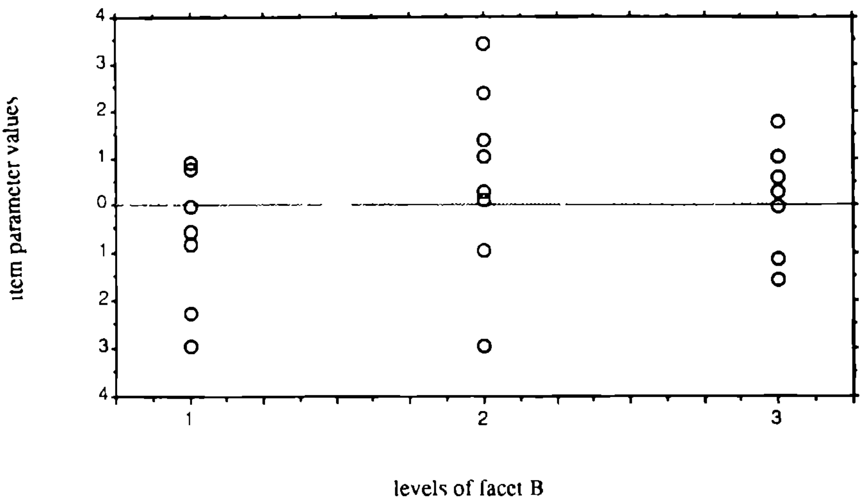
Figure 8.14 - A scatterplot showing the relationship between the item parameters pertaining to valuation, as estimated for the first sample (x-axis), and the item parameters pertaining to valuation, as estimated for the second sample (y-axis). The correlation is high (r=.91).

On the parameter values, we performed a stepwise regression analysis with contrasts for all possible main, pseudo-main and interaction effects (everything pertaining to struct A1 excepted) as possible predictors. Table 8.38 compares the results of the stepwise regression analysis for the first sample with those of the second. Compared to the predictors in the regression equation for the first sample, the regression equation for the second sample contains two new contrasts: C1 and A2E, corresponding to (pseudo-) main effects for facet C and facet E. On the other hand, three original predictors have disappeared from the equation: C1E, B1 and B2C1D. The disappearance of the CE and BCD interaction effects indicates that the structure of the data has actually become simpler. Originally, the structure in the data was determined primarily by CE and BD interaction effects, but for the second sample the structure is primarily determined by main effects for all facets, with a few minor interaction effects completing the description of the structure.

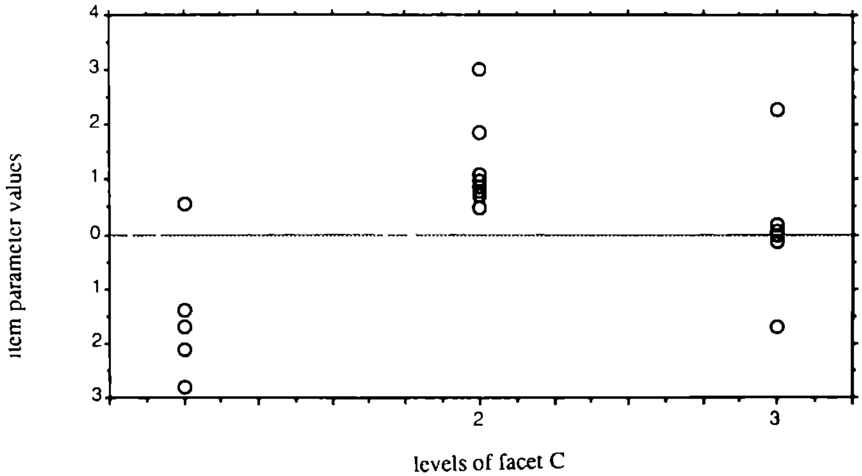
Comparing the roles of the facets

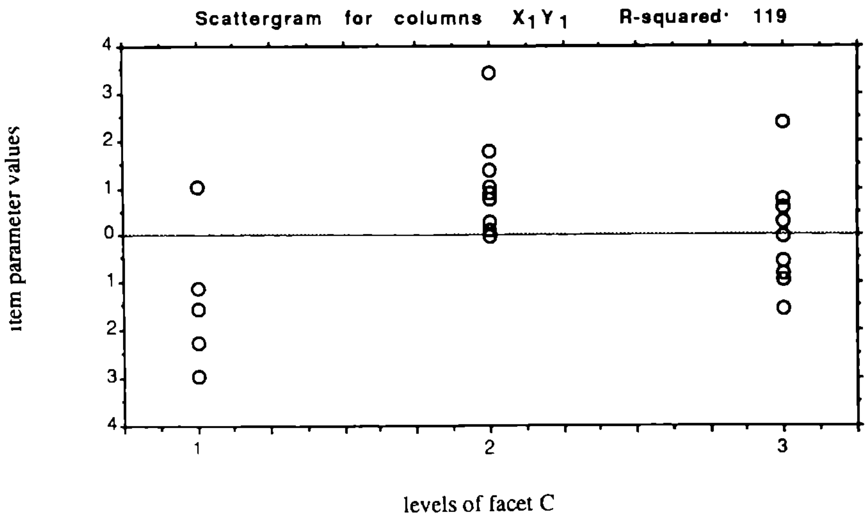
Figures 8.15 - 8.18 picture the role of the facets for the first and second samples. Compared with the results for the first sample, the role of facet B has remained largely the same. The most conspicuous difference is that two of the B3 situations have a more negative weight, indicating that some of the social exchange situations dealing with exchange of positive experiences are now considered more important than before. The role of facet C has remained the same, in comparison to the results of the



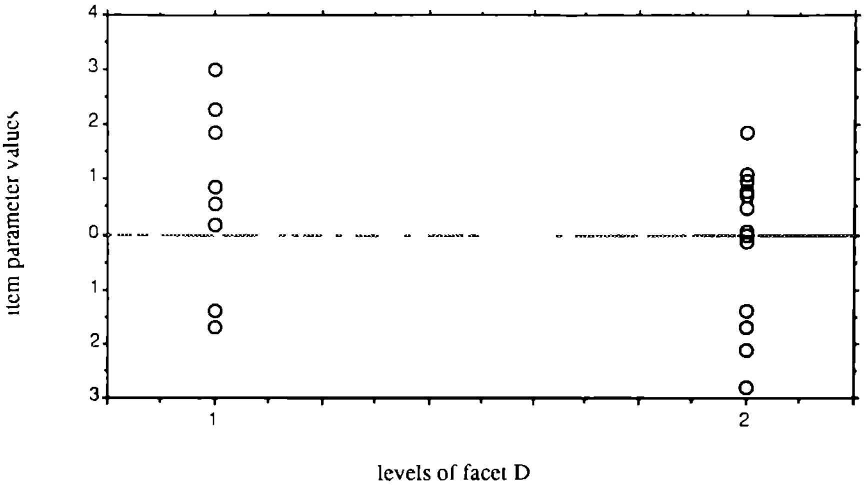


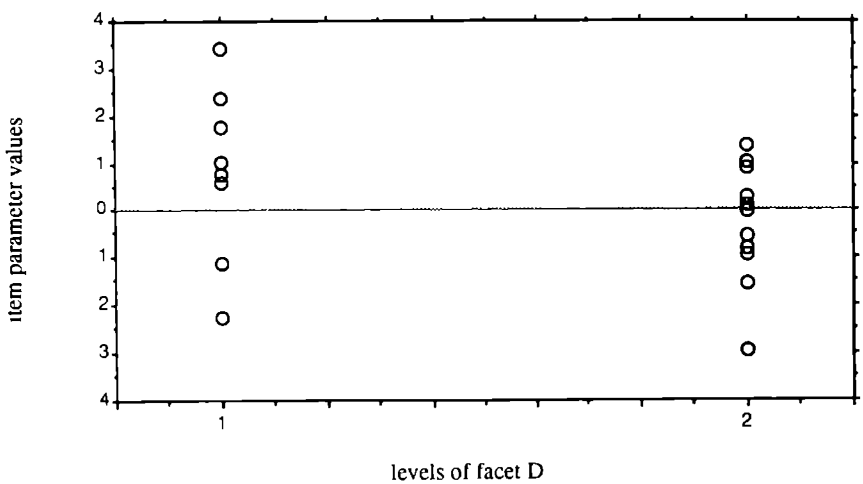
Figures 8.15a and 8.15b - A scattergram, relating the levels of facet B to the Rasch item parameter values, pertaining to valuation The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained largely the same, with B2 situations (attitude as focus) generally considered as less important



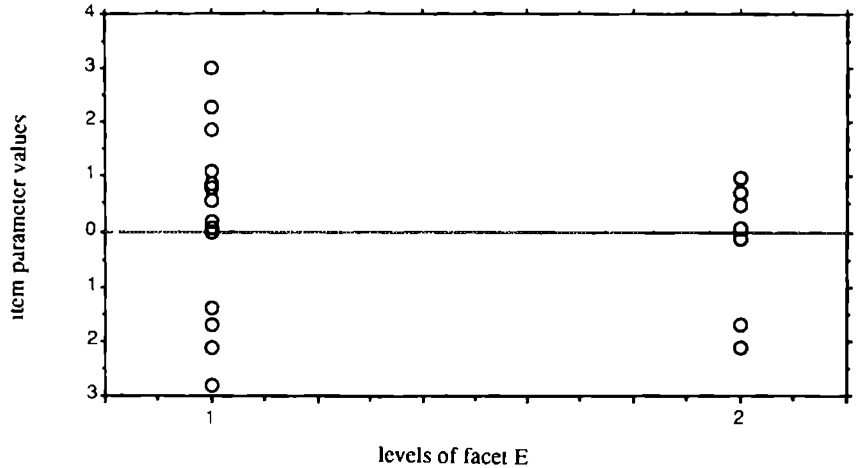


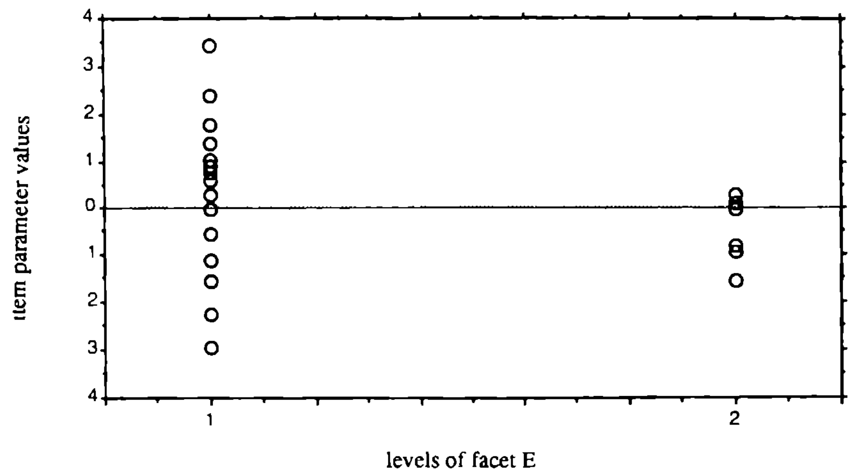
Figures 8.16a and 8.16b - A scattergram, relating the levels of facet C to the Rasch item parameter values, pertaining to valuation The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained the same over the two samples, with social exchanges with the marital partner (C1) considered as the most important, and social exchanges with relatives (C2) considered as the least important





Figures 8.17a and 8.17b - A scattergram, relating the levels of facet D to the Rasch item parameter values, pertaining to valuation The upper figure pertains to the results found in the second sample the lower figure pertains to results found in the first sample The pattern has remained the same over the two samples, with D2 ('saying) situations generally considered as more important





Figures 8.18a and 8.18b - A scattergram, relating the levels of facet E to the Rasch item parameter values, pertaining to valuation The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained largely the same

first sample Subjects attach the highest importance to social exchange with partners, and the least importance to exchanges with relatives The role of facet D has likewise remained unchanged in comparison to what we found for the first sample Verbal social exchange is considered to be of greater importance than exchanges involving some sort of physical action Compared to the results for the first sample, all E2 situations have received somewhat lower parameter values, indicating that our present group of subjects attaches a higher value than the student group to social exchanges focussing on problems, attitudes or positive experiences of their social exchange partners

Interactions

Tables 8 39 and 8 40 list the BD and BE interactions effects, which appear in both the first and in the second study The upper values correspond with the value found in the first sample, the lower value pertains to the second sample

TABLE 8.39: BD INTERACTION FOR VALUATION PARAMETERS - The cell entries are mean item parameters values

	D1	D2
B1	-.242	-.687
	-.124	-.306
B2	2.280	-.420
	1.943	-.119
B3	.416	-.366
	.109	-.647

Considering the BD interaction table, we can see that the observed interaction effect has remained the same. Likewise, the interaction effect between B and E has also largely remained the same, with a minor difference pertaining to B3 E1 situations (social exchanges focussing on positive experiences of the subject) For the first sample, we found that B2 and B3 situations were considered important only where it concerned attitudes and experiences from the other For the second sample, the exchange of positive experiences is considered important also when they pertain to the subject himself

TABLE 8.40: BE INTERACTION FOR VALUATION PARAMETERS - The cell entrıes are mean item parameter values

	E1	E2
B1	-.556	-.411
	-.217	-.301
B2	.925	-.407
	1.061	-.418
B3	.116	-.638
	-.285	-.597

8.5 2 Analysıs of satısfactıon data

Fırst order analysıs of the 27 ıtems pertaınıng to satısfactıon yıelded an R(1) equal to 127 76 Wıth 104 degrees of freedom, thıs result ıs not sıgnıficant (p = .06) In figure 8 19 below, a scatterplot shows the correlatıon between the CML estımates of ıtem parameters for the first sample and those for the second sample As we can see, the correlatıon (r = 73) ıs smaller than the correlatıon between the valuatıon parameters of the two samples, but ıt stıll shows that the results of the two samples are reasonably comparable

We performed a stepwıse regressıon on the estımated ıtem parameters of the satısfactıon data (reported ın Appendıx E), wıth contrasts for all possıble maın, pseudo-maın, and ınteractıon effects as possıble predıctors The results, together wıth those we obtaıned for the first sample, are shown ın table 8 41

To a large extent, the regressıon equatıon, and thereby the structure ın the data, has remaıned the same One contrast has dısappeared from the equatıon (C1), and one ınteractıon effect has found expressıon ın a dıfferent contrast (now C1E, formerly C2E) Furthermore, two new ınteractıon effects have been added. B1D and C2D

Comparıng the roles of facets

Fıgures 8 20-8 23 pıcture the role of the facets for the first and second samples The role of the elements of facet B has remaıned the same ın comparıson to the first study Satısfactıon ıs most easıly

TABLE 8.41: MULTIPLE REGRESSION ON SATISFACTION PARAMETERS, WITH CONTRASTS AS PREDICTORS

	First sample		Second sample	
Step nr.	Contrast	MR	Contrast	MR
1	C1	.569	C2	.632
2	B2	.759	B2	.816
3	C2	.881	D	.889
4	D	.915	B1D	.909
5	C2E	.939	C1E	.924
6	A2E	.954	A2E	.935
7	B1A2E	.968	B1A2E	.944
8			C2D	.951

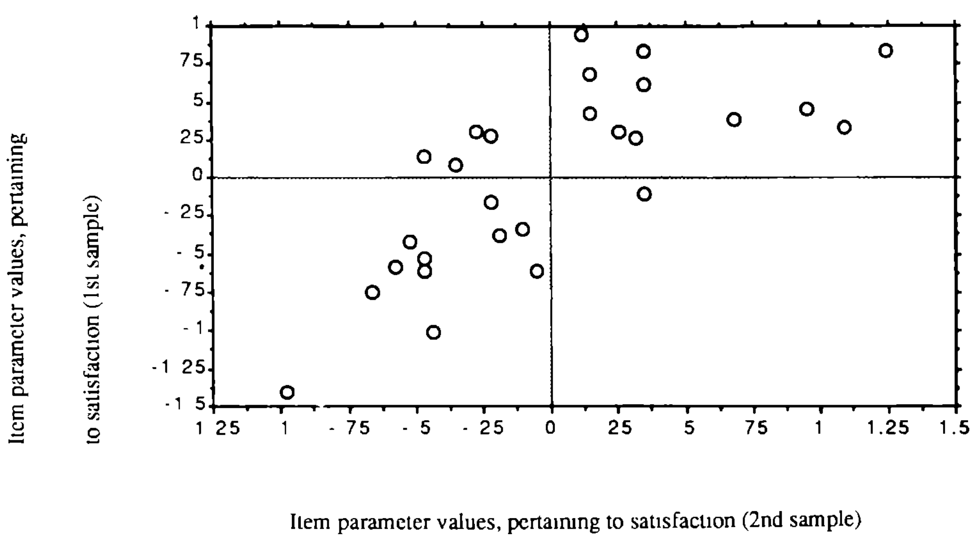
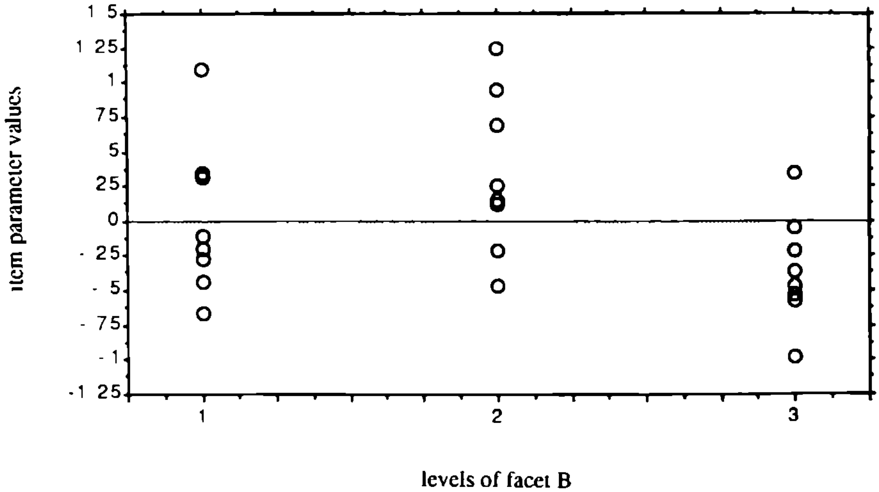
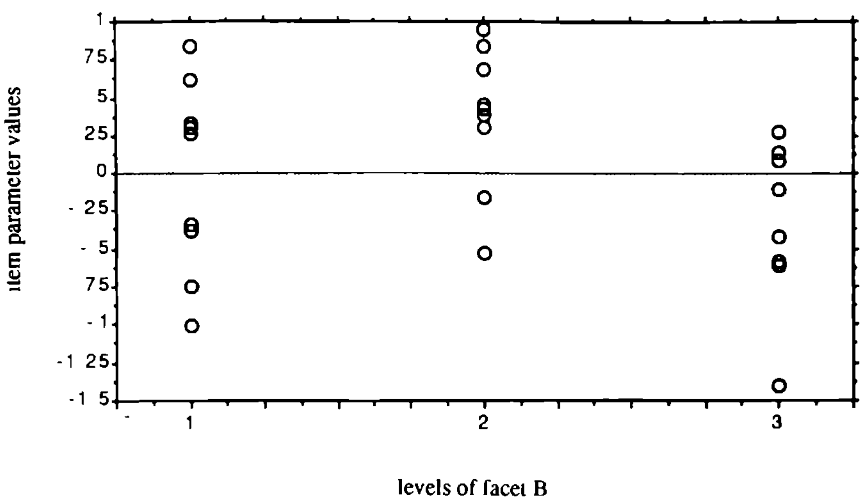
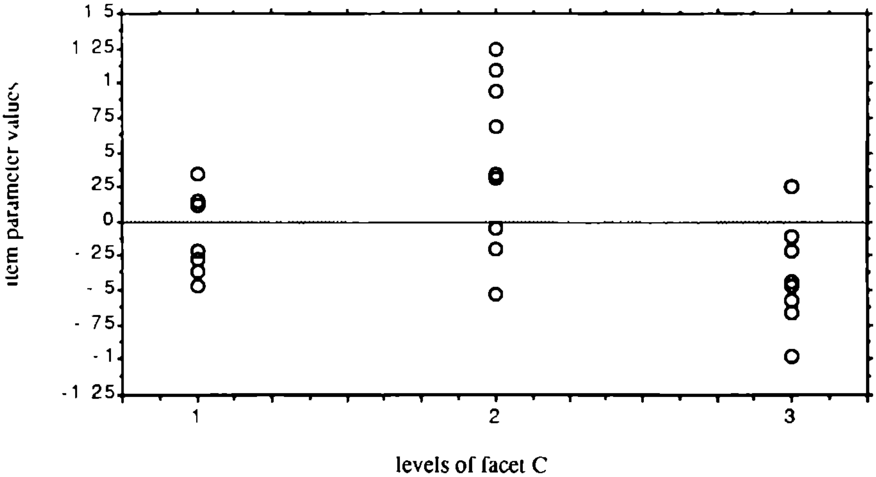


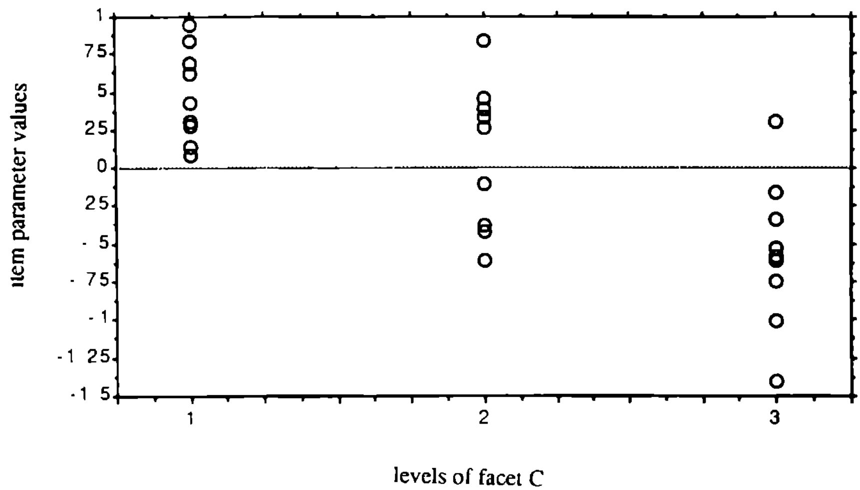
Figure 8.19 - A scatterplot showing the relationship between the item parameters pertaining to satisfaction, as estimated for the second sample (x-axis), and the item parameters pertaining to satisfaction, as estimated for the first sample (y-axis). The correlation equals .73.



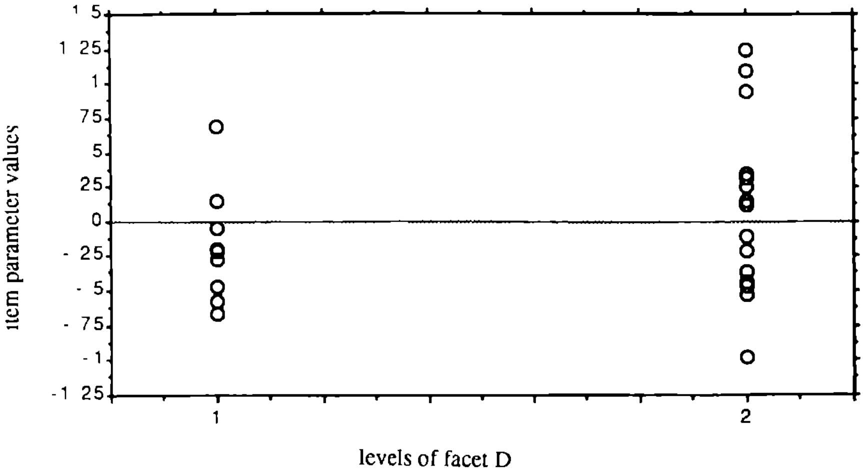


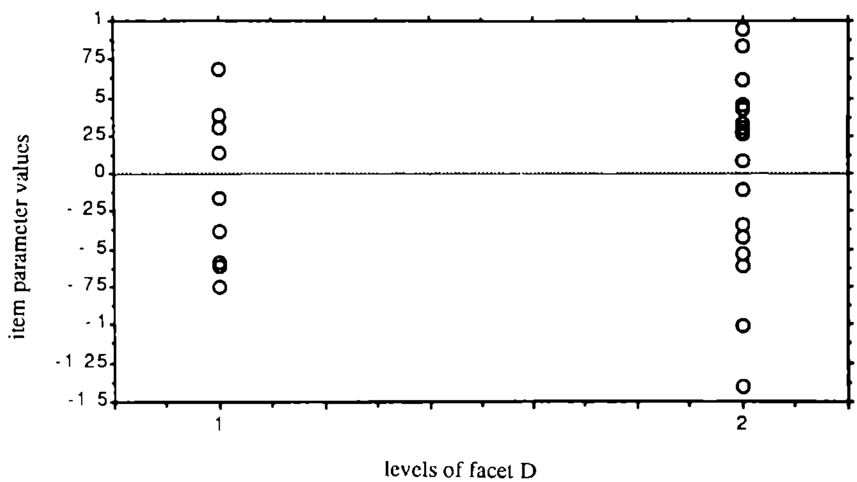
Figures 8.20a and 8.20b - A scattergram, relating the levels of facet B to the Rasch item parameter values, pertaining to satisfaction. The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample. The pattern has remained largely the same, with B2 situations (attitude as focus) eliciting satisfaction less frequently



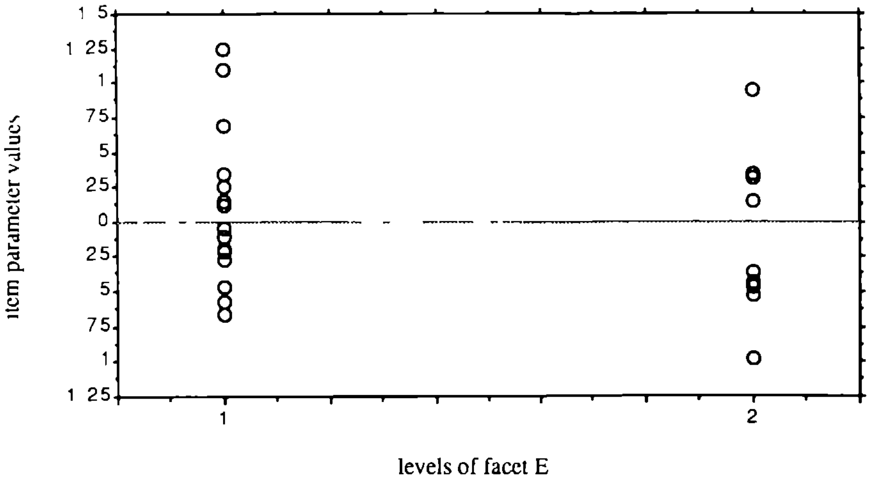


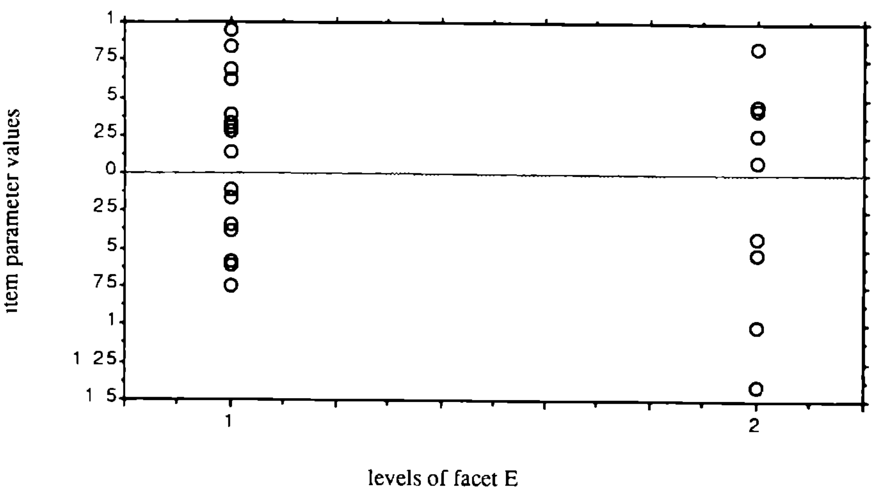
Figures 8.21a and 8.21b - A scattergram, relating the levels of facet C to the Rasch item parameter values, pertaining to satisfaction The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample. Different results can be detected in the two samples with regard to struct C1 (marital partner forms the partner of the social exchange). For the second sample, subjects tend to be satisfied with exchanges with marital partners more frequently than subjects of the first sample





Figures 8.22a and 8.22b - A scattergram, relating the levels of facet D to the Rasch item parameter values, pertaining to satisfaction The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample. The pattern has remained the same over the two samples, with D2 ('saying') situations eliciting more extreme appraisals, either as satisfactory or as unsatisfactory





Figures 8.23a and 8.23b - A scattergram, relating the levels of facet E to the Rasch item parameter values, pertaining to satisfaction The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained largely the same, with E2 situations (focus pertaining to the other) more frequently eliciting satisfaction than E1 satisfaction (focus pertaining to the subject)

elicited by situations involving social exchanges which focus on positive experiences On average, situations that involve social exchanges focussing on attitudes are the most difficult to elicit satisfaction The roles of structs C2 and C3 have remained the same Concerning C1, however, we can detect a change In the second sample, social exchanges with a partner elicit satisfaction more easily than they did in the first sample This may be related to the different age groups comprising the two samples the partnerrelationships that are formed by subjects of the second sample tend to be of a more stable, crystallized nature than those formed by subjects of the first sample For facet D, the pattern has remained the same D2 situations meet with more extreme appraisal than do D1 situations, either as very satisfactory, or as very unsatisfactory For facet E, the pattern has also remained the same E2 situations elicit satisfaction more easily than E1 situations

Interactions

Table 8 42 lists the interaction effect for facets C and E. The upper values show the values found for the first sample, the lower values correspond to the second sample

TABLE 8.42: CE INTERACTION FOR SATISFACTION PARAMETERS - The cell entries are mean item parameter values

	E1	E2
C1	.493	.450
	-.058	.045
C2	.080	.098
	.521	.249
C3	-.356	-.982
	-.296	-.628

Compared to the results of our first study, it is remarkable that where subjects of the first sample considered C1 (partner) situations as difficult to appraise as satisfactory, such situations do now easier elicit a response of satisfaction This situation is reversed in the case of C2 (relatives) situations formerly such social exchanges neither easily nor difficultly elicited responses of satisfaction, now these situations are more difficult in eliciting responses of satisfaction Furthermore, for the second sample

TABLE 8.43: BE INTERACTION FOR SATISFACTION PARAMETERS - The cell entries are mean item parameter values.

	E1	E2
B1	-.035	.032
	.034	.076
B2	.499	.117
	.372	.209
B3	-.248	-.583
	-.239	-.619

a slight difference can be detected between C2 E1 situations and C2 E2 situations: situations are appraised as satisfactory more easily in case the focus of the social exchange pertains to the other. Table 8.43 lists the interaction between facets B and E. The pattern to be observed in this table has remained largely the same over the two samples. Table 8.44 lists the interaction effect for facets B and D. The interaction is manifest in B1 (problem) cases. Situations in which others do something

TABLE 8.44: BD-INTERACTION FOR SATISFACTION ITEMS - The cells contain the number of subjects who responded to the items with the given BD structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	D	level 1	level 2	Totals
B	level 1	3 - 376	6 26	9 048
	level 2	3 204	6 375	9 .318
	level 3	3 - 366	6 - 366	9 - 366
Totals		9 - 179	18 09	27 -3 704E-5

for the subject, concerning his/her problems (i e physical support) easily elicit responses of satisfaction, but situations in which others say something to the subject about his/her problems neither difficultly nor easily elicit responses of satisfaction

8.6 Analysis of uncertainty and angryness data

In our first study, we found that omission of a number of items resulted in a Rasch homogeneous item set for uncertainty and for angryness data, but not for indifference data To check whether the Rasch structures were not the result of capitalization on chance, we aimed to reproduce the structures for the second sample We first analyzed our complete data sets (i e all 52 items included) The angryness data proved to be Rasch homogeneous with all items included, the uncertainty data did not We then omitted all those items from the uncertainty data set, that were also omitted during the first study, and the resulting item set proved to be approximately Rasch homogeneous Results of the first order analyses on uncertainty and angryness data are reported in table 8 45

TABLE 8.45: FIRST ORDER ANALYSES UNCERTAINTY AND ANGRYNESS ITEMS

Item set	R(1)	DF	P
All angryness items	385.89	400	.68
All uncertainty items	464.06	375	.001
Replication of uncertainty scale	418.46	355	.01

8 6 1 Analysis of uncertainty data

The scatterplot pictured in figure 8 24 expresses the correlation between the item parameters for the first sample and those for the second sample (r = 65) There exists a clear linear relationship between the two sets of item parameters, but the result is less convincing than the result we found for the replication of valuation and satisfaction data Figure 8 25 shows the scatterplot expressing the relationship between loneliness and uncertainty parameters The correlation between the two sets of parameters equals - 196 We may recall that for the first sample, we detected a peculiar nonlinear relationship between loneliness and uncertainty parameters In the scatterplot above, this pattern is only partially detectable For loneliness parameters smaller than zero, there exists no relationship with uncertainty parameters (whereas in the first sample we found a negative linear relationship) For loneliness

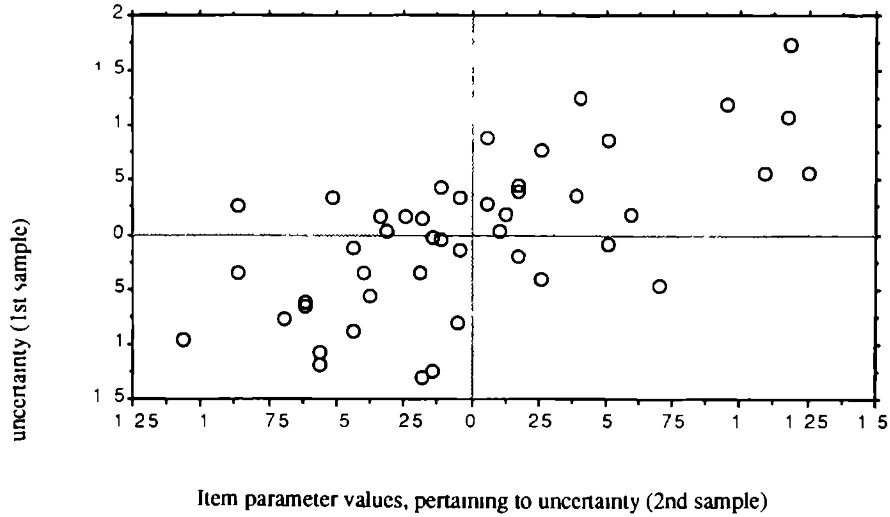


Figure 8.24 - A scatterplot showing the relationship between the item parameters pertaining to uncertainty, as estimated for the second sample (x-axis), and the item parameters pertaining to uncertainty, as estimated for the first sample (y-axis) The correlation equals 65

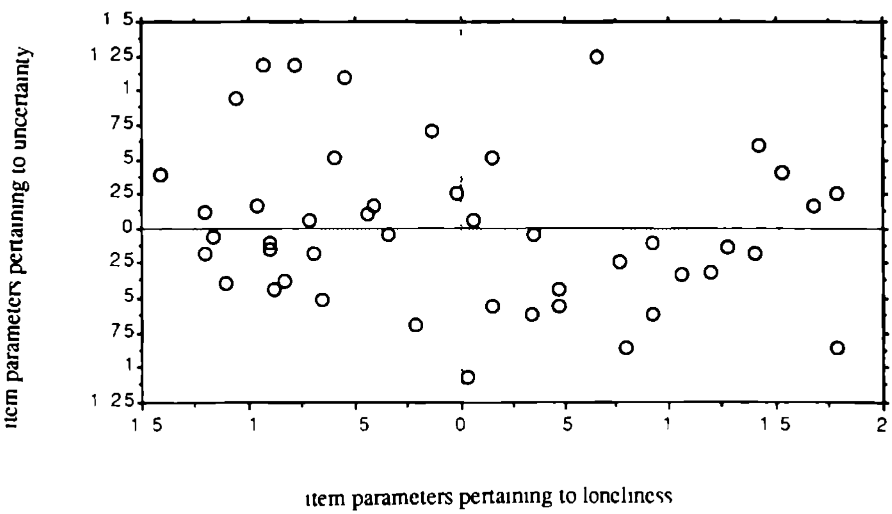


Figure 8.25 - A scatterplot showing the relationship between the item parameters pertaining to loneliness, as estimated for the second sample (x-axis), and the item parameters pertaining to uncertainty, as estimated for the second sample (y-axis) The correlation equals - 196

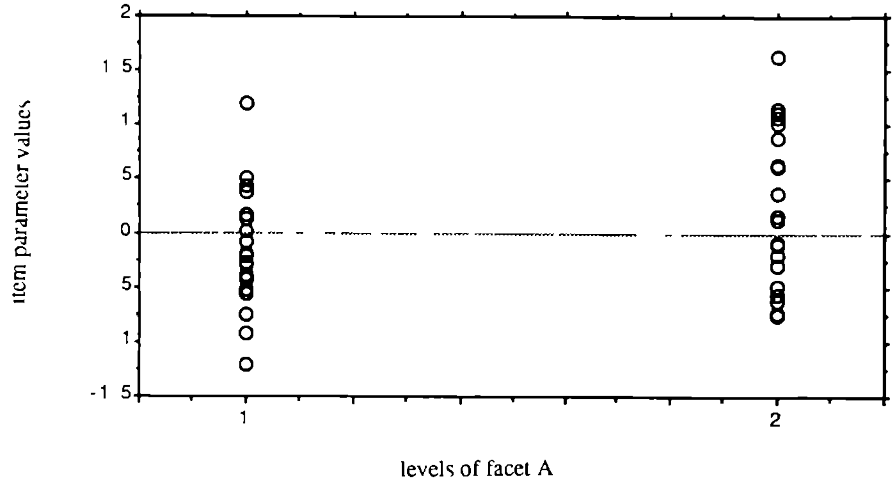
parameters greater than zero, however, a faint positive linear relationship can be detected. The relationship between the two sets of parameters that we found for the first sample is therefore only partially replicated.

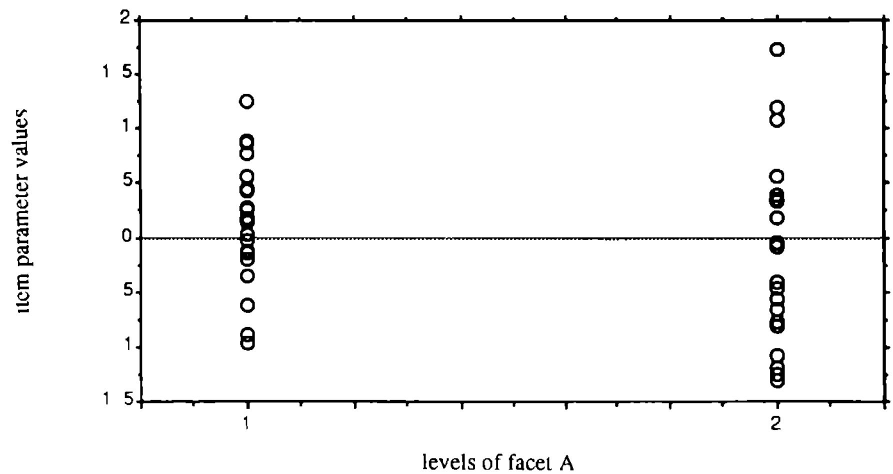
The CML estimates for the uncertainty item parameters are reported in Appendix G. On these parameters, we performed a stepwise multiple regression procedure with contrasts for all possible main and interaction effects as predictors. Table 8.46 compares the result of this analysis with the data from the first sample.

TABLE 8.46: MULTIPLE REGRESSION ON UNCERTAINTY PARAMETERS, WITH CONTRASTS AS PREDICTORS

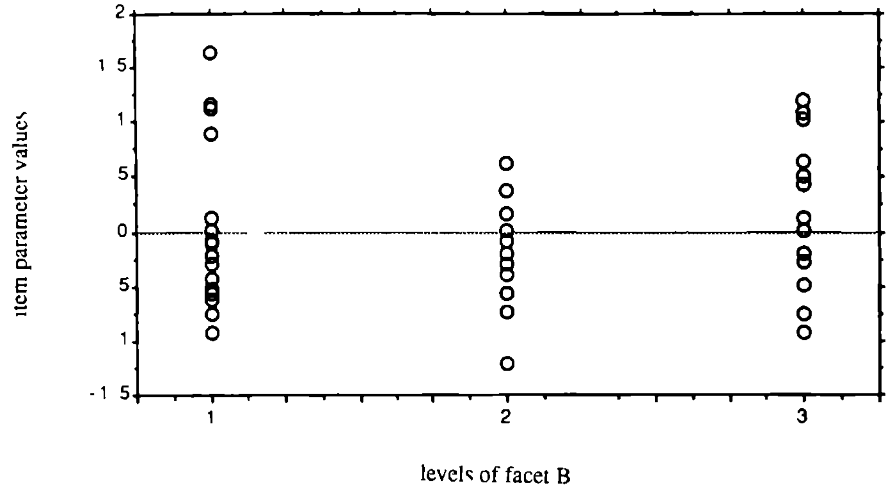
	First sample		Second sample	
Step nr.	Contrast	MR	Contrast	MR
1	C2	.441	A2E	.467
2	A2E	.584	C2	.595
3	C1	.666	A	.680
4	AB1	.723	AB1	.727
5	D	.767	B2	.773
6	B1A2E	.805	B2D	.798
7	B2C2E	.833	B1C2D	.820
8	B2A1E	.857	B2C2E	.840
9	B1	.874	C1D	.850
10	B1C2E	.889	C2D	.860
11	AB2	.904	AB2	.870
12	B2	.919	B2A1E	.880

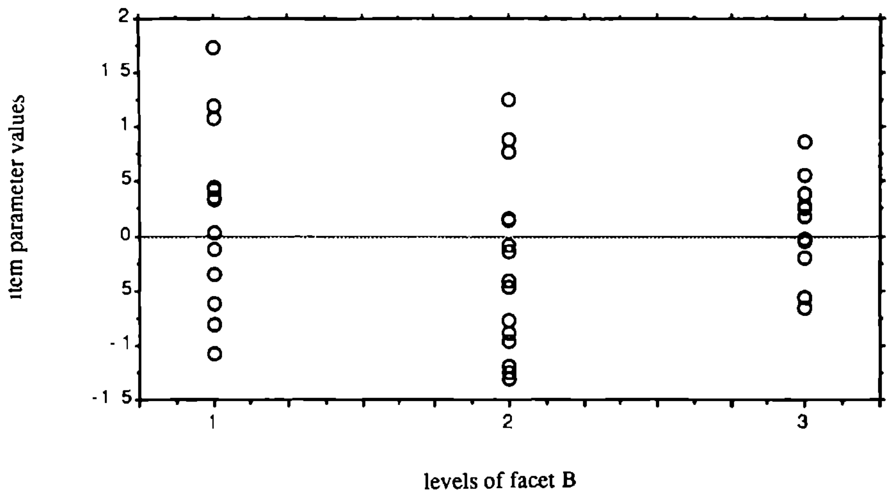
The most conspicuous difference between the results of the first and those of the second sample is that the main effect for facet D, found in the first sample, has made way for a number of interaction effects involving facet D Compared to the first sample, the structure of the data from the second sample is somewhat more complex.



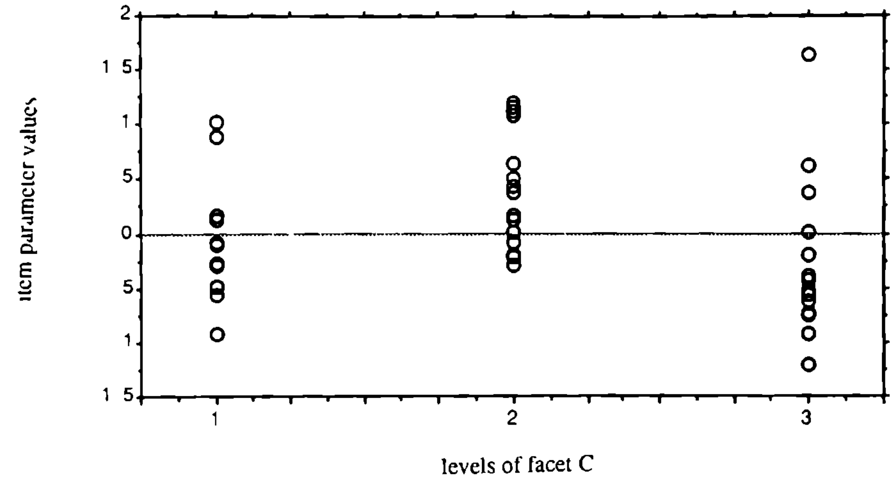


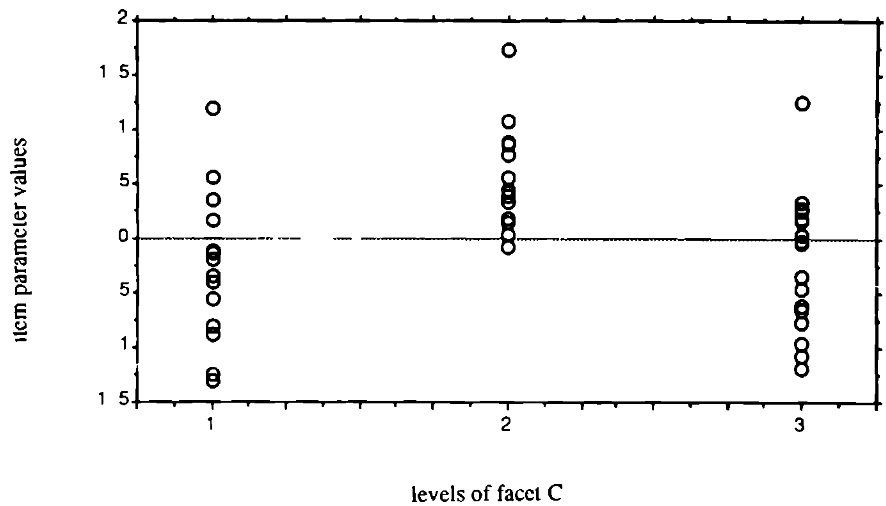
Figures 8.26a and 8.26b - A scattergram, relating the levels of facet A to the Rasch item parameter values, pertaining to uncertainty The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample Whereas in the first sample we found no difference between the roles of the two levels of facet A, for the second sample A1 situations (absence of exchanges from the subject to the other) more frequently elicit a response of uncertainty than A2 situation (absence of exchanges from the other to the subject)



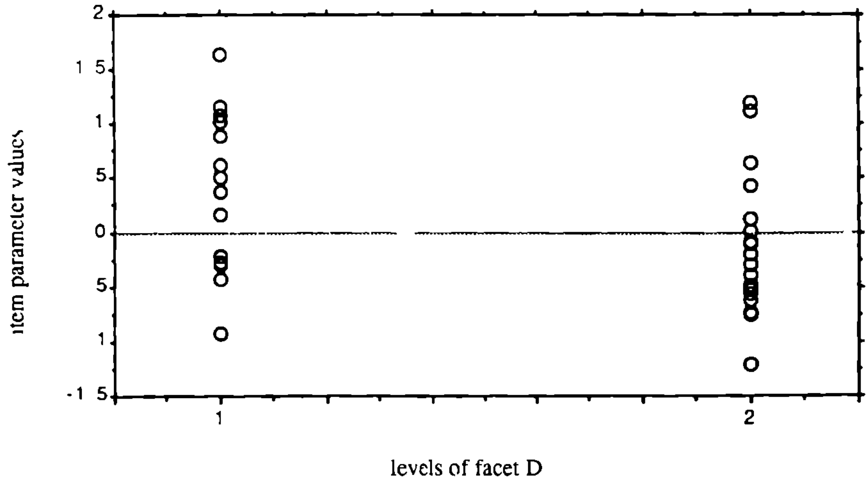


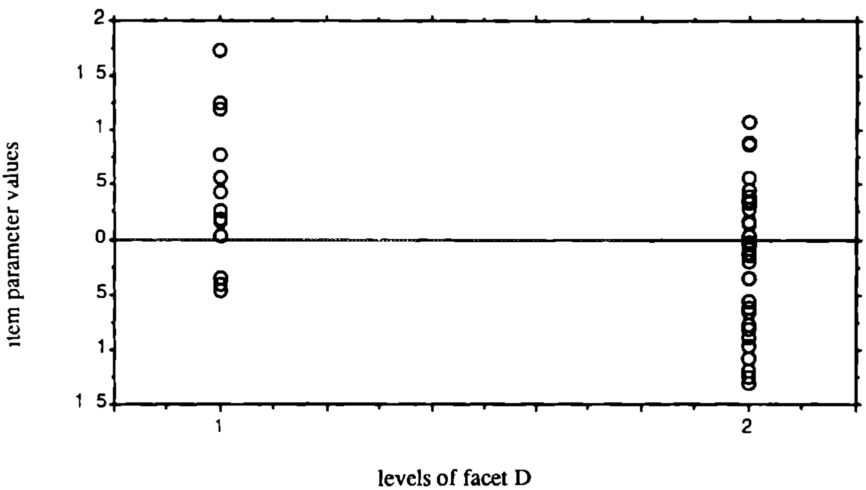
Figures 8.27a and 8.27b - A scattergram, relating the levels of facet B to the Rasch item parameter values, pertaining to uncertainty The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained largely the same, with B2 situations (attitude as focus) eliciting uncertainty the most frequently



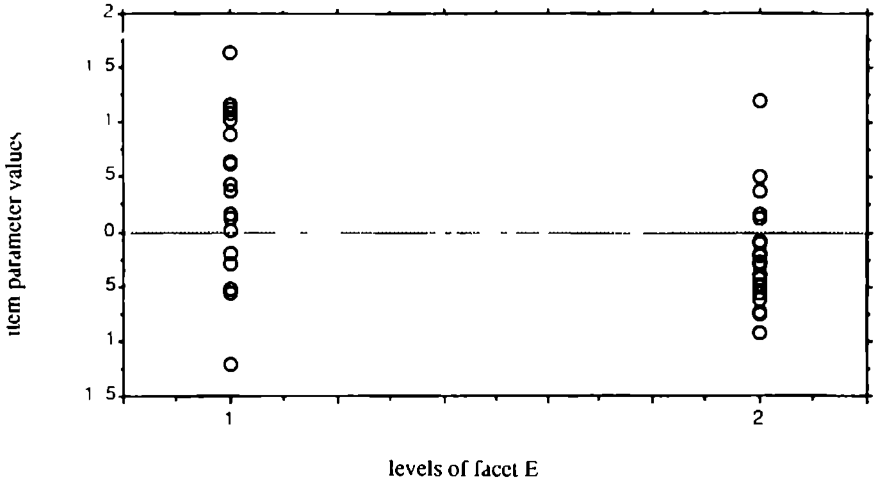


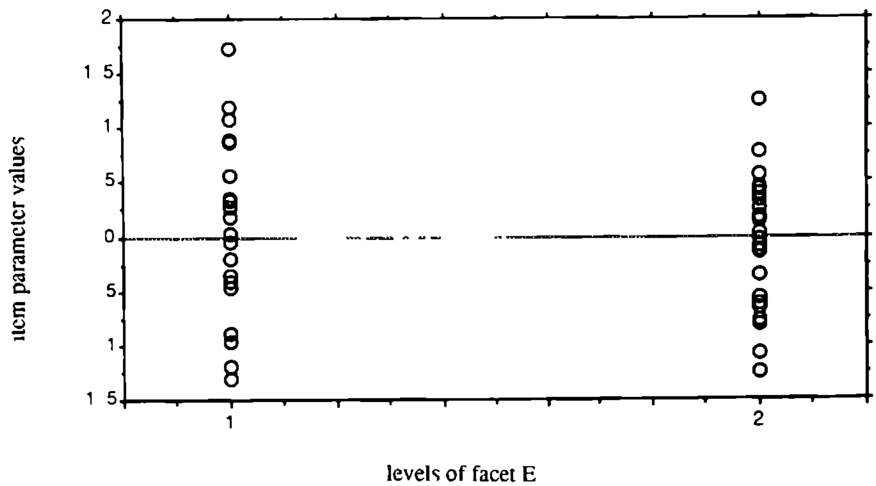
Figures 8.28a and 8.28b - A scattergram relating the levels of facet C to the Rasch item parameter values, pertaining to uncertainty The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained the same over the two samples, with absence of exchanges with relatives eliciting uncertainty the least frequently





Figures 8.29a and 8.29b - A scattergram, relating the levels of facet D to the Rasch item parameter values, pertaining to satisfaction The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample Whereas in the first sample we found that D2 ('saying') situations evoked uncertainty more frequently than D1 ('doing') situations, no difference between D1 and D2 situations can be detected for the second sample





Figures 8.30a and 8.30b - A scattergram, relating the levels of facet E to the Rasch item parameter values, pertaining to uncertainty The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained largely the same, with no noticeable difference between the roles of E1 (focus pertaining the subject) and of E2 (focus pertaining to the other)

Figures 8 26 8 30 (see previous pages), compare the roles of the facets over the two samples In the first sample, no main effect for facet A was found. In the second sample, however, we find that A1 situations - the subject not doing or saying something towards the other - elicit more feelings of uncertainty than somebody else not doing or saying something to the subject Like we found for the first sample, B2 situations (social exchanges focussing on attitudes) have the strongest potential to elicit uncertainty There is no difference in the effects of structs B1 and B3 When we found that social exchanges focussing on attitudes very easily elicit feelings of uncertainty, we hypothesized that this could be related to the academic subculture of our subjects, in which self esteem is often derived from one's ability to develop and defend interesting opinions However, for the second sample, we now find that for a more heterogeneous population social exchanges focussing on attitudes elicit feelings of uncertainty even more easily than before Like facet B, the relationship between the elements of facet C and feelings of uncertainty has remained the same over the two samples Again we find that failing social exchanges with relatives neither difficultly nor easily elicit feelings of uncertainty, and that there exists little difference between C1 and C3 situations Failing social exchanges with a partner have an equal probability of yielding feelings of uncertainty as do failing social exchanges with friends Contrary to what we found in the first sample, there is now no clear difference to be detected between D1 and D2 situations The role of facet E has not changed over the two samples Just as we found for the first sample, little difference can be discerned between the roles of E1 and E2

Interactions

Compared to the results of the first sample, three interaction effects have remained the same AB, BCE, and ABE interactions Three new interactions were also found, each involving facet D BD, BCD, and CD These latter interactions replace the main effect for facet D that was found for the first sample

Table 8 47 shows the interaction between facets A and B The upper values refer to the values found in the first sample, the lower values to the values of the second sample

Compared to the first sample, noticeable differences have emerged Originally we found that it were mainly the A2 B2 situations that gave rise to feelings of uncertainty However, in the second sample these particular situations neither difficultly nor easily elicit feelings of uncertainty Instead, we find that especially A1 B1 (not saying or doing anything about problems) and A1 B2 situations (not saying or doing anything about attitudes) easily elicit feelings of uncertainty

Table 8 48 shows the interaction between facets B, C, and E Compared to the results of the first sample, the results of the second sample show some relationships to have become somewhat stronger (more positive or negative) or weaker (closer to zero), but on the whole negative mean parameters have remained negative and positive mean parameters have remained positive The only clear difference concerns B2 C3 E2 situations not to discuss or act upon an attitude of a friend elicits feelings

TABLE 8.47: AB INTERACTION FOR UNCERTAINTY PARAMETERS - The cell entries are mean item parameters values

	A1	A2
B1	-.094	-.394
	-.396	-.425
B2	.153	-.785
	-.253	-.011
B3	.275	-.020
	.109	.273

of uncertainty easily, which it did not in the first sample

Table 8 49 shows the interaction between facets A, B and E Like the BCE interaction effect, this interaction effect too has largely remained the same in comparison with the first sample, with some relationships having become weaker and other relationships stronger The only difference concerns A2 B2 situations in the first sample we found such situations in combination with struct E1 strongly to elicit feelings of uncertainty, but in the second sample such situations do not tend to elicit uncertainty Conversely, A2 B2 situations in combination with struct E2 did not tend to elicit feelings of uncertainty, but are strongly related to uncertainty in the second sample The interaction tables involving facet D all clearly reveal struct D2 (saying) to be of far greater importance in the context of uncertainty, which is consonant with what we found for the first sample The CD interaction is caused by the fact that D2 situations strongly elicit uncertainty, but not when the social exchange partner is a relative, the BD interaction is caused by the fact that D2 situations clearly elicit uncertainty, except when the focus of social exchange forms a positive experience, lastly, the BCD interaction is caused by the fact that C2 D2 situations do not easily elicit feelings of uncertainty, except in the B2 case, when the focus forms an attitude

8 6 2 Analysis of angryness data

Figure 8 31 depicts the relationship between the CML estimates for item parameters of the angryness data for the first sample, and the corresponding parameters for the second sample The correlation is fairly high (r = 81), indicating comparable results Figure 8 32 shows the relationship between the

TABLE 8.48: BCE INTERACTION FOR UNCERTAINTY PARAMETERS - The cell entries are mean item parameter values.

	C1		C2		C3	
	E1	E2	E1	E2	E1	E2
B1	.403	-.429	.947	.409	.001	-.554
	.293	-.531	.757	-.061	.181	-.598
B2	-.872	-.411	.887	.275	-.876	.216
	-.230	-.190	.065	-.065	-.289	-.253
B3	.190	-.564	.863	.383	.136	-.145
	.579	-.389	.717	.610	.017	-.623

TABLE 8.49: ABE INTERACTION FOR UNCERTAINTY PARAMETERS - The cell entries are mean item parameter values

	B1		B2		B3	
	E1	E2	E1	E2	E1	E2
A1	-.224	-.028	-.324	.392	.315	.244
	-.271	-.459	-.584	-.088	.192	.059
A2	.924	-.704	-.846	.235	.235	-.275
	.843	-.271	.136	-.743	.916	-.371

TABLE 8.50: CD-INTERACTION TABLE FOR UNCERTAINTY ITEMS - The cells contain the number of subjects who responded to the items with the given CD structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

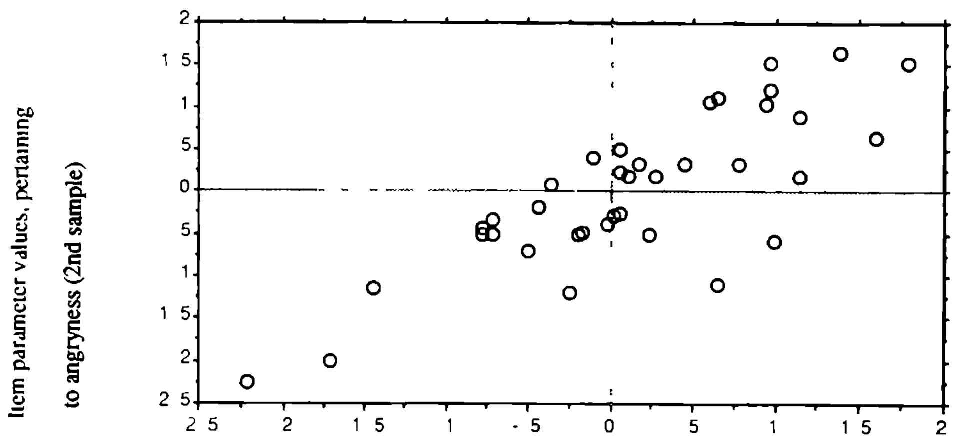
	D	level 1	level 2	Totals
C	level 1	12	16	28
		095	- 284	- 121
	level 2	12	22	34
		509	28	361
	level 3	10	20	30
		.255	- 571	- 296
Totals		34	58	92
		288	- 169	2 1739E-5

TABLE 8.51: BD-INTERACTION TABLE FOR UNCERTAINTY ITEMS - The cells contain the number of subjects who responded to the items with the given BD structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	D	level 1	level 2	Totals
B	level 1	6	11	17
		348	- 205	- 01
	level 2	6	9	15
		234	- 416	- 156
	level 3	5	9	14
		.281	122	179
Totals		17	29	46
		288	- 169	2.1739E-5

TABLE 8 52 BCD-INTERACTION TABLE FOR UNCERTAINTY ITEMS - The cells contain the number of subjects who responded to the items with the given BCD structuple profile (upper right value), and the mean parameter value for items with this structuple profile (lower right value). The mean parameters should be interpreted as item difficulty

	D	level 1			level 2	
	C	level 1	level 2	level 3	level 1	level 2
B	level 1	2	2	2	3	4
		022	466	6	321	289
	level 2	2	2	2	3	3
		064	266	5	314	156
	level 3	2	2	1	2	4
		372	794	928	183	598
Totals		6	6	5	8	11
		095	509	255	284	28



Item parameter values, pertaining to angryness (1st sample)

Figure 8.31 - A scatterplot showing the relationship between the item parameters pertaining to angryness, as estimated for the second sample (y-axis), and the item parameters pertaining to angryness, as estimated for the first sample (x axis) The correlation is fairly high (r= 81)

parameter estimates for the loneliness data of the second sample and the estimates for the angryness data of the second sample Contrary to what we found for the first sample, a faint positive linear relationship may be detected (r = 30) As situations tend to elicit more angryness, they also tend to elicit more loneliness

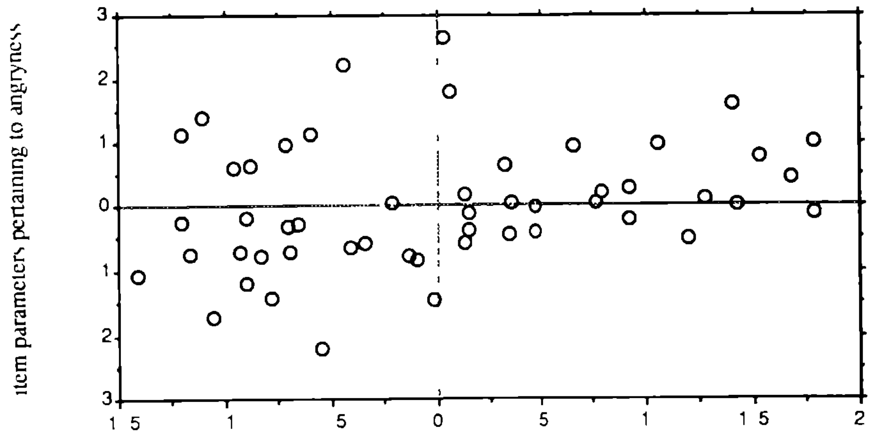
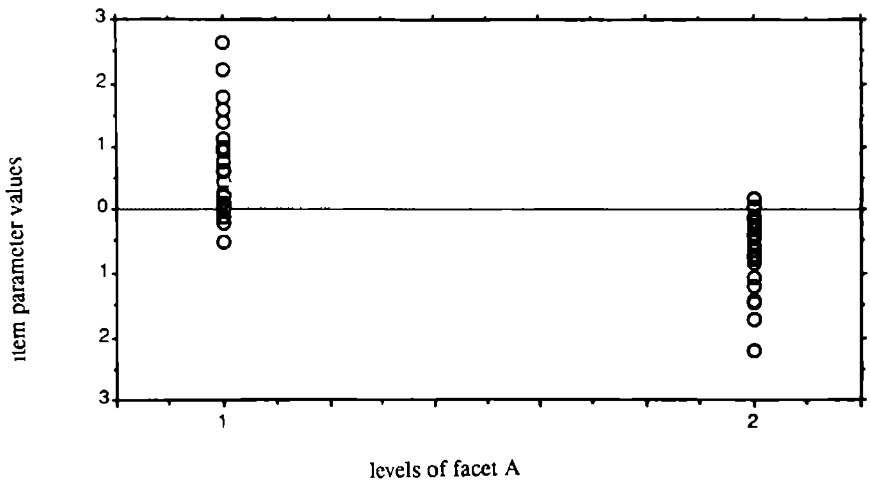


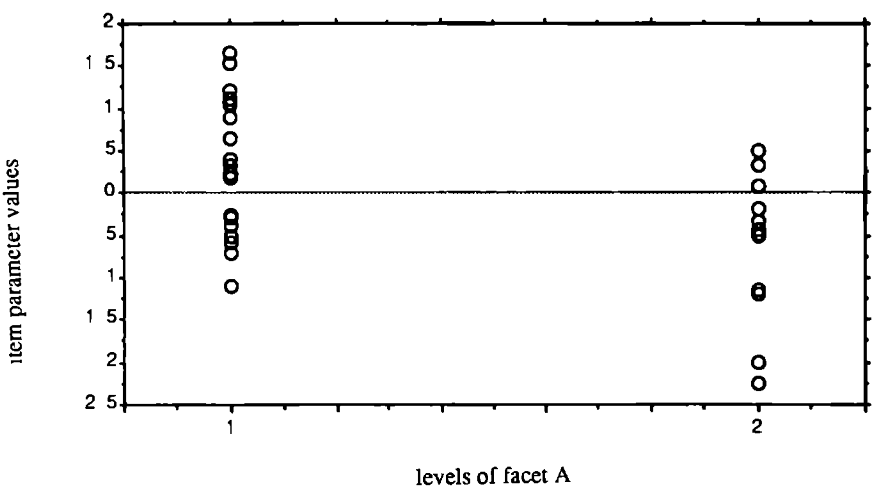
Figure 8 32 - A scatterplot showing the relationship between the item parameters pertaining to loneliness, as estimated for the second sample (x-axis), and the item parameters pertaining to angryness as estimated for the second sample (y-axis) The correlation equals 30

CML parameter estimates for the angryness data are reported in Appendix F On these parameter estimates we performed the usual stepwise multiple regression analyses A comparison of the results of this analysis for the first and second samples is given in table 8 53
It can be seen from this table that the variables that account for most of the variance in the parameter estimates have remained the same over the two samples A1, A1E, C1, and D1, signifying main effects for facets A, C, D and E The differences over the two samples are to be found in the small interaction effects that complement the regression equation

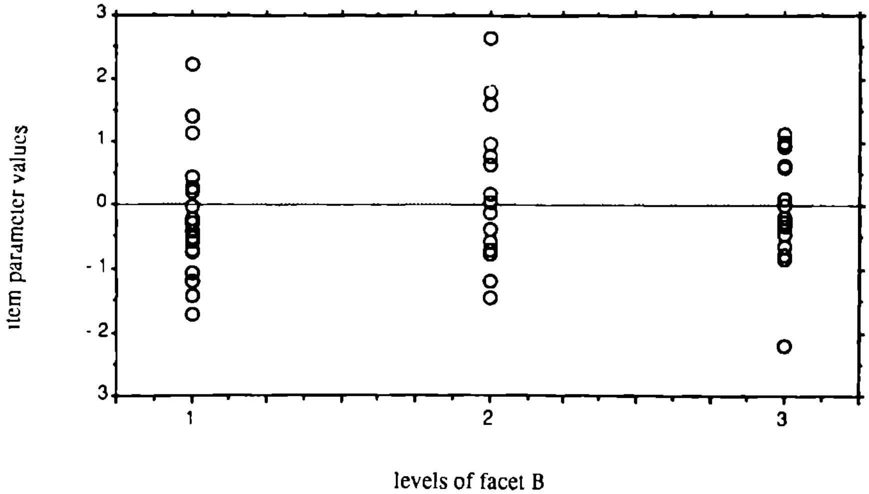
Comparing the roles of the facets

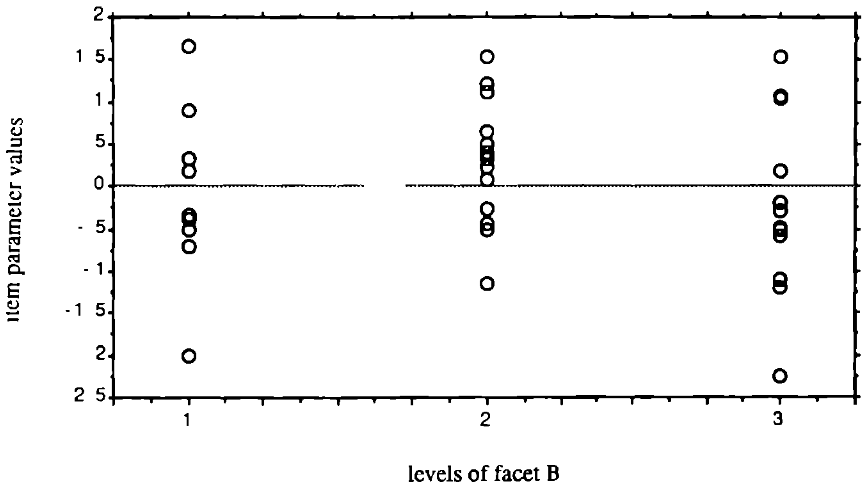
Figures 8 33a and 8 33b show that the role of facet A has remained the same over the two samples As one would expect, situations tend to evoke angryness more easily when they show others reluctant to engage into social exchange with us, then when they picture the subject being reluctant to initiate social exchange with others As can be seen from figures 8 34a and 8 34b, the difference between the three categories of facet B has become smaller, which is expressed in the small regression weight of the B1 contrast in the regression equation for the second sample Figures 8 35a and 8 35b show that in comparison to the data of the first sample, the role of struct C1 is still the most important A failing



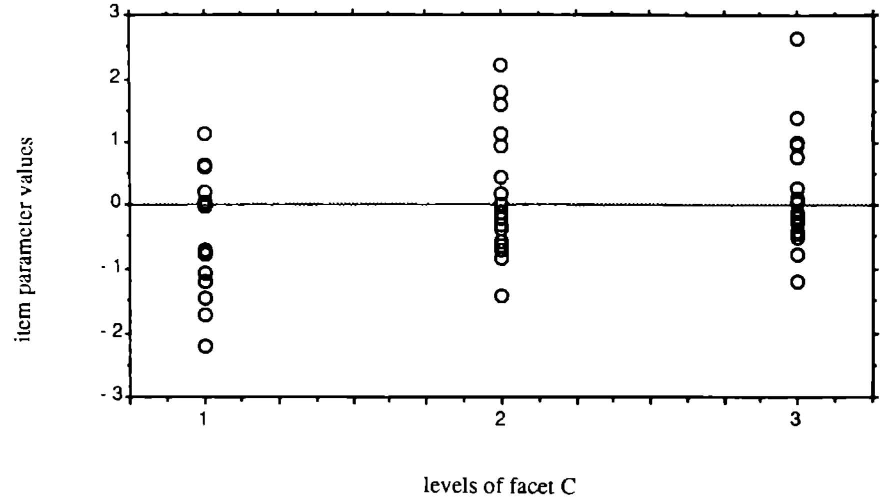


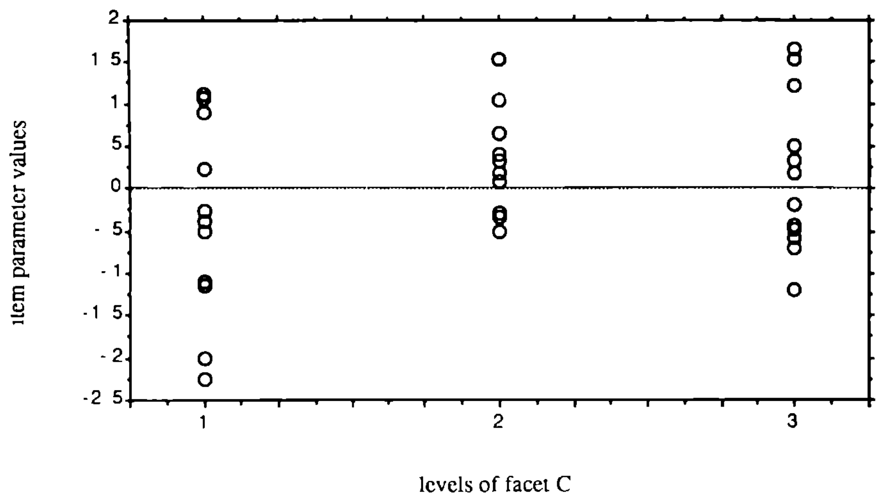
Figures 8.33a and 8.33b - A scattergram, relating the levels of facet A to the Rasch item parameter values, pertaining to angryness The upper figure pertains to the results found in the second sam ple the lower figure pertains to results found in the first sample In both samples, absence of social exchanges initiated by the other (A2) tend to elicit more angryness than absence of social exchanges elicited by the subject (A1)



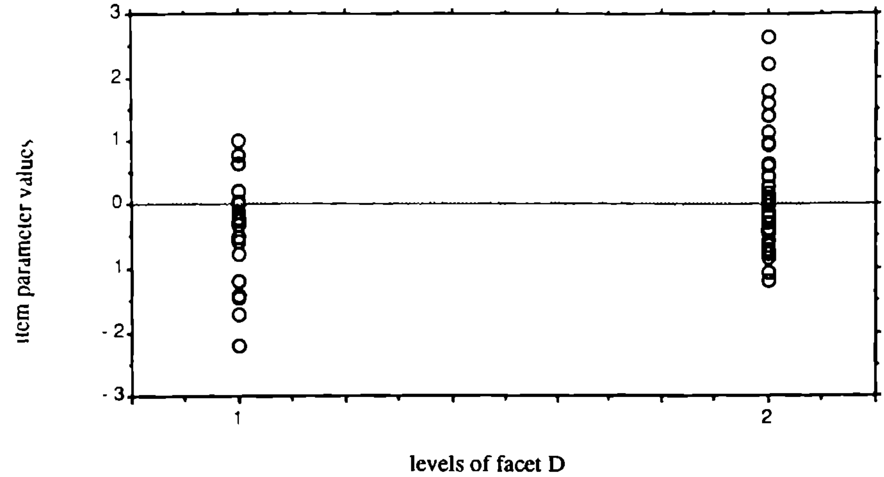


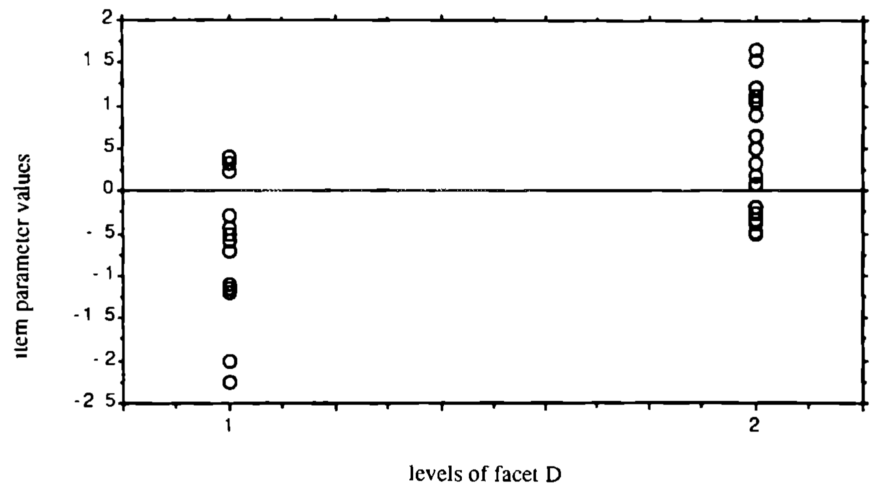
Figures 8.34a and 8.34b - A scattergram, relating the levels of facet B to the Rasch item parameter values, pertaining to angryness The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained comparable, although the roles of the three elements of facet B can be less clearly distinguished for the second sample



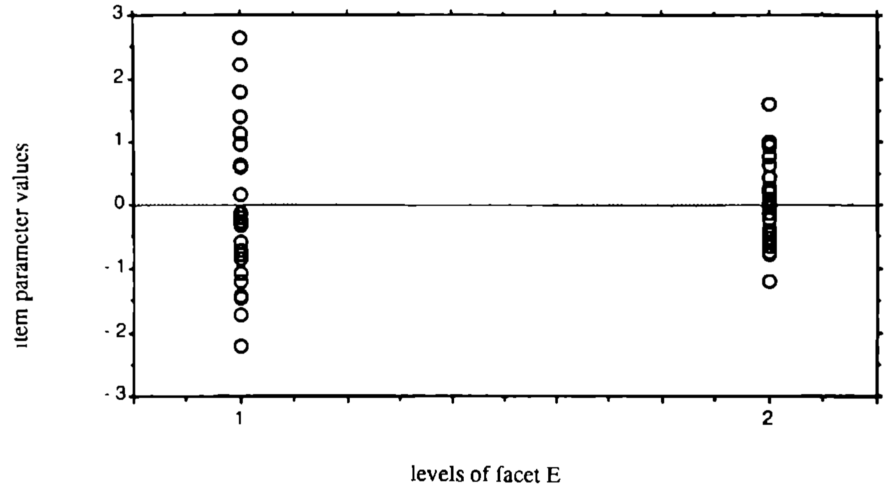


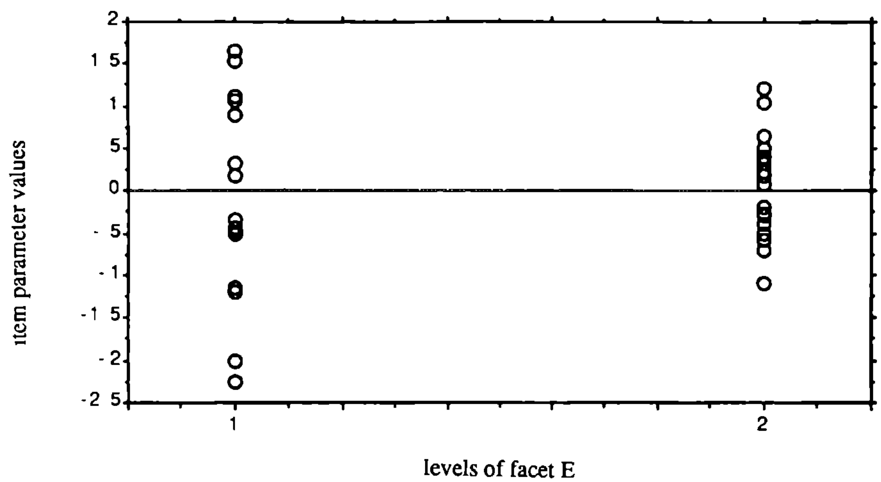
Figures 8.35a and 8.35b - A scattergram, relating the levels of facet C to the Rasch item parameter values, pertaining to angryness. The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample Absence of exchange with a marital partner still elicits angryness the most frequently, but the roles of the other two elements of facet C can no longer be distinguished





Figures 8.36a and 8.36b - A scattergram, relating the levels of facet D to the Rasch item parameter values, pertaining to angryness The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample The pattern has remained the same over the two samples, with absence of D1 situations ('doing') raising more angryness than absence of D2 situations ('saying')





Figures 8.37a and 8.37b - A scattergram, relating the levels of facet E to the Rasch item parameter values, pertaining to angryness The upper figure pertains to the results found in the second sample, the lower figure pertains to results found in the first sample. The pattern has remained largely the same, with the parameters of E1 items (focus pertains to the subject) displaying more variance than the parameters of E2 items (focus pertains to the other)

TABLE 8.53: MULTIPLE REGRESSION ON ANGRYNESS PARAMETERS, WITH CONTRASTS AS PREDICTORS

	First sample		Second sample	
Step nr.	Contrast	MR	Contrast	MR
1	A	.51	A	.74
2	A1E	.69	A1E	.82
3	D	.79	C1	.87
4	C1	.85	D	.89
5	B2	.89	C1E	.895
6	A2E	.92	B1A1E	.90
7	B2C2E	.93	B1	.91
8	B2D	.94	B2A1E	.92

social exchange with the partner tends to elicit more feelings of angryness than failing social exchanges with relatives or friends The distinction between these latter two categories, found in the first sample, has now virtually disappeared From figures 8 36a and 8 36b we learn that the roles of the elements of facet D have remained the same Absence of physical action more easily elicits feelings of angryness than absence of verbal social exchange Lastly, figures 8 37a and 8 37b indicate that the roles of the elements of facet E have remained the same as well, with the parameters of E1 situations showing more variance than the parameters of the E2 situations

Interactions

The regression equation for the second sample shows the importance of two interaction effects, one of which - ABE was also found present in the equation for the first sample - and the other - CE - is new

Table 8 54 shows the interaction between facets A, B, and E As before, the upper values refer to the data of the first sample, the lower values refer to the second sample The table shows only a few differences, all pertaining to E2 situations A1 B1 E2 situations easily elicited responses of angryness in the first sample, but in the second sample the item difficulty has increased, and such situations now neither easily nor difficultly elicit a response of angryness A1 B3 E2 situations have changed even more dramatically, from eliciting responses of angryness very easily in the first sample to eliciting

TABLE 8.54: ABE INTERACTION FOR ANGRYNESS PARAMETERS - The cell entries are mean item parameter values

	B1		B2		B3	
	E1	E2	E1	E2	E1	E2
A1	1.268	-.266	1.322	.421	.924	-.154
	1.582	.034	1.696	.551	.900	.537
A2	-1.173	XXX	-.435	.293	-1.309	-.342
	-1.066	-.574	-.575	-.506	-.756	-.621

such responses very difficultly in the second sample. Finally, A2 B2 E2 situations have changed into the other direction: these situations elicited responses of angryness very difficultly in the first sample, but now do so very easily in the second sample.

TABLE 8.55: CE-INTERACTION FOR ANGRYNESS ITEMS - The cells contain the number of subjects who responded to the items with the given CE structuple profile (upper right value), and the mean parameter value for items with this CE structuple profile (lower right value). The mean parameters should be interpreted as item difficulty.

	E*	level 1	level 2	Totals.
C	level 1	8 - 597	8 - 224	16 -.411
	level 2	9 165	9 121	18 143
	level 3	9 244	9 199	18 222
Totals		26 - 042	26 042	52 -9 615E-5

Table 8.55 shows the interaction between facets C and E. The effect can be seen to be only small: it is caused by the fact that the difference between C1 E1 and C1 E2 situations is considerably bigger than the difference between the other C E1 and C E2 pairs.

8.7 Summary and conclusions

This second main study was conducted for the purpose of cross-validating results that we had found in the first Since in the first sample we had used exploratory techniques such as stepwise regression analysis in order to uncover the best possible linear logistic test model, there was a possibility of capitalization on chance, even if the best fitting LLTM did correspond to a large extent to the model that we had predicted

The second sample of subjects differed considerably from the first It was formed by a random selection of inhabitants of Nijmegen, whereas our first sample consisted entirely of (generally young) students Owing to this fact, the second sample showed considerable more variation on background variables such as age, income level, educational level, civil status, having children and having sufficient friends The procedure of administrating the questionnaire had also changed over the two samples whereas in the original sample subjects were allowed to fill out the questionnaire privately at home, in the second sample questionnaires were administered by trained interviewers who paid the subjects a personal visit

For the second sample, we had not attempted to replicate the results from the SSA and Addtree analyses, as these analyses had been shown in the first sample to yield little interesting results The attempts at replication were thus entirely concentrated on the Rasch analyses First order tests on loneliness data showed an even better fit than was found in the first sample, but like before, second order tests did reveal violations of the local independence assumption Again, it could be shown that at least part of this violation is caused by the similarity in the item formulations, owing to the template form we had chosen Bearing in mind the high power of the Q(2)-test that was performed, and the positive indications provided by the first order tests, we decided to proceed with additional analyses, aimed at retrieving the LLTM-structure found in the first sample

The original best fitting LLTM was replicated to a considerable degree The only differences between the LLTM found in the first and that found in the second sample all pertain to facet C The interesting result was revealed that for the young students, social exchange with relatives plays an important role in the presence or absence of loneliness, whereas social exchanges with a partner do not For the more mature subjects of the second sample, this situation is reversed We explained this finding by noting that for younger people, partner relationships still tend to be casual and immature, whereas relations with parents and siblings are still frequent and of primary importance For older subjects, the parental home has long been left behind, and the need for intimacy is primarily satisfied by a partner relationship

This key difference between subjects of the first and of the second sample seems to account for the differences between the LLTM-models found for the two samples Rasch parameters for the second sample, reproduced out of the η parameters derived from the LLTM for the second sample, and Rasch parameters for the first sample, reproduced out of the η parameters derived from the LLTM for the first sample correlate 90, providing additional corroboration that both LLTM-models match very well

Like we found in the first sample, the situational hypotheses pertaining to facets A, B, and E were corroborated, and facet D again showed no effect at all As we just stated, with regard to facet C, findings for the first and second samples diverge, in that the roles of structs C1 and C2 have interchanged The ABE and BCE interactions, found in both samples, have remained the same, except for the fact that in the second sample all mean parameters values pertaining to C1 have become more negative, and all parameter values pertaining to C2 have become more positive

Like in the first sample, it was found that there exists no association between proneness to loneliness and any of the proposed personal determinants of loneliness The conclusion must be that proneness to loneliness is unrelated to actual social relations Of all the background variables, only sex proved to be significantly associated with proneness to loneliness The general finding, often reported in the literature, that women sooner tend to admit that they feel lonely than men do, was replicated in the second study, but it was not found to hold in the first Additional analyses showed that the LLTM could be improved by including an interaction effect involving sex in it this effect showed that it is particularly the absence of social exchanges with friends that makes women feel lonely sooner than men

The explorative analyses of valuation, satisfaction, angryness and uncertainty data, which we conducted in the first sample, was repeated for the second sample Valuation data again showed Rasch homogeneity (as indicated by first order tests), and the valuation parameters of the second sample correlated 91 with the valuation parameters of the first sample, indicating that the item difficulties for the valuation items have remained largely the same The internal structure of the valuation data, as revealed by stepwise regression analysis, has largely remained the same, with one less interaction effect (CE) and an additional main effect (E) The satisfaction items also revealed evidence of Rasch homogeneity, and the item parameters for the satisfaction data of the second study correlated 73 with the item parameters of the first study The internal structure has remained largely the same, but with the main effect for facet C, found in the first sample, now replaced by contrasts specifying CE interactions

In the first study we found the uncertainty items to possess Rasch homogeneity after deletion of six items For the second sample we analyzed this particular subset of uncertainty items and first order tests again indicated a good fit of the Rasch model For the first sample, an interesting relationship was found between loneliness and uncertainty items For items that depict situations that difficultly elicit loneliness, a negative linear relationship with uncertainty was revealed, whereas for items depicting situations that elicit loneliness easily, a positive relationship with uncertainty was found This dual relationship could be explained with reference to the AB interaction in the data However, for the second sample, no relationship between loneliness and uncertainty was found for those items that easily elicit loneliness, whereas only a faint positive linear relationship can still be detected between uncertainty and loneliness for items that difficultly elicit loneliness The internal structure of the uncertainty data has become more complex, with the main effect of facet D, found in the first sample, now replaced by various contrasts specifying interaction effects involving facet D

Lastly, the set of angryness items also revealed Rasch homogeneity, and the item parameters for the second sample correlated 81 with those for the first Contrary to what we found for the first sample, a faint positive linear relationship between loneliness and angryness can now be detected: situations that tend to elicit more loneliness, also tend to elicit more angryness. The internal structure of the angryness data reveals the same main effects, but different interactions.

Overall, the conclusion must be that we have been quite succesful in replicating results that we found in the first main study, indicating that the structures that we uncovered in the data were not due to capitalization on chance. Our replications are even more succesful when we consider the fact that there were marked differences between the subjects of the two samples: the first sample a homogeneous collection of young, educated students, and the second sample a heterogeneous collection of inhabitants of Nijmegen.

Starting point for this dissertation was the discontent with the practice of operationalization in social science and in psychology This traditional research practice we referred to as the conceptual entry tradition In this thesis, we have been exploring an alternative research methodology, which we referred to as the empirical entry approach Guttman devised a systematic method of plotting empirical observations, which he called facet design Like the space-time coordinate system in physics, Guttman intended the facet design to become the coordinate system for plotting psychological and sociological data The only difference between a facet design and the space-time coordinate system being that the former will often consist of (many different) qualitative categories, whereas space-time is described by just a few quantitative facets

Just like a theory in physics pertains to regularities that may be described in terms of relation ships between its facets (i e space and time coordinates), Guttman felt that a theory in social science should pertain to regularities in terms of relationships between the facets that describe its domain 'A theory is an hypothesis of a correspondence between a definitional system for a universe of observations and an aspect of the empirical structure of those observations, together with a rationale for such a hypothesis' There are many different aspects to the empirical structure of the observations pertaining to the faceted domain, but for unclear reasons Guttman and his followers have restricted themselves to the correlational structure of empirical domains Stressing that theories should be stated in terms of the data analysis to be used, Guttman resorted to the specification of regional hypotheses (predictions of similarity structures), which he analysed with use of SSA This specific approach by Guttman has come to be known as facet theory, by which he derived several lawful structures, like the cylindrex structure of the domain of intelligence items (see chapter 2)

It is noteworthy that Guttman first proposed his ideas on facet theory in the mid-fifties, and that there have been little new developments in this research strategy since then Furthermore, although a promising alternative to conventional research strategy, facet theory has not succeeded into establishing a new methodological paradigm for social science In chapter 2, we linked this failing popularity and stagnation in progress to a number of weak points in Guttman's approach

First, the prediction of order relations among correlation coefficients of a faceted domain is a trivial pursuit the order relations follow more or less logically from the particular way we have chosen to construct our facet design This also means that, unlike practice in the physical sciences, we have a contamination of the definitional system with the theory the former depends on the latter (see Roskam, 1981)

Second, the regional hypotheses yield a type of lawfulness that differs from the general laws that function in deductive nomological explanations Second laws specify the internal structure of a domain of content, they do not permit the derivation of specific consequences under certain conditions, and therefore do not constitute explanations of specific social or psychological observations

A third weak point of facet theory is that no rationale is given for the use of a particular type of similarity coefficient Each similarity index implies a certain loss function, and different indices need not necessarily yield the same structures This abstinence of theoretical justification for technical choices is also manifest in the assumption that the similarities can be embedded in a metric space with additive segments, as implied in the use of SSA No rationale for making this assumption is given by facet theorists In general, technical choices imply assumptions that should be compatible with the data generating process, and understanding the nature of this process requires substantive theory, which is lacking in facet theory (cf Roskam, 1981)

A final point of criticism that we leveled against facet theory, and which we think provides a particular reason for its lack of popularity among social scientists, is the fact that SSA deals exclusively with the structure of a given domain of observations, and ignores differences between subjects yiel ding the information concerning this structure Especially for psychologists, this is therefore an unsatisfactory approach Facet theorists do sometimes complement these SSA analyses with multidimensional scalogram analyses, yielding an ordering of subjects along different dimensions However, it is unclear how data pertaining to the SSA analyses relate to those of the MSA analyses

These points of criticism make clear that Guttman's facet approach needs to be further developed into alternative directions The empirical entry approach, outlined in chapter 3, retains the cardinal idea of facet design as a coordinate system for plotting psychological observations, but discards the link with data analytical procedures such as SSA Instead, the aim has been to translate a substantive theory that relates person and situation facets to the response facets into a model that gives a probabilistic description of the structure in the data matrix It is only after formalization that a theory can be properly tested, and that theoretical concepts and measurements are firmly rooted in the data The latter no longer constitute (more or less arbitrary) operationalizations of a concept-as-intended, but refer to certain structures in the data, regulated by parameters in the model (cf Roskam, 1989b) Coombs' theory of data provides a general framework for the formalization of substantive theories into data models, for questionnaire data, the prototypical model seems to be Rasch' one parameter logistic model

Although our alternative elaboration of Guttman's approach does not require the use of any particular method of data collection, we have examined the merits of our methodology using the questionnaire method The role of the questionnaire in the framework of the empirical entry approach clearly differs from its role in the traditional methodological approach Whereas traditionally questionnaires are used as measurement instruments, we have used the questionnaire as a research instrument In its role as research instrument, a questionnaire contains the observations (in the form of items) necessary for testing a theory on a faceted domain Whether the data that we collect with the questionnaire yield measurements, depends on the structure in those data The theory may predict a data structure that yields some sort of measure, but empirical research will have to determine if this prediction is born out If so, the questionnaire forms a measurement instrument, if not, it does not (cf Roskam, 1989b)

In our research, we have tried out the empirical entry approach on the domain of states, feelings and opinions This domain we referred to as that of appraisive judgements, and it is traditionally almost exclusively approached within the operationalization tradition One of the research fields that belongs to the domain of appraisive judgements and which has been extensively studied using the methodology of the conceptual entry approach, is the field of loneliness research The domain of loneliness experiences became the object of the present studies, reported in this dissertation We sought to answer several research questions, some of a purely methodological nature, others of a substantive nature, pertaining to the field of loneliness The key methodological question we sought to answer was if the empirical entry approach, which has been so succesful in the natural sciences and which has been used with some success in fields like mathematical psychology and psychonomic research, could be used as an acceptable alternative to the conceptual entry approach for the domain of appraisive judgements More specific methodological questions were, first, how a facet design should be constructed so as to be useful as a research tool in an empirical entry oriented study, and second, how to translate the structuples that may be derived from the facet design into useful and unequivocal questionnaire items

Apart from these methodological questions, we also set out to answer some questions pertaining to the substantive domain of loneliness experiences First, is it possible to refer the proneness of individuals to appraise themselves in certain situations as lonely, and the potential of situations to evoke feelings of loneliness to a single, unidimensional continuum? Second, what are the features of situations and of individuals, that determine the likelihood that a certain person will appraise himself in a given situation as lonely?

9.1 Methodological issues

9 1 1 Domain definition versus research design

Although there exists a great variety of literature on facet design, little attention is usually given to the question of how to construct one Studying practical examples does not provide much help to the uninitiated the facet designs that are reported in the literature range from very general with just a few generic facets to highly specific with a number of facets and facet elements that allow for the derivation of thousands of structuples

The confusing picture is due to a distinction in the use of facet design that is usually left implicit Facet designs are employed either as a tool for defining domains or as a research design, in the simplest form an observation scheme The need for a well defined domain was clearly observed by Coombs, when he pointed out that much theory testing in psychology does not result in an overall acceptance or rejection of the theory, but rather into an increasing clarity into the boundaries of the domain to which the theory pertains (Coombs, 1983) Coombs recommended facet design as a useful tool for defining domains

The question of how to construct a facet design can now be answered with reference to its intended use The first construction rule is that, as a tool for defining domains, a facet design should contain only 'necessary' facets, i e facets which omission in the design would lead to the inclusion in the domain of a number of phenomena that we do not consider as belonging to our domain of interest For example, loneliness always pertains to social exchange situations (which needs to be specified with a necessary situation facet), intelligence behavior always concerns problem solving behavior that can be objectively classified as right or wrong (which needs to be specified by a necessary response facet), etc

A second construction rule is that a necessary facet should be split up into its constituent elements only if these elements serve to demarcate behavior of interest from irrelevant behavior that would be included into the domain had the full set of elements constituting the necessary facet been taken up For example, in all intelligence behavior the situation evokes either the application or the inference of an objective rule, but it does not call for a recitation of such a rule Hence, the domain definition should contain a facet specifying the use of an objective rule In contrast, since loneliness phenomena always pertain to social exchange situations and since there are no specific types of social exchange situations that do not have any bearing on loneliness experiences, 'social exchange situations' is taken up as a necessary facet in the domain definition, without its elements being specified

So two rules for the construction of domain definitions are that the facet design should contain only necessary facets, and that these should be split up into constitutive elements only in case the inclusion of some possible facet elements would result into the inclusion of behavior that we do not consider as belonging to our domain of interest In its role as a research design, a facet design will be very articulated, and contain as many facets as required for a proper test of a theory Which facets will be included in a research design type facet design, depends entirely on the hypotheses that may be derived from the theory, and which dictate the observations that must be made for its testing So the articulation of the domain definition into a research design is forced by necessity It is important that the facet elements in a research design are as objective as possible, i e various judges should agree on concrete examples of the facet elements In addition, the elements should be exhaustive and mutually exclusive

In our research on loneliness, our theory consisted of a number of hypotheses on situational and personal determinants of the loneliness experience, that were suggested by earlier research on loneliness In the course of our research, we came to the conclusion that one of the hypotheses pertained to observational categories that were not unequivocal what we called the 'Type of social exchange' facet contained the elements 'emotional', 'instrumental', and 'informational' Terms that closely corresponded to those used in existing research literature However, there is considerable room for controversy on what exactly constitutes an 'emotional' type of social exchange, or when we may speak of an 'instrumental' type of social exchange We were therefore forced to think of further reduction of our observational categories to more elementary and less equivocal facet elements Eventually, these became simply 'to do' something versus 'to say' something

Another facet had to be changed because the elements did not prove to be mutually exclusive This was the 'Focus of social exchange' facet, containing the elements 'problem', 'attitude', and 'experience or activity' The third category could overlap with the first, in case the experience was of a highly negative emotional character In such a case, the experience would be a traumatic one, and as such constitute a problem We therefore changed our third category into a 'positive experience or activity', excluding any possibility of overlap with the problem category

The conclusion with regard to the construction of facet design is that facet designs may be employed in two different ways We may use it as a tool for defining domains, or we may use it as a research design In its latter role, facet design functions as a coordinate system for plotting observations Whereas domain definitions will usually contain just a few generic facets, research designs are characterized by their articulate appearance, containing many specific facets that are as objective as possible

9 1 2 Depth versus surface structure

A facet design in its role as research design functions as a coordinate system for plotting observations The hypotheses are stated in terms of the categories of the facet design and predict that only a subset of the logically possible PxSxR combinations will actually be manifest in the data matrix To collect data, the structuples of the facet design have to be translated into actual observations, in the case of a questionnaire, these will be items

A problem is that there are multiple ways in which an abstract PxSxR structuple may be translated into a concrete questionnaire item Although the theory is stated in terms of relations between facets, it is tested by observing subjects' responses to concrete items For a valid test of the theory, it is therefore of importance that the item formulations correspond as closely as possible to the structuples

For a translation of structuples into questionnaire items, there are broadly two different possibilities One is to stick as closely as possible to the structuples The simplest way to achieve this is to concatenate the various structs and to add some connectives so as to produce a readable item A drawback of this procedure is that the items will tend to look alike, and that the task of filling out the questionnaire will quickly become monotonous

The other possibility is to construct a real life situation that may be considered as a concrete example of the abstract structuple The latter option will result into a questionnaire with diverse content, but has the drawback that the researcher cannot be sure that the subject interpretes the situation pictured in the correct way, that is, as a translation of the underlying structuple Research has shown that when asked to match concrete items to abstract structuples, judges will tend to disagree with one another Our own preliminary research indicated similar problems occurring with the use of concrete item formulations

Since a proper test of a theory requires that the researcher can be confident that his subjects will interpret the items the same way, we eventually chose to make use of the first option, and created items by concatenating structs with the addition of some verbal connectives The resulting items we referred to as templates However, our pilot study indicated that even the use of these templates could result into idiosyncratic interpretations Some subjects tended to confuse certain facet elements with one another, or simply to ignore them To minimize the risk of such idiosyncratic interpretations, we added several 'reminders' to the items in the actual questionnaire (e g in an item figuring 'to do' we would add an italicized message like 'Remember that 'to do something' means something else than simply 'to say something') and we included some preparatory tasks in the questionnaire, which the subject had to handle before starting on the actual questionnaire Such tasks were intended to make subjects reflect on the differences between the various categories used (e g he would be asked name five different problems that you can think of, next name five different attitudes that you can think of, and finally name five different positive experiences or activities that you can think of)

The fact that so much trouble was necessary to ensure as much as possible that items would correctly be interpreted as translations of certain structuples, indicates that the alternative option of using a varied set of concrete, 'real-life' situations as items could not possibly be used for a test of the theory Using facet design as a coordinate system for plotting observations demands that we use categories that are as objective and unequivocal as possible, and that these categories are represented in the items such that they are as recognizable as possible Our research indicates that this requirement necessarily leads to the adoption of template items The use of templates does however involve negative consequences like monotonous questionnaires and a risk of memory and consistency artefacts in the responses Such negative consequences will be further discussed in the next subsection

9 1 3 Formalized theory of appraisive judgements

Many of the traditional theories of loneliness use explanatory concepts at a high level of abstraction Much used concepts in this field are, for example, 'intimacy', 'social support', 'standards with regard to social network', and 'quality of social network' While such concepts have a strong intuitive appeal when we attempt to understand the experience of loneliness, their exact relationship to an empirical domain of observations remains obscure This is partly due to the fact that these concepts were raised following a conceptual entry approach - i e the researcher started out with postulating the empirical meaningfulness of these concepts and proceeded to construct scales for them - and partly the result of their high level of abstraction These concepts do not regulate lawful relationships between elementary observational categories, but aim at a much deeper understanding Our view is that such deeper understanding will not be possible in a stage where no lawful relationships between more elementary observational categories have as yet been discovered Like we noted in chapter 3, much social science research is characterized by over-ambitiousness The modern physicists did not start out with hypothesizing on the structure of the atom, but with describing the laws of falling bodies Our empirical entry approach to the study of loneliness aimed at identifying relevant elementary observational categories, that would allow for the uncovering of some fundamental lawful relationships

Careful study of the existing literature on loneliness suggested the following facets direction of the social exchange (who initiates the exchange?), focus of the social exchange (what is the social exchange about?), partner of the social exchange (whom is one exchanging with?), mode of the social exchange (is one doing something, or merely saying something?), and finally the locus of the focus of the exchange (is the focus of the exchange related to the subject or to the other?) These facets we hypothesized to be situational determinants of loneliness, i e they form features of situations (portraying absence of social exchange) that determine the likelihood that an individual will feel lonely

Our theory predicted that these features or characteristics of situations would each independently contribute to the likelihood of a person feeling lonely, but that different elements of these situational facets would have a different potential of eliciting loneliness The absence of social exchange focussing on a problem, for instance, was hypothesized to be more potent in eliciting loneliness than the absence of situations focussing on attitudes (for a more detailed discussion of the predictions with regard to the situational facet elements, see subsection 9 2 1 below) Therefore we hypothesized that situations could be ordered with regard to their potential to evoke loneliness, and that this order could be understood with reference to the constituent facet elements Apart from situations differing in their potential to elicit loneliness, we also hypothesized that different individuals would show a different proneness to respond to situations with a feeling of loneliness The proneness of a subject to feel lonely we hypothesized to be primarily determined by the number of social exchanges that he or she values and is satisfied with, relative to the number of social exchanges that the subject values The more valued social exchanges that one is satisfied with in one's actual life, the less likely one is to feel lonely in any given situation (for more detail on the prediction with regard to the personal determinants of loneliness, see subsection 9 2 1 below)

To test our theory on the determinants of loneliness, hypothesized relationships between facets and responses had to be formalized into a model describing the structure in the data matrix For single stimulus dominance data the prototypical model is the one parameter logistic model, usually known as the Rasch model Various tests for investigating the tenability of this model exist, which broadly fall into two categories So-called first order tests check on the assumption of ICC holomorphism, whereas second order tests are sensitive to violations of unidimensionality and local stochastic independence Although some hold that first order tests provide sufficient indication of the goodness-of-fit of the model, we used both types of test

Our first order tests returned an acceptable goodness-of-fit of the model, but the second order test indicated violation of the model assumptions Further investigation provided evidence of some violation of local independence owing to the similarity of items with a comparable structuple profile Since the power of the second order test that we used was high (implying that small violations of the assumptions would lead to a significant result), and since the first order tests indicated a good fit of the model, we decided to treat the data as quasi Rasch homogeneous, and to proceed with additional analyses

However, in future research this problem should be carefully looked into In the previous subsection we discussed the necessity of using template-like items, to ensure that the items would be correctly interpreted by all subjects Only then can a facet design be used as a coordinate system for plotting observations, and will there be a possibility of identifying lawful relationships among responses But the use of template items is likely to yield memory and consistency effects, resulting in violations of local independence This means that either another data model should be used, one that incorporates this correlatedness of resembling items, or provisions against the unwanted effects should as far as possible be taken in the construction of the design The latter strategy does not seem to promising, however To curb the effects of memory, two similar items should be separated by a substantial col lection of distraction items This is not feasible since this would greatly increase the number of items, and in our present research we already had to make use of an incomplete design to keep the number of items in the questionnaire within an acceptable limit

Nonetheless, despite the memory and consistency effects that could be traced in our data, our formalized approach may be qualified as succesful in that many of the hypotheses were corroborated, and that alternative structures in the data that we did not expect (notably certain interaction effects) proved to be interpretable and could be replicated in our second study (see the next section)

In our theory on loneliness there are two concepts that are strictly theoretical the proneness of individuals to respond to situations with loneliness, and the potential of situations to elicit a response of loneliness These two concepts we did not conceptualize and measure in advance of our main empirical research, instead their meaningfulness follows from the structure in the data such as we found it in both studies Because of their meaningfulness, our research has enabled us to measure the proneness of our individuals to respond to situations with feelings of loneliness, and also to measure the potential of situations to elicit feelings of loneliness

In addition, we have succeeded into decomposing the potential of situations to elicit feelings of loneliness into more basic effects, corresponding to the facet elements and to interactions between these These basic effects could be identified by posing linear constraints on the item parameters of the Rasch model, resulting into a restrictive variant of the model known as the linear logistic test model (LLTM) Orthogonal contrasts for all possible main and interaction effects were constructed and subsequent analyses showed that an LLTM with 10 contrasts involving both main and interaction effects could not be significantly distinguished from the original unconstrained Rasch model However, any linear transformation of a set of orthogonal contrasts will yield an alternative set of orthogonal contrasts Close inspection of the data suggested that one contrast in the model could be eliminated by a transformation of some of the original contrasts Data analyses with the new set of contrasts indeed yielded an optimal LLTM containing one less interaction effect

The conclusion must be that an empirical entry approach to a domain of appraisive judgements does indeed provide a challenging alternative to the traditional conceptual entry approach The endeavour to establish lawful relationships between objective categories is a line of research that can be replicated or elaborated upon by other researchers much easier than the traditional approach in which theories are tested involving highly abstract concepts that are measured apriori and whose empirical meaningfulness is open to dispute The empirical meaningfulness of our theoretical concepts has been empirically verified and can be done so by any researcher who studies relationships between the same observational categories Extensions or modifications of our research can be achieved by using additional or alternative observational categories, the fruitfulness of which can be objectively demonstrated or shown to be failing

The empirical entry approach thus provides a foundation for cumulative theory construction However, we have seen that at present we have not been able to cover the structure in the data with a data model that is empirically precise our Rasch model ignored the violations of local independence in the data structure In future research thought must be given to a more correct modelling of the data, that allows for the description of the latent continuum along which subjects may be ordered as more or less prone to feelings of loneliness and situations may be ordered as having a stronger or weaker potential to elicit loneliness, without ignoring the fact that some items may be correlated due to their similarity Once the proneness of subjects and the potential of situations have been more accurately modelled - our present research strongly suggests that this latent continuum does exist - the theoretical concepts can be taken up in a higher order facet design and provide the fundaments for cumulative theory construction

For such cumulative theory construction to become possible, new facets will have to be related to the theoretical concepts that have so far been shown to be meaningful We would have to measure our concepts (that were shown to exist in the original data structures), and see how the measurements relate to different facet combinations In our research, the measurements were yielded by the data structure gathered with the use of 54 items If new research would require the administration of all these 54 items in order to obtain the valid measurements, there would be little room for investigating the relationship between these measurements and new facets Addition of new facets would quickly lead to an unworkable number of observations to be made, hence, the attempt at cumulative theory construction would not get very far Fortunately, at least in the case of the Rasch model, administration of all the original 54 items in order to gain measurements will not be necessary In a Rasch homogeneous set of items, any subset of these items will also be Rasch homogeneous We could therefore restrict ourselves to the administration of just a limited number of items, thus retaining the possibility of adding new facets for research Therefore, the empirical entry approach as unfolded in this dissertation allows for cumulative theory construction, if the data model used allows for the use of item subsets for the purpose of measurement

A future research objective that does not require studying the role of additional facets, could be the investigation of the relationship between proneness to loneliness and actual loneliness, as expressed by individuals De Jong Gierveld (1984) classified people as not lonely, moderately lonely, strongly lonely or excessively lonely by asking her subjects to which of these categories they considered themselves as belonging to In our studies, we have not asked our subjects whether they actually felt lonely, and if so, to what extent Since the majority of the population belongs to the category of individuals not feeling lonely, we may assume that our samples contained few individuals who would consider themselves as lonely

In future research, stratified sampling could ensure us a group of subjects consisting of not lonely individuals as well as lonely individuals of varying intensity We could then establish whether an expected monotonous relationship between proneness to loneliness and degree of loneliness, as indicated by the rating scale, really exists Furthermore, in our research we surprisingly found no relationship between the hypothesized determinants (number of social exchanges that one values and is satisfied with relative to the number of social exchanges that one values, number of social exchanges that one values and engages in relative to the number of social exchanges that one values and could potentially engage in, and lastly the number of social exchanges that one values and could potentially engage in relative to the number of social exchanges that one values) and proneness to loneliness This may be due to the fact that we have (presumably) primarily focussed on not lonely individuals We would at least expect that the aforementioned personal determinants are positively related to actual loneliness Furthermore, it could be that for the lonely, a relationship between the hypothesized personal determinants and proneness to loneliness will also be manifest Explorative research in this area may yield interesting information on the nature of proneness to loneliness

In our research, we established the existence of a variable proneness to loneliness by offering our subjects four different response options to each situation, from which they were forced to choose one alternative Subjects could choose between feeling lonely, angry, uncertain or indifferent in response to a situation Subsequently, we dichotomized responses as either lonely or not lonely If subjects do not consider themselves as lonely in a hypothesized situation, but even less as angry, uncertain or indifferent in that same situation, they will presumably respond with the loneliness alternative as the least inappropriate of all four responses Since all items pictured situations that were particularly of relevance for a study of the experience of loneliness, the polytomous response format may have had some unexpected effect on the development of our data structure It will be interesting to try to replicate our present research findings, using a true dichotomous response format, with alternatives 'lonely' and 'not lonely' If a similar data structure will emerge from such a study, such a replication will increase the generality of our findings, and show the relationships between our facets to be of a lawful nature

9.2 Theoretical and explorative research

Our theory on loneliness was formalized into the one parameter logistic model, and subsequent analyses suggested that there does exist a latent continuum along which subjects can be ordered as more or less prone to respond to situations with loneliness, and along which situations can be ordered as having more or less potential to elicit responses of loneliness The acceptable fit of the model, as indicated by first order tests, permitted subsequent analyses of hypotheses on situational and personal determinants of loneliness Apart from testing these hypotheses, we have also explored the data on other appraisive responses to our domain (e g valuation, satisfaction, angryness, etc) for the existence of interesting and interpretable structures In the next subsections these findings will be discussed

9 2 1 Research on loneliness

None of the proposed personal determinants of loneliness, the three ratios m(S)/m(V), m(E)/m(C), m(C)/m(V), showed any relationship to 'proneness to loneliness' For two of these ratio's, failure to detect any relationship with proneness may be related to the fact that they hardly showed any variance almost all our subjects in both samples engage in valued social exchanges when they have an opportunity to do so (m(E)/m(C)), and similarly, subjects are able to engage in most social exchanges that are valued (m(C)/m(V)) The variance in this latter ratio is mainly caused by the distinction between people with, and people without a partner Those with a partner have an opportunity to engage in social exchanges with a partner, whereas those without a partner lack that opportunity Since almost all subjects have friends and living relatives, by definition nearly everyone has the opportunity to engage in all other types of social exchange In our present research, we have therefore not succeeded in understanding what characteristics of individuals determine their proneness to feel lonely

By contrast, most of the hypothesized situational determinants have been corroborated Situational determinants were tested by decomposing the item parameters of the Rasch model into the sum of a number of more elementary effect parameters This decomposition resulted in a more restrictive variant of the Rasch model, known as the LLTM For both samples, reduction of the original Rasch model into an LLTM containing a small number of main and interaction effects did not significantly reduce the goodness-of-fit of the model From the effect parameters of the LLTM, the hypotheses on situational determinants of loneliness could be tested

With regard to the 'direction of social exchange' facet, we hypothesized that situations involving the absence of social exchanges initiated by the subject have less potential to elicit loneliness than situations involving the absence of social exchanges initiated by the other The rationale for this hypothesis was that loneliness is an involuntary and adverse experience, which subjects will try to avoid if possible When the other fails to initiate social exchanges, this is a situation that the subject will have to accept, a fact that he cannot (easily) change In contrast, the subject decides for himself whether to initiate a social exchange or not He has some control over this situation and will therefore only choose to refrain from social exchange when this abstinence does not result in adverse effects such as loneliness Our data clearly supported our hypothesis on the elements of the 'direction of social exchange' facet

With regard to facet B, the 'focus of the social exchange' facet, we hypothesized that situations involving the absence of social exchange focussing on either a problem or a positive experience or activity will have a stronger potential to elicit loneliness than situations involving the absence of social exchanges focussing on an attitude Rationale for this hypothesis is the fact that problems and experiences or activities tend to be of an emotional nature, whereas attitudes are primarily cognitive In addition, we hypothesized that situations with a problem focus would have a stronger potential to elicit loneliness than situations with a focus on an experience or an activity The rationale for this hypothesis was that problems reflect an emergency situation they need to be solved and therefore we may need help Inability to obtain such help may be a very frustrating experience By contrast, experiences or activities do not reflect such an emergency situation Since the failure to engage in social exchanges focussing on a problem will result in a more intensely negative emotional experience than the failure to engage in social exchanges focussing on an experience or activity, we believe that the former situations will elicit loneliness more strongly than the latter All our hypotheses pertaining to the 'focus of social exchange' facet were corroborated in our studies

With regard to the 'partner of social exchange' facet, we hypothesized that situations involving the absence of social exchange with a (marital) partner will have a stronger potential to elicit loneliness than situations involving absence of social exchange with relatives, and that situations involving absence of social exchange with relatives will have a stronger potential to elicit loneliness than situations involving the absence of social exchange with friends Rationale for these hypotheses was the assumed psychological distance between the subject and the possible social exchange partners We believed the psychological distance between subject and (marital) partner to be the smallest, making this the most intimate relationship, and we believed the psychological distance between subject and blood relatives to be smaller than between subject and friends

With regard to the hypotheses on this facet, we found an interesting difference between subjects of the first and those of the second sample. In the first sample, consisting of (mainly young) university students, we found that - contrary to our expectation - it was not absence of social exchange with a marital partner that had the greatest potential of eliciting a response of loneliness, but instead the absence of social exchanges with relatives that had the greatest potential of doing so. The potential of marital partners and friends to elicit loneliness could not be distinguished. However, in the second sample, consisting of a more heterogeneous sample of (generally older) subjects, marital partners did have the greatest potential of eliciting loneliness responses, whereas the potential of relatives and friends could not be distinguished.

This interesting distinction between the two samples we believe to be related to the age difference of the two groups of subjects. University students still have strong bonds with their parental homes, whereas their partner relationships are still experimental and immature. Their needs of intimacy are primarily satisfied by the parents, and less so by their partners. In contrast, for older subjects such as in our second sample, ties with parental homes have long been weakened and the need for intimacy is primarily satisfied by the relationship with a marital partner. Our rationale for an ordering of the elements of facet C seems to have been correct, but we were mistaken in believing that the psychological distance between subject and marital partner would always be smaller than that between subject and relatives. For younger age groups, the reverse will generally be the case.

The LLTM showed no main effect for facet D, implying that with regard to loneliness subjects did not distinguish between absence of 'doing something' and absence of 'saying something', contrary to our expectation. Our hypothesis was that 'doing something' for somebody reflected more emotional involvement than merely 'saying something', and that for this reason situations involving absence of 'doing something' would have a greater potential of eliciting loneliness than situations involving absence of 'saying something'. This hypothesis was refuted. An important reason for this seems to be the fact that with regard to emotional foci, verbal interaction is considered as more important than a social exchange involving some physical undertaking (see our results on valuation data). For emotions to be shared or supported, people need to talk to one another. In addition, where the social exchange focusses on an attitude, people find it hard to imagine what there is 'to be done'. Attitudes primarily lend themselves for discussion. That people did recognize the distinction between 'doing' and 'saying' is evident from the fact that the data on other appraisive responses (e.g. valuation and angryness) do clearly reflect different effects emanating from D1 (doing) and D2 (saying) situations. These data are discussed in the following subsections.

Finally, we hypothesized that situations involving a focus that pertains to the subject have a greater potential to elicit loneliness than situations involving a focus pertaining to the other. This hypothesis was supported by the data.

Apart from the main effects discussed above, we found a few interaction effects that occurred in both samples, but which we had not anticipated. An ABE interaction effect revealed that in A1 E1 situations (subject does not initiate social exchanges with a focus concerning him- or herself), the ordering of the elements of facet B conforms closely to our hypothesis for facet B. When the focus is an attitude, an A1 E1 situation scarcely has any effect on loneliness at all. If you do not discuss your attitudes with somebody else, you may feel that the other will not be interested or that he is not clever enough to follow the argument, but it will not lead you to feel lonely However, if you decide not to discuss your problems or your personal experiences to somebody else, this seems contrary to a natural inclination, and therefore suggests a faulty relationship with the other Feelings of loneliness seem probable in this case On the other hand, if one chooses not to respond to the problems, attitudes, or experiences of the other (A1 E2), this does not seem to have any bearing on loneliness, as we expected

In A2 E1 situations, the ordering of the elements of facet B again closely conforms to our hypothesis concerning facet B In A2 E2 situations, however, situations where the other does not say anything to you about his or her problems, attitudes, or experiences, there is scarcely any difference in importance between problems and experiences as foci Even more conspicuous is the fact that in these situations, attitudes seem to contribute substantially to the probability of a subject feeling lonely Apparently, if the other does not discuss either problems, attitudes, or experiences with you, this suggests a lack of confidence and therefore a faulty relationship In such a case one is likely to feel lonely

A BCE interaction showed that in all E1 situations (subject forms locus of focus) the elements of facet B (focus of social exchange) are ordered as hypothesized, but that in C1 E2 situations (marital partner forms locus of focus) B3 (focus forms an experience or activity) situations tend to elicit loneliness more strongly than B1 (problem focus) situations, whereas in C2 E2 situations (relatives of subject form locus of focus) B3 and B1 situations elicit loneliness equally strongly, and in C3 E2 situations (where friends of the subject form the locus of focus) all three elements of facet B elicit loneliness equally strongly

In our second study we found that women tend to be more prone to appraise themselves as lonely than men This is a finding which has been widely reported in the literature Further analysis revealed that the difference between men and women is particularly manifest in the appraisal of absence of social exchange with friends men do not tend to feel lonely in such situations, whereas women do Furthermore, absence of social exchange with the marital partner will more frequently result into a feeling of loneliness for women than it will for men Therefore, a loneliness questionnaire asking about social exchange with friends and/or partner would be slightly gender-biased

9 2 2 Research on valuation of social exchanges

With regard to the valuation of social exchange situations, subjects from both samples attach the highest value to social exchanges focussing on a problem, followed by social exchanges focussing on an experience or activity Social exchanges focussing on an attitude are considered as of least importance We believe that this ordering of the elements of facet B can be understood in the same way as the ordering of these elements in the context of loneliness research emotional foci are more important than cognitive foci, and all the more so when they reflect an emergency situation

With regard to facet C, the partner of the social exchange, subjects from both samples agree in their valuation of the three elements Social exchanges with marital partners are considered as of prime importance, followed by social exchanges with friends The least importance is attached to social exchanges with relatives For the student subjects this outcome is somewhat surprising, since for them we found that failing social exchanges with relatives resulted into loneliness more easily than failing social exchanges with partners or friends Possibly, the minor importance given to social exchange with relatives is due to the fact that these social exchanges are already guaranteed, whereas most subjects are still engaged in a continuous process of realizing satisfactory social exchanges with a partner and with friends That social exchange with a partner should be valued more highly than social exchange with friends comes as no surprise we may expect it to be related to the unique intimate character of a partner relationship

For facet D, the mode of social exchange, we found that verbal exchanges were considered as of greater importance than exchanges involving some physical undertaking ('doing something') As we discussed in the previous subsection, this finding may be related to the fact that people who wish to share emotional foci (like problems or experiences), or who seek support with regard to emotional foci, are primarily looking for verbal interaction With regard to attitudes, the most rewarding social exchange also seems to be of a verbal nature, like in having a discussion over them

With regard to the elements of the 'locus of focus' facet, it appeared that the (on average older) subjects of the second sample attached more importance to foci pertaining to the other (E2 situations) than did the students

In both samples, BD and BE interaction effects were found The BD interaction showed that in case of a problem focus, 'doing' something is of greatest importance, but in case the focus is an attitude or an experience or activity, a higher value is placed on 'saying' something The BE interaction showed that exchanges focussing on a problem are always considered as important However, exchanges focussing on attitudes or experiences are only considered as important when they pertain to the other (E2 situations) Exchanges on attitudes or experiences of the subject him- or herself are not considered as very important by the students The subjects of the second sample do attach more importance to exchanges on experiences or activities of their own, but they do not attach much value to exchanges on attitudes of their own

9 2 3 Research on satisfaction with social exchanges

Analysis of satisfaction data in both studies showed that situations involving social exchanges focussing on a problem elicit a response of satisfaction more frequently than situations involving a social exchange focussing on an experience or attitude, and that social exchanges focussing on an attitude are the least frequently appraised as satisfactory

With regard to facet C, the partner of the social exchange, we again notice the familiar difference between our student sample and our general sample Subjects from both samples appraise social exchanges with friends as satisfactory the most frequently, but where students sooner appraise social exchanges with relatives than social exchanges with a (marital) partner as satisfactory, for the subjects of the second sample this is the other way round In the context of loneliness research we came to the conclusion that for the student sample, the smallest psychological distance is formed by that between the subject and his/her relatives For the general sample, however, the psychological distance between the subject and his/her marital partner is smaller The results with regard to the satisfaction data suggests that people tend to be satisfied with their most intimate relationship

For facet D, data from both samples show that D2 situations ('saying something') tend to evoke more extreme reactions than D1 situations ('doing something') Some D2 situations are judged as satisfactory very frequently, whereas other D2 situations are judged as satisfactory very infrequently In contrast, most D1 situations are judged as satisfactory neither very infrequently nor very frequently

For both samples, situations involving a social exchange where the locus of focus is formed by the other (E2) are judged as satisfactory more easily than situations involving a social exchange where the locus of focus is formed by the subject (E1) Apparently subjects are less easily satisfied with social exchange when the focus is on their own problem, attitude or experience This might make them more demanding

With regard to satisfaction data, two interaction effects were found An interaction effect for facets B and E showed that situations involving social exchanges focussing on a problem are appraised as satisfactory more frequently when the problem pertains to the subject (E1) than when the problem pertains to the other (E2) A possible interpretation for this is that we feel a need to discuss or share our own problems with others, but that we are reluctant to be confronted with the problems of others Interestingly, for social exchanges focussing on an experience or an activity, this is reversed In that case situations are appraised as satisfactory more frequently when the experience or activity pertains to the other than when it pertains to the subject

A second interaction effect that occurred in both samples pertained to facets C and E, and is caused by the fact that social exchanges with friends focussing on a problem, attitude or experience of the other are more frequently appraised as satisfactory than social exchanges where the focus pertains to the subject.

9 2 4 Research on uncertainty

With regard to uncertainty data, some divergence between the two samples was manifest Although the Rasch scale that we found to exist for a large subset of the total number of items could be replicated in the second study, item parameters for the two samples correlated only 65 An interesting relationship between uncertainty and loneliness, found for the first sample, could only partially be replicated for the second In the first study we found that for those situations that elicit loneliness only difficultly, loneliness and uncertainty showed a positive linear relationship However, for situations that elicit loneliness easily, the relationship between loneliness and uncertainty became negative Inspection of interaction tables suggested an explanation for this dual relationship Situations that easily elicit loneliness are mostly A2 situations (direction of social exchange from other to subject) It is only for A2 situations focussing on attitudes that loneliness is difficultly elicited However, uncertainty is most easily elicited for A2 B2 situations, thus (partly) accounting for a negative relationship between loneliness and uncertainty A1 situations, by contrast, do not tend to elicit loneliness easily, except in the case of a problem focus On the other hand, A1 situations focussing on attitudes do not, but A1 situations focussing on problems do easily elicit uncertainty, thus (partly) accounting for the positive relationship between loneliness and uncertainty In the second study we still found evidence of the positive relationship between loneliness and uncertainty for those situations that elicit loneliness difficultly, but the negative relationship for the situations that easily elicit loneliness could not be replicated

The structure of the data had also changed over the two samples Only a main effect for facets B and C was evident in both samples It appears that social exchanges focussing on attitudes most easily elicit feelings of uncertainty This may be related to the fact that in our culture, intellectual assertion of one's point of view is an important determinant of self esteem Furthermore, social exchanges with relatives do not easily elicit feelings of uncertainty, whereas social exchanges with a marital partner or with friends do

9 2 5 Research on angryness

The data on angryness yield comparable results over the two samples, with a correlation of 81 between the item parameters There are main effects for all five facets As common sense suggests, it appears that situations involving the absence of social exchanges initiated by the other more easily elicit angryness than situations involving the absence of social exchanges initiated by the subject For facet B, absence of social exchanges focussing on attitudes least easily elicit angryness, whereas social exchanges focussing on problems and those focussing on experiences or activities elicit angryness equally easily

For facet C, angryness is most easily elicited by absence of social exchange with a marital partner and least easily by absence of social exchange with relatives This is true for both samples, an interesting difference with the data on loneliness, where for the student sample relatives evoked loneliness more easily than a marital partner Presumably, both students and the general population expect their partners to be supportive and loyal, when marital partners fail to do so, they raise indignation

For facet D, it is interesting to note that in the context of angryness, it is the absence of physical undertakings ('doing something') rather than the absence of verbal interactions, that most easily elicits feelings of angryness This result was found in both samples and differs from the results that we found for the other appraisive categories Possibly, if somebody fails to do something for you, this is experienced as lazyness or unwillingness on the part of the other, rather than that it is taken as a sign that the other does not value you as a person

Lastly, like we found in the context of loneliness, and as we would expect, situations involving a focus pertaining to the subject (E1) more easily elicit angryness than situations involving a focus pertaining to the other (E2)

For the first sample, no relationship with loneliness was found, but the results of the second sample indicated a certain positive relationship (r = 30) between loneliness and angryness

9.3 Conclusion

Our empirical entry approach, working with elementary observational categories that are as objective as possible, easily permitted a replication of the original study which, as we have seen, to a large extent yielded comparable results, providing a reliable starting point for future research We have suggested some further refinements and extensions of the present research that may lead the way to a deeper understanding of the experience of loneliness It will be interesting to see to what extent this deeper understanding will correspond to or diverge from insights and explanations that figure in conventional theories of loneliness, developed within a conceptual entry framework

APPENDIX A: OVERVIEW OF QUESTIONNAIRE ITEMS PERTAINING TO LONELINESS

1) Als het zelden voorkomt dat je iets voor je partner doet als het gaat om zijn/haar problemen, dan zou je je voelen (If it seldom occurs that you do something for your partner, where his/her problems are concerned, you would feel) (A1 B1 C1 D1 E2)[1]
2) Als het zelden voorkomt dat je iets zegt tegen je partner over je problemen, dan zou je je voe len (If it seldom occurs that you say something to your partner about your problems, you would feel) (A1 B1 C1 D2 E1)
3) Als het zelden voorkomt dat je iets zegt tegen je partner over zijn/haar problemen, dan zou je je voelen (If it seldom occurs that you say something to your partner about his/her problems, you would feel) (A1 B1 C1 D2 E2)
4) Als het zelden voorkomt dat je iets voor je naaste familie doet als het gaat om hun problemen, dan zou je je voelen (If it seldom occurs that you do something for your relatives, where their problems are concerned, you would feel) (A1 B1 C2 D1 E2)
5) Als het zelden voorkomt dat je iets zegt tegen je naaste familie over je problemen, dan zou je je voelen (If it seldom occurs that you say something to your relatives about your problems, you would feel) (A1 B1 C2 D2 E1)
6) Als het zelden voorkomt dat je iets zegt tegen je naaste familie over hun problemen, dan zou je je voelen (If it seldom occurs that you say something to your relatives about their problems, you would feel) (A1 B1 C2 D2 E2)
7) Als het zelden voorkomt dat je iets voor een vriend(in) doet als het gaat om zijn/haar problemen, dan zou je je voelen (If it seldom occurs that you do something for a friend, where his/her problems are concerned, you would feel) (A1 B1 C3 D1 E2)
8) Als het zelden voorkomt dat je iets zegt tegen een vriend(in) over je problemen, dan zou je je voelen (If it seldom occurs that you say something to a friend about your problems, you would feel) (A1 B1 C3 D2 E1)
9) Als het zelden voorkomt dat je iets zegt tegen een vriend(in) over zijn/haar problemen, dan zou je je voelen (If it seldom occurs that you say something to a friend about his/her problems, you would feel) (A1 B1 C3 D2 E2)
10) Als het zelden voorkomt dat je iets voor je partner doet als het gaat om zijn/haar opvattingen, dan zou je je voelen (If it seldom occurs that you do something for your partner, where his/her attitudes are concerned, you would feel) (A1 B2 C1 D1 E2)
11) Als het zelden voorkomt dat je iets zegt tegen je partner over je opvattingen, dan zou je je voelen (If it seldom occurs that you say something to your partner about your attitudes, you would feel) (A1 B2 C1 D2 E1)
12) Als het zelden voorkomt dat je iets zegt tegen je partner over zijn/haar opvattingen, dan zou je je

[1] All items offered four response alternatives eenzaam boos onverschillig onzeker

..... voelen. (If it seldom occurs that you say something to your partner about his/her attitudes, you would feel ...) (A1 B2 C1 D2 E2).

13) Als het zelden voorkomt dat je iets voor je naaste familie doet als het gaat om hun opvattingen, dan zou je je ..... voelen. (If it seldom occurs that you do something for your relatives, where their attitudes are concerned, you would feel ...) (A1 B2 C2 D1 E2).

14) Als het zelden voorkomt dat je iets zegt tegen je naaste familie over je opvattingen, dan zou je je ..... voelen. (If it seldom occurs that you say something to your relatives about your attitudes, you would feel ...) (A1 B2 C2 D2 E1).

15) Als het zelden voorkomt dat je iets zegt tegen je naaste familie over hun opvattingen, dan zou je je ..... voelen. (If it seldom occurs that you say something to your relatives about their attitudes, you would feel ...) (A1 B2 C2 D2 E2).

16) Als het zelden voorkomt dat je iets voor een vriend(in) doet als het gaat om zijn/haar opvattingen, dan zou je je ..... voelen. (If it seldom occurs that you do something for a friend, where his/her attitudes are concerned, you would feel...) (A1 B2 C3 D1 E2).

17) Als het zelden voorkomt dat je iets zegt tegen een vriend(in) over je opvattingen, dan zou je je ..... voelen. (If it seldom occurs that you say something to a friend about your attitudes, you would feel ...) (A1 B2 C3 D2 E1).

18) Als het zelden voorkomt dat je iets zegt tegen een vriend(in) over zijn/haar opvattingen, dan zou je je ..... voelen. (If it seldom occurs that you say something to a friend about his/her attitudes, you would feel ...) (A1 B2 C3 D2 E2).

19) Als het zelden voorkomt dat je iets voor je partner doet als het gaat om belevingen of bezigheden die hij/zij fijn vindt, dan zou je je ..... voelen. (If it seldom occurs that you do something for your partner, where occupations or experiences are concerned that he/she likes, you would feel ...) (A1 B3 C1 D1 E2).

20) Als het zelden voorkomt dat je iets zegt tegen je partner over belevingen of bezigheden die je fijn vindt, dan zou je je ..... voelen (If it seldom occurs that you say something to your partner about occupations or experiences that you like, you would feel...) (A1 B3 C1 D2 E1)

21) Als het zelden voorkomt dat je iets zegt tegen je partner over belevingen of bezigheden die hij/zij fijn vindt, dan zou je je ..... voelen. (If it seldom occurs that you say something to your partner about occupations or experiences that he/she likes, you would feel...) (A1 B3 C1 D2 E2).

22) Als het zelden voorkomt dat je iets voor je naaste familie doet als het gaat om belevingen of bezigheden die zij fijn vinden, dan zou je je ..... voelen. (If it seldom occurs that you do something for your relatives, where occupations or experiences that they like are concerned, you would feel ...) (A1 B3 C2 D1 E2).

23) Als het zelden voorkomt dat je iets zegt tegen je naaste familie over belevingen of bezigheden die je fijn vindt, dan zou je je ..... voelen (If it seldom occurs that you say something to your relatives about occupations or experiences that you like, you would feel ...) (A1 B3 C2 D2 E1)

24) Als het zelden voorkomt dat je iets zegt tegen je naaste familie over belevingen of bezigheden die zij fijn vinden, dan zou je je ..... voelen. (If it seldom occurs that you say something to your relatives about occupations or experiences that they like, you would feel...) (A1 B3 C2 D2 E2).

25) Als het zelden voorkomt dat je iets voor een vriend(in) doet als het gaat om belevingen of bezigheden die hij/zij fijn vindt, dan zou je je voelen (If it seldom occurs that you do something for a friend, where occupations or experiences are concerned that he/she likes, you would feel) (A1 B3 C3 D1 E2)

26) Als het zelden voorkomt dat je iets zegt tegen een vriend(in) over belevingen of bezigheden die je fijn vindt, dan zou je je voelen (If it seldom occurs that you say something to a friend about occupations or experiences that you like, you would feel) (A1 B3 C3 D2 E1)

27) Als het zelden voorkomt dat je iets zegt tegen een vriend(in) over belevingen of bezigheden die hij/zij fijn vindt, dan zou je je voelen (If it seldom occurs that you say something to a friend about occupations or experiences that he/she likes, you would feel) (A1 B3 C3 D2 E2)

28) Als het zelden voorkomt dat je partner iets voor je doet als het gaat om je problemen, dan zou je je voelen (If it seldom occurs that your partner does something for you, where your problems are concerned, you would feel) (A2 B1 C1 D1 E1)

29) Als het zelden voorkomt dat je partner iets tegen je zegt over zijn/haar problemen, dan zou je je voelen (If it seldom occurs that your partner says something to you about his/her problems, you would feel) (A2 B1 C1 D2 E2)

30) Als het zelden voorkomt dat je partner iets tegen je zegt over je problemen, dan zou je je voelen (If it seldom occurs that partner says something to you about your problems, you would feel) (A2 B1 C1 D2 E1)

31) Als het zelden voorkomt dat naaste familie iets voor je doet als het gaat om je problemen, dan zou je je voelen (If it seldom occurs that your relatives do something for you, where your problems are concerned, you would feel) (A2 B1 C2 D1 E1)

32) Als het zelden voorkomt dat naaste familie iets tegen je zegt over hun problemen, dan zou je je voelen (If it seldom occurs that your relatives say something to you about their problems, you would feel) (A2 B1 C2 D2 E2)

33) Als het zelden voorkomt dat naaste familie iets tegen je zegt over je problemen, dan zou je je voelen (If it seldom occurs that your relatives say something to you about your problems, you would feel) (A2 B1 C2 D2 E1)

34) Als het zelden voorkomt dat een vriend(in) iets voor je doet als het gaat om je problemen, dan zou je je voelen (If it seldom occurs that a friend does something for you, where your problems are concerned, you would feel) (A2 B1 C3 D1 E1)

35) Als het zelden voorkomt dat een vriend(in) iets tegen je zegt over zijn/haar problemen, dan zou je je voelen (If it seldom occurs that a friend says something to you about his/her problems, you would feel) (A2 B1 C3 D2 E2)

36) Als het zelden voorkomt dat een vriend(in) iets tegen je zegt over je problemen, dan zou je je voelen (If it seldom occurs that a friend says something to you about your problems, you would feel) (A2 B1 C3 D2 E1)

37) Als het zelden voorkomt dat je partner iets voor je doet als het gaat om je opvattingen, dan zou je je voelen (If it seldom occurs that your partner does something for you, where your attitudes are concerned, you would feel) (A2 B2 C1 D1 E1)

38) Als het zelden voorkomt dat je partner iets tegen je zegt over zijn/haar opvattingen, dan zou je je voelen (If it seldom occurs that your partner says something to you about his/her attitudes, you would feel) (A2 B2 C1 D2 E2)

39) Als het zelden voorkomt dat je partner iets tegen je zegt over je opvattingen, dan zou je je voelen (If it seldom occurs that your partner says something to you about your attitudes, you would feel) (A2 B2 C1 D2 E1)

40) Als het zelden voorkomt dat naaste familie iets voor je doet als het gaat om je opvattingen, dan zou je je voelen (If it seldom occurs that your relatives do something for you, where your attitudes are concerned, you would feel) (A2 B2 C2 D1 E1)

41) Als het zelden voorkomt dat naaste familie iets tegen je zegt over hun opvattingen, dan zou je je voelen (If it seldom occurs that your relatives say something to you about their attitudes, you would feel) (A2 B2 C2 D2 E2)

42) Als het zelden voorkomt dat naaste familie iets tegen je zegt over je opvattingen, dan zou je je voelen (If it seldom occurs that your relatives say something to you about your attitudes, you would feel) (A2 B2 C2 D2 E1)

43) Als het zelden voorkomt dat een vriend(in) iets voor je doet als het gaat om je opvattingen, dan zou je je voelen (If it seldom occurs that a friend does something for you, where your attitudes are concerned, you would feel .) (A2 B2 C3 D1 E1)

44) Als het zelden voorkomt dat een vriend(in) iets tegen je zegt over zijn/haar opvattingen, dan zou je je voelen (If it seldom occurs that a friend says something to you about his/her attitudes, you would feel) (A2 B2 C3 D2 E2)

45) Als het zelden voorkomt dat een vriend(in) iets tegen je zegt over je opvattingen, dan zou je je voelen (If it seldom occurs that a friend says something to you about your attitudes, you would feel) (A2 B2 C3 D2 E1)

46) Als het zelden voorkomt dat je partner iets voor je doet als het gaat om belevingen of bezigheden die je fijn vindt, dan zou je je voelen (If it seldom occurs that your partner does something for you, where occupations or experiences are concerned that you like, you would feel) (A2 B3 C1 D1 E1)

47) Als het zelden voorkomt dat je partner iets tegen je zegt over belevingen of bezigheden die hij/zij fijn vindt, dan zou je je voelen (If it seldom occurs that your partner says something to you about occupations or experiences that he/she likes, you would feel) (A2 B3 C1 D2 E2)

48) Als het zelden voorkomt dat je partner iets tegen je zegt over belevingen of bezigheden die je fijn vindt, dan zou je je voelen (If it seldom occurs that your partner says something to you about occupations or experiences that you like, you would feel) (A2 B3 C1 D2 E1)

49) Als het zelden voorkomt dat naaste familie iets voor je doet als het gaat om belevingen of bezigheden die je fijn vindt, dan zou je je voelen (If it seldom occurs that relatives do something for you, where occupations or experiences that you like are concerned, you would feel) (A2 B3 C2 D1 E1)

50) Als het zelden voorkomt dat naaste familie iets tegen je zegt over belevingen of bezigheden die zij fijn vinden, dan zou je je voelen (If it seldom occurs that relatives say something to you

about occupations or experiences that they like, you would feel) (A2 B3 C2 D2 E2)

51) Als het zelden voorkomt dat naaste familie iets tegen je zegt over belevingen of bezigheden die je fijn vindt, dan zou je je   voelen (If it seldom occurs that relatives say something to you about occupations or experiences that you like, you would feel) (A2 B3 C2 D2 E1)

52) Als het zelden voorkomt dat een vriend(in) iets voor je doet als het gaat om belevingen of bezigheden die je fijn vindt, dan zou je je   voelen (If it seldom occurs that a friend does something for you, where occupations or experiences that you like are concerned, you would feel) (A2 B3 C3 D1 E1)

53) Als het zelden voorkomt dat een vriend(in) iets tegen je zegt over belevingen of bezigheden die hij/zij fijn vindt, dan zou je je   voelen (If it seldom occurs that a friend says something to you about occupations or experiences that he/she likes, you would feel) (A2 B3 C3 D2 E2)

54) Als het zelden voorkomt dat een vriend(in) iets tegen je zegt over belevingen of bezigheden die je fijn vindt, dan zou je je   voelen (If it seldom occurs that a friend says something to you about occupations or experiences that you like, you would feel) (A2 B3 C3 D2 E1)

APPENDIX B: OVERVIEW OF QUESTIONNAIRE ITEMS PERTAINING TO VALUATION

1) Vindt u het belangrijk dat je partner iets voor je doet, als het het gaat om je problemen? (Do you consider it important that your partner does something for you, where your problems are concerned?) (A2 B1 C1 D1 E1)[2]
2) Vindt u het belangrijk dat je partner iets tegen je zegt over zijn/haar problemen? (Do you consider it important that your partner says something to you about his/her problems?) (A2 B1 C1 D2 E2)
3) Vindt u het belangrijk dat je partner iets tegen je zegt over je problemen? (Do you consider it important that your partner says something to you about your problems?) (A2 B1 C1 D2 E1)
4) Vindt u het belangrijk dat naaste familie iets voor je doet, als het het gaat om je problemen? (Do you consider it important that your relatives do something for you, where your problems are concerned?) (A2 B1 C2 D1 E1)
5) Vindt u het belangrijk dat naaste familie iets tegen je zegt over hun problemen? (Do you consider it important that your relatives say something to you about their problems?) (A2 B1 C2 D2 E2)
6) Vindt u het belangrijk dat naaste familie iets tegen je zegt over je problemen? (Do you consider it important that your relatives say something to you about your problems?) (A2 B1 C2 D2 E1)
7) Vindt u het belangrijk dat een vriend(in) iets voor je doet, als het het gaat om je problemen? (Do you consider it important that a friend does something for you, where your problems are concerned?) (A2 B1 C3 D1 E1)
8) Vindt u het belangrijk dat een vriend(in) iets tegen je zegt over zijn/haar problemen? (Do you consider it important that a friend says something to you about his/her problems?) (A2 B1 C3 D2 E2)
9) Vindt u het belangrijk dat een vriend(in) iets tegen je zegt over je problemen? (Do you consider it important that a friend says something to you about your problems?) (A2 B1 C3 D2 E1)
10) Vindt u het belangrijk dat je partner iets voor je doet, als het het gaat om je opvattingen? (Do you consider it important that your partner does something for you, where your attitudes are concerned?) (A2 B2 C1 D1 E1)
11) Vindt u het belangrijk dat je partner iets tegen je zegt over zijn/haar opvattingen? (Do you consider it important that your partner says something to you about his/her attitudes?) (A2 B2 C1 D2 E2)
12) Vindt u het belangrijk dat je partner iets tegen je zegt over je opvattingen? (Do you consider it important that your partner says something to you about your attitudes?) (A2 B2 C1 D2 E1)
13) Vindt u het belangrijk dat naaste familie iets voor je doet, als het het gaat om je opvattingen? (Do you consider it important that your relatives do something for you, where your attitudes are concerned?) (A2 B2 C2 D1 E1)
14) Vindt u het belangrijk dat naaste familie iets tegen je zegt over hun opvattingen? (Do you

[2] All items offered two response alternatives yes versus no

consider it important that your relatives say something to you about their attitudes?) (A2 B2 C2 D2 E2)

15) Vindt u het belangrijk dat naaste familie iets tegen je zegt over je opvattingen? (Do you consider it important that your relatives say something to you about your attitudes?) (A2 B2 C2 D2 E1)

16) Vindt u het belangrijk dat een vriend(in) iets voor je doet, als het het gaat om je opvattingen? (Do you consider it important that a friend does something for you, where your attitudes are concerned?) (A2 B2 C3 D1 E1)

17) Vindt u het belangrijk dat een vriend(in) iets tegen je zegt over zijn/haar opvattingen? (Do you consider it important that a friend says something to you about his/her attitudes?) (A2 B2 C3 D2 E2)

18) Vindt u het belangrijk dat een vriend(in) iets tegen je zegt over je opvattingen? (Do you consider it important that a friend says something to you about your attitudes?) (A2 B2 C3 D2 E1)

19) Vindt u het belangrijk dat je partner iets voor je doet, als het het gaat om belevingen of bezigheden die je fijn vindt? (Do you consider it important that your partner does something for you, where occupations or experiences that you like are concerned?) (A2 B3 C1 D1 E1)

20) Vindt u het belangrijk dat je partner iets tegen je zegt over belevingen of bezigheden die hij/zij fijn vindt? (Do you consider it important that your partner says something to you about occupations or experiences that he/she likes?) (A2 B1 C1 D2 E2)

21) Vindt u het belangrijk dat je partner iets tegen je zegt over belevingen of bezigheden die je fijn vindt? (Do you consider it important that your partner says something to you about occupations or experiences that you like?) (A2 B3 C1 D2 E1)

22) Vindt u het belangrijk dat naaste familie iets voor je doet, als het het gaat om belevingen of bezigheden die je fijn vindt? (Do you consider it important that relatives do something for you, where occupations or experiences that you like are concerned?) (A2 B3 C2 D1 E1)

23) Vindt u het belangrijk dat naaste familie iets tegen je zegt over belevingen of bezigheden die zij fijn vinden? (Do you consider it important that relatives say something to you about occupations or experiences that they like?) (A2 B3 C2 D2 E2)

24) Vindt u het belangrijk dat naaste familie iets tegen je zegt over belevingen of bezigheden die je fijn vindt? (Do you consider it important that relatives say something to you about occupations or experiences that you like?) (A2 B3 C2 D2 E1)

25) Vindt u het belangrijk dat een vriend(in) iets voor je doet, als het het gaat om belevingen of bezigheden die je fijn vindt? (Do you consider it important that a friend does something for you, where occupations or experiences that you like are concerned?) (A2 B3 C3 D1 E1)

26) Vindt u het belangrijk dat een vriend(in) iets tegen je zegt over belevingen of bezigheden die hij/zij fijn vindt? (Do you consider it important that a friend says something to you about occupations or experiences that he/she likes?) (A2 B3 C3 D2 E2)

27) Vindt u het belangrijk dat een vriend(in) iets tegen je zegt over belevingen of bezigheden die je fijn vindt? (Do you consider it important that a friend says something to you about occupations or experiences that you like?) (A2 B3 C3 D2 E1)

APPENDIX C: OVERVIEW OF QUESTIONNAIRE ITEMS PERTAINING TO ENGAGEMENT AND TO SATISFACTION

1) Komt het naar uw mening voldoende vaak voor dat uw partner iets voor u doet, als het gaat om uw problemen? (In your opinion, does it occur sufficiently often that your partner does something for you, where your problems are concerned?) (A2 B1 C1 D1 E1)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   (Only in case you have responded with YES to the previous question:)

   Bent u tevreden met wat uw partner voor u doet, als het gaat om uw problemen? (Are you satisfied with what your partner does for you, where your problems are concerned?)[3]

2) Komt het naar uw mening voldoende vaak voor dat uw partner iets tegen u zegt over zijn/haar problemen? (In your opinion, does it occur sufficiently often that your partner says something to you about his/her problems?) (A2 B1 C1 D2 E2)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met wat uw partner tegen u zegt over zijn/haar problemen? (Are you satisfied with what your partner says to you about his/her problems?)

3) Komt het naar uw mening voldoende vaak voor dat uw partner iets tegen u zegt over uw problemen? (In your opinion, does it occur sufficiently often that your partner says something to you about your problems?) (A2 B1 C1 D2 E1)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met wat uw partner tegen u zegt over uw problemen? (Are you satisfied with what your partner says to you about your problems?)

4) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets voor u doet, als het gaat om uw problemen? (In your opinion, does it occur sufficiently often that your relatives do something for you, where your problems are concerned?) (A2 B1 C2 D1 E1)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met wat uw naaste familie voor u doet, als het gaat om uw problemen? (Are you satisfied with what your relatives do for you, where your problems are concerned?)

5) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets tegen u zegt over hun problemen? (In your opinion, does it occur sufficiently often that your relatives say something to you about their problems?) (A2 B1 C2 D2 E2)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met wat uw naaste familie tegen u zegt over hun problemen? (Are you satisfied with what your relatives say to you about their problems?)

6) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets tegen u zegt over uw problemen? (In your opinion, does it occur sufficiently often that your relatives say something to

[3] All engagement items offered three response alternatives: 'yes', 'no', or 'this situation does not apply to me, because I have no partner/relatives/friends'. All satisfaction items also offered three response alternatives: 'yes,mostly', 'sometimes', 'no, mostly not'.

you about your problems?) (A2 B1 C2 D2 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord:

Bent u tevreden met **wat** uw naaste familie tegen u zegt over uw problemen? (Are you satisfied with what your relatives say to you about your problems?)

7) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets voor u doet, als het gaat om uw problemen? (In your opinion, does it occur sufficiently often that a friend does something for you, where your problems are concerned?) (A2 B1 C3 D1 E1)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met **wat** een vriend(in) voor u doet, als het gaat om uw problemen? (Are you satisfied with what a friend does for you, where your problems are concerned?)

8) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets tegen u zegt over zijn/haar problemen? (In your opinion, does it occur sufficiently often that a friend says something to you about his/her problems?) (A2 B1 C3 D2 E2)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met **wat** een vriend(in) tegen u zegt over zijn/haar problemen? (Are you satisfied with what a friend says to you about his/her problems?)

9) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets tegen u zegt over uw problemen? (In your opinion, does it occur sufficiently often that a friend says something to you about your problems? (A2 B1 C3 D2 E1)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met **wat** een vriend(in) tegen u zegt over uw problemen? (Are you satisfied with what a friend says to you about your problems?)

10) Komt het naar uw mening voldoende vaak voor dat uw partner iets voor u doet, als het gaat om uw opvattingen? (In your opinion, does it occur sufficiently often that your partner does something for you, where your attitudes are concerned?) (A2 B2 C1 D1 E1)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met **wat** uw partner voor u doet, als het gaat om uw opvattingen? (Are you satisfied with what your partner does for you, where your attitudes are concerned?)

11) Komt het naar uw mening voldoende vaak voor dat uw partner iets tegen u zegt over zijn/haar opvattingen? (In your opinion, does it occur sufficiently often that your partner says something to you about his/her attitudes?) (A2 B2 C1 D2 E2)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met **wat** uw partner tegen u zegt over zijn/haar opvattingen? (Are you satisfied with what your partner says to you about his/her attitudes?)

12) Komt het naar uw mening voldoende vaak voor dat uw partner iets tegen u zegt over uw opvattingen? (In your opinion, does it occur sufficiently often that your partner says something to you about your attitudes?) (A2 B2 C1 D2 E1)

   Alleen indien u op de vorige vraag met JA hebt geantwoord:

   Bent u tevreden met **wat** uw partner tegen u zegt over uw opvattingen? (Are you satisfied with what your partner says to you about your attitudes?)

13) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets voor u doet, als het gaat om uw opvattingen? (In your opinion, does it occur sufficiently often that your relatives do something for you, where your attitudes are concerned?) (A2 B2 C2 D1 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw naaste familie voor u doet, als het gaat om uw opvattingen? (Are you satisfied with what your relatives do for you, where your attitudes are concerned?)

14) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets tegen u zegt over hun opvattingen? (In your opinion, does it occur sufficiently often that your relatives say something to you about their attitudes?) (A2 B2 C2 D2 E2)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw naaste familie tegen u zegt over hun opvattingen? (Are you satisfied with what your relatives say to you about their attitudes?)

15) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets tegen u zegt over uw opvattingen? (In your opinion, does it occur sufficiently often that your relatives say something to you about your attitudes?) (A2 B2 C2 D2 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw naaste familie tegen u zegt over uw opvattingen? (Are you satisfied with what your relatives say to you about your attitudes?)

16) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets voor u doet, als het gaat om uw opvattigen? (In your opinion, does it occur sufficiently often that a friend does something for you, where your attitudes are concerned?) (A2 B2 C3 D1 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** een vriend(in) voor u doet, als het gaat om uw opvattingen? (Are you satisfied with what a friend does for you, where your attitudes are concerned?)

17) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets tegen u zegt over zijn/haar opvattingen? (In your opinion, does it occur sufficiently often that a friend says something to you about his/her attitudes?) (A2 B2 C3 D2 E2)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** een vriend(in) tegen u zegt over zijn/haar opvattingen? (Are you satisfied with what a friend says to you about his/her attitudes?)

18) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets tegen u zegt over uw opvattingen? (In your opinion, does it occur sufficiently often that a friend says something to you about your attitudes?) (A2 B2 C3 D2 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** een vriend(in) tegen u zegt over uw opvattingen? (Are you satisfied with what your friend says to you about your attitudes?)

19) Komt het naar uw mening voldoende vaak voor dat uw partner iets voor u doet, als het gaat om belevingen of bezigheden die u fijn vindt? (In your opinion, does it occur sufficiently often that your partner does something for you, where occupations or experiences that you like are concerned?) (A2 B3 C1 D1 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw partner voor u doet, als het gaat om belevingen of bezigheden die u fijn vindt? (Are you satisfied with what your partner does for you, where occupations or experiences that you like are concerned?)

20) Komt het naar uw mening voldoende vaak voor dat uw partner iets tegen u zegt over belevingen of bezigheden die hij/zij fijn vindt? (In your opinion, does it occur sufficiently often that your partner says something to you about occupations or experiences that he/she likes?) (A2 B3 C1 D2 E2)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw partner tegen u zegt over belevingen of bezigheden die hij/zij fijn vindt? (Are you satisfied with what your partner says to you about occupations or experiences that he/she likes?)

21) Komt het naar uw mening voldoende vaak voor dat uw partner iets tegen u zegt over belevingen of bezigheden die u fijn vindt? (In your opinion, does it occur sufficiently often that your partner says something to you about occupations or experiences that you like? (A2 B3 C1 D2 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw partner tegen u zegt over belevingen of bezigheden die u fijn vindt? (Are you satisfied with what your partner says to you about occupations or experiences that you like?)

22) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets voor u doet, als het gaat om belevingen of bezigheden die u fijn vindt? (In your opinion, does it occur sufficiently often that your relatives do something for you, where occupations or experiences that you like are concerned?) (A2 B3 C2 D1 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw naaste familie voor u doet, als het gaat om belevingen of bezigheden die u fijn vindt? (Are you satisfied with what your relatives do for you, where occupations or experiences that you like are concerned?)

23) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets tegen u zegt over belevingen of bezigheden die zij fijn vinden? (In your opinion, does it occur sufficiently often that your relatives say something to you about occupations or experiences that they like?) (A2 B3 C2 D2 E2)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw naaste familie tegen u zegt over belevingen of bezigheden die zij fijn vinden? (Are you satisfied with what your relatives say to you about occupations or experiences that they like?)

24) Komt het naar uw mening voldoende vaak voor dat uw naaste familie iets tegen u zegt over belevingen of bezigheden die u fijn vindt? (In your opinion, does it occur sufficiently often that your relatives say something to you about occupations or experiences that you like?) (A2 B3 C2 D2 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** uw naaste familie tegen u zegt over belevingen of bezigheden die u fijn vindt? (Are you satisfied with what your relatives say to you about occupations or experiences that you like?)

25) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets voor u doet, als het gaat om belevingen of bezigheden die u fijn vindt? (In your opinion, does it occur sufficiently often that a friend does something for you, where occupations or experiences that you like are concerned?) (A2 B3 C3 D1 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** een vriend(in) voor u doet, als het gaat om belevingen of bezigheden die u fijn vindt? (Are you satisfied with what a friend does for you, where occupations or experiences that you like are concerned?)

26) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets tegen u zegt over belevingen of bezigheden die hij/zij fijn vindt? (In your opinion, does it occur sufficiently often that a friend says something to you about occupations or experiences that he/she likes?) (A2 B3 C3 D2 E2)

Alleen indien u op de vorige vraag met JA hebt geantwoord

Bent u tevreden met **wat** een vriend(in) tegen u zegt over belevingen of bezigheden die hij/zij fijn vindt? (Are you satisfied with what a friend says to you about occupations or experiences that he/she likes?)

27) Komt het naar uw mening voldoende vaak voor dat een vriend(in) iets tegen u zegt over belevingen of bezigheden die u fijn vindt? (In your opinion, does it occur sufficiently often that a friend says something to you about occupations or experiences that you like?) (A2 B3 C3 D2 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord.

Bent u tevreden met **wat** een vriend(in) tegen u zegt over belevingen of bezigheden die u fijn vindt? (Are you satisfied with what a friend says to you about occupations or experiences that you like?)

CML ESTIMATION OF VALUATION ITEM PARAMETERS, FIRST AND SECOND SAMPLES

	First sample		Second sample	
	CML	s.e.	CML	s.e
Item 28	-2.269	.691	-1.389	.508
Item 29	*	*	-1.691	.577
Item 30	-2.960	.952	-2.106	.694
Item 31	.772	.240	.850	.260
Item 32	-.032	.293	.714	.267
Item 33	.879	.236	1.101	.250
Item 34	.772	.240	.166	.300
Item 35	-.790	.376	.074	.307
Item 36	-.530	.343	.074	.307
Item 37	1.030	.229	.571	.274
Item 38	*	*	-2.106	.694
Item 39	-2.960	.952	-1.389	.508
Item 40	3.426	.209	2.987	.224
Item 41	.129	.280	.978	.255
Item 42	1.396	.218	1.853	.231
Item 43	2.383	.204	2.271	.225
Item 44	-.942	.397	-.126	.325

Item 45	.277	.269	.074	.307
Item 46	-1.114	.424	-1.691	.577
Item 47	*	*	*	*
Item 48	-1.552	.505	-2.798	.957
Item 49	1.763	.210	1.853	.231
Item 50	.277	.269	.496	.278
Item 51	1.030	.229	.783	.263
Item 52	.600	.249	.166	.300
Item 53	-1.552	.505	-1.691	.577
Item 54	-.032	.293	-.023	.316

CML ESTIMATION OF SATISFACTION ITEM PARAMETERS, FIRST AND SECOND SAMPLES

	First sample		Second sample	
	CML	s.e.	CML	s.e
Item 28	.300	.134	-.274	.163
Item 29	.841	.140	.348	.169
Item 30	.622	.137	.348	.169
Item 31	-.379	.134	-.191	.163
Item 32	.263	.133	.319	.168
Item 33	.337	.134	1.093	.187
Item 34	-.743	.138	-.662	.164
Item 35	-1.008	.143	-.440	.163
Item 36	-.342	.134	-.108	.164
Item 37	.680	.138	.145	.166
Item 38	.430	.135	.145	.166
Item 39	.945	.142	.117	.166
Item 40	.393	.134	.685	.175
Item 41	.449	.135	.951	.183
Item 42	.841	.140	1.243	.192
Item 43	-.158	.133	-.219	.163
Item 44	-.530	.135	-.468	.163

Item 45	.300	.134	.260	.167
Item 46	.134	.133	-.468	.163
Item 47	.079	.133	-.357	.163
Item 48	.281	.134	-.219	.163
Item 49	-.606	.136	-.052	.164
Item 50	-.417	.134	-.523	.163
Item 51	-.103	.133	.348	.169
Item 52	-.587	.136	-.578	.164
Item 53	-1.415	.153	-.976	.168
Item 54	-.606	.136	-.468	.163

APPENDIX F

CML ESTIMATION OF ANGRYNESS ITEM PARAMETERS, FIRST AND SECOND SAMPLES

	First sample		Second sample	
	CML	s.e.	CML	s.e
Item 1	-.498	.311	.229	.358
Item 2	.889	.382	1.137	.475
Item 3	-.391	.235	-.028	.309
Item 4	-.496	.276	-.202	.294
Item 5	*	*	2.227	.634
Item 6	.316	.313	.443	.391
Item 7	-.704	.266	-.509	.273
Item 8	1.648	.521	1.381	.525
Item 9	.178	.325	.273	.337
Item 10	.225	.308	.048	.350
Item 11	1.124	.444	.644	.379
Item 12	-.264	.285	.048	.350
Item 13	.394	.346	-.117	.301
Item 14	1.521	.425	1.791	.625
Item 15	.644	.375	1.591	.521
Item 16	.316	.313	.770	.433
Item 17	*	*	2.654	.715

APPENDIX F - CONTINUED

	First sample		Second sample	
	CML	s.e.	CML	s.e
Item 18	1.209	.386	.964	.462
Item 19	-1.100	.301	.643	.400
Item 20	1.073	.372	.598	.410
Item 22	-.298	.263	.015	.318
Item 23	.178	.325	1.138	.447
Item 24	1.039	.405	.933	.438
Item 25	-.587	.309	.984	.440
Item 26	1.521	.425	.964	.462
Item 27	.174	.332	.109	.348
Item 28	-1.998	.215	-1.711	.234
Item 29	*	*	-.753	.293
Item 30	*	*	-1.069	.284
Item 31	*	*	-1.421	.276
Item 32	*	*	-.562	.307
Item 33	-.347	.285	-.713	.262
Item 34	*	*	-1.204	.281

	First sample		Second sample	
	CML	s.e.	CML	s.e
Item 35	*	*	-.407	.311
Item 36	*	*	-.278	.324
Item 37	-1.138	.251	-1.453	.236
Item 38	*	*	-1.204	.281
Item 39	-.496	.276	-.713	.262
Item 40	*	*	-.562	.307
Item 41	.080	.316	-.362	.283
Item 42	.316	.313	.170	.362
Item 43	-.423	.280	-.777	.259
Item 44	.507	.325	.048	.350
Item 45	*	*	-.117	.301
Item 46	-2.244	.217	-2.212	.235
Item 47	-.496	.276	-.777	.259
Item 49	*	*	-.313	.317
Item 50	*	*	-.650	.302
Item 51	*	*	-.833	.290
Item 52	-1.199	.223	-.254	.294
Item 53	-.187	.295	-.437	.278
Item 54	-.484	.252	-.169	.301

CML ESTIMATION OF UNCERTAINTY ITEM PARAMETERS, FIRST AND SECOND SAMPLES

	First sample		Second sample	
	CML	s.e.	CML	s.e
Item 1	-.349	.229	-.862	.280
Item 2	-.349	.224	-.188	.276
Item 3	-.124	.193	-.438	.254
Item 4	.431	.280	-.115	.267
Item 5	.025	.252	.099	.279
Item 6	.459	.257	.168	.343
Item 7	.025	.252	-.313	.259
Item 8	-.349	.224	-.398	.266
Item 9	-.612	.223	-.618	.248
Item 10	.164	.240	-.245	.318
Item 11	-.886	.216	-.438	.254
Item 12	-.146	.227	-.047	.329
Item 13	.767	.310	.255	.289
Item 14	.887	.290	.058	.336
Item 15	.151	.260	-.183	.264
Item 16	1.251	.325	.405	.362
Item 17	-.974	.214	-1.064	.239

	First sample		Second sample	
	CML	s.e.	CML	s.e
Item 18	.164	.240	-.339	.313
Item 19	*	*	*	*
Item 20	-.194	.225	.168	.343
Item 22	.178	.249	.593	.333
Item 23	.863	.320	.512	.308
Item 24	.574	.276	1.249	.412
Item 25	.260	.257	-.862	.280
Item 26	.277	.246	.058	.336
Item 27	-.035	.241	-.145	.304
Item 28	1.201	.338	.951	.372
Item 29	-.815	.217	-.056	.309
Item 30	.357	.209	.390	.315
Item 31	1.737	.387	1.181	.453
Item 32	.336	.250	-.047	.329
Item 33	1.079	.345	1.177	.376
Item 34	*	*	*	*

	First sample		Second sample	
	CML	s.e.	CML	s.e
Item 35	-1.076	.214	-.559	.288
Item 36	.336	.250	-.519	.306
Item 37	-.416	.230	.255	.289
Item 38	-1.251	.207	-.147	.323
Item 39	-1.313	.211	-.183	.264
Item 40	*	*	*	*
Item 41	.093	.245	.512	.308
Item 42	*	*	*	*
Item 43	-.466	.228	.706	.325
Item 44	-.768	.211	-.691	.300
Item 45	-1.187	.212	-.559	.250
Item 46	.574	.276	1.092	.390
Item 47	-.564	.225	-.376	.256
Item 49	*	*	*	*
Item 50	.397	.253	.168	.343
Item 51	*	*	*	*
Item 52	.178	.249	.123	.295
Item 53	-.659	.222	-.618	.248
Item 54	-.047	.237	-.114	.280

FREQUENCIES OF EMOTIONAL CATEGORIES, TRANSLATED IN DUTCH

Category	*Frequency*	*Category*	*Frequency*
Teleurgesteld	65	Trots	7
Ongeïnteresseerd	44	Opgelaten	7
Machteloos	43	Wanhopig	6
Onzeker	35	Waardering	5
Gekwetst	35	Verlaten	5
Eenzaam	34	Geisoleerd	5
Boos	33	Afstandelijk	4
Minderwaardig	33	Depressief	4
Superieur	33	Koel	4
Gefrustreerd	26	Onbegrepen	4
Angstig	24	Beschaamd	3
Verdriet	18	Achtergesteld	3
Gepasseerd	16	Agressief	3
Geirriteerd	15	Misdeeld	3
Onverschillig	14	Respect	3
Afgewezen	14	Verveeld	3
Buitengesloten	13	Verheugd	2
Vervreemd	13	Machtig	2

APPENDIX H - CONTINUED

Tevreden	12	Verachting	2
Bezorgd	11	Geprikkeld	2
Berusting	11	Spijt	1
Onbeduidend	10	Geremd	1
Verwaarloosd	9	Blij	1
Schuldbewust	8	Ongemotiveerd	1
Ongebonden	8	Sterk	1
Jaloers	8	Gelaten	1
Verkrampt	7		

GENERIC EMOTIONAL CATEGORIES, TRANSLATED IN DUTCH

Sterk = Superieur + Machtig + Trots + Sterk
Eenzaam = Eenzaam + Buitengesloten + Verlaten + Geisoleerd
Machteloos = Machteloos + Wanhopig + Verkrampt
Minderwaardig = Minderwaardig + Onbeduidend
Onzeker = Onzeker + Bezorgd + Angstig
Boos = Boos + Gefrusteerd + Geirriteerd + Geprikkeld + Agressief
Ongeïnteresseerd = Ongeïnteresseerd + Onverschillig + Ongemotiveerd
Teleurgesteld
Gekwetst

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In de sociale wetenschappen en in veel deelgebieden van de psychologie is sprake van een gebrek aan ontwikkeling van het kennisbestand. Ondanks een inmiddels rijke traditie aan empirisch onderzoek kenmerken deze disciplines zich door een veelvoud aan theoretische inzichten die geen geïntegreerd en cumulatief geheel vormen. Een van de belangrijkste oorzaken van deze onwenselijke stand van zaken vormt de gangbare methodologische benadering in de sociale wetenschappen, waarin het operationaliseren van theoretische begrippen een belangrijke rol speelt. De gebruikelijke onderzoekspraktijk (zoals met name verdedigd door De Groot, 1961) is dat er theoretische constructen worden geïntroduceerd die een verklaring moeten bieden voor een reeks geobserveerde empirische verschijnselen. Om te toetsen of deze theoretische constructen in de empirie optreden gelijk de theorie het voorstelt, worden de begrippen vertaald in een of meer empirische operaties. Vervolgens rijst de vraag in hoeverre de empirische bepaling van het begrip - in de psychologie vaak een vragenlijst - het theoretisch begrip dekt. Meet men met de gespecificeerde operaties datgene wat men beoogde te meten, m.a.w., is de operationalisatie van het theoretisch construct valide? De onmogelijkheid om deze vraag sluitend te beantwoorden wordt in deze dissertatie in aansluiting op Roskam (1989b) beschouwd als het kernprobleem dat verantwoordelijk is voor de stagnerende ontwikkeling van de psychologie en de sociale wetenschappen.

Hoewel de operationalisatiepraktijk zijn wortels vindt in Bridgmans operationisme, een wetenschapstheoretische stroming die werd geïnspireerd door ontwikkelingen in de natuurkunde, maakt een vergelijking tussen het proces van theorievorming in de sociale wetenschappen en dat in de natuurwetenschappen duidelijk dat er sprake is van substantiële verschillen in de methodische benadering die door beide vakgebieden wordt gevolgd. In de fysica poogt men samenhang en struktuur te vinden in observaties die kunnen worden weergegeven met behulp van het ruimte-tijd assenstelsel. Een mathematisch model dat deze samenhang beschrijft bevat struktuur bepalende parameters die hun betekenis ontlenen aan de theorie die ten grondslag ligt aan het model. De theoretische begrippen in de natuurkunde liggen aldus verankerd in de empirische wetmatigheden die door de formele theorie (het model) worden beschreven. Dit in de natuurkunde gebruikelijke proces van theorievorming wordt in deze dissertatie aangeduid als de *empirical entry* (empirische ingang - de term werd geïntroduceerd door Roskam, 1981) benadering, aangezien het de - met behulp van het coördinatenstelsel uitgedrukte - empirische wetmatigheden zijn, die de theoretische begrippen opleveren.

In de sociale wetenschappen hebben theorieën zelden betrekking op een duidelijk gedefinieerd domein van verschijnselen. De onderzoeker heeft een globale voorstelling van zijn domein van belangstelling en introduceert theoretische begrippen die een verklaring moeten bieden voor bepaalde empirische verschijnselen. Deze theoretische constructen liggen niet verankerd in empirische wetmatigheden, maar worden gepostuleerd als zijnde relevant voor een goed begrip van veronderstelde empirische samenhangen. Om te onderzoeken of de theoretische constructen inderdaad de door de theorie voorspelde rol van betekenis spelen moeten ze eerst empirisch worden gecreëerd, oftewel worden geöperationaliseerd. Met de geconstrueerde operationalisaties wordt de theorie vervolgens getoetst. Aangezien het vertrekpunt in de sociaal wetenschappelijke benadering wordt gevormd door het postuleren van verklarende begrippen, wordt deze benadering in de dissertatie aangeduid als de *conceptual entry* (conceptuele ingang - zie eveneens Roskam, 1981) benadering. Uitgangspunt voor de onderhavige studie vormt de vraag of een 'empirische ingang' benadering ook voor die takken van de sociale wetenschappen mogelijk is, die tot op heden vrij exclusief gebruik hebben gemaakt van een 'conceptuele ingang' benadering.

De 'empirische ingang' benadering is in de psychologie niet geheel onbekend. Modelgerichte benaderingen hebben in de leerpsychologie, de mathematische psychologie en de psychonomie tot de formulering van wetten geleid, die zich lenen als fundament voor verdere theorie-ontwikkeling. Veel deelgebieden in de psychologie ontwikkelen zich echter uitsluitend binnen de 'conceptuele ingang' traditie. Met name binnen die gebieden die zich richten op de studie van gevoelens en opinies, in deze dissertatie aangeduid als 'appraisive' (Roskam, 1990) oordelen van subjecten, is de 'empirische ingang' benadering geheel onbekend.

De onderhavige studie was oorspronkelijk opgezet om een methodologie voor vragenlijstconstructie te ontwikkelen en daarbij gebruik te maken van de eenzaamheidservaring als proefdomein. Door Roskam waren ten behoeve van de te ontwikkelen methodologie reeds verscheidene ideeen van methodologische en wetenschapstheoretische aard ontwikkeld (zie o.a. Roskam, 1989b), en door Staalduinen (1986) was een eerste voorlopige studie verricht. Gaandeweg werden de doelstellingen van het huidige onderzoek verbreed en werd de probleemstelling veranderd in de vraag of de formele theorievorming uit de 'empirische ingang' traditie ook voor onderzoek op het gebied van opinies en gevoelens een vruchtbaar alternatief voor de 'conceptuele ingang' aanpak zou kunnen zijn. Gepoogd zou worden om met behulp van Guttmans facet methodiek een inhoudelijk domein van belangstelling (i.c. eenzaamheid) te karteren, een theorie over dit domein te formaliseren en het resulterende model op zijn geldigheid te toetsen. Hoewel een dergelijke methodologische benadering geen specifieke vorm van dataverzameling vereist, wordt zij in deze dissertatie - vanwege de oorspronkelijke doelstelling van het project - uitgewerkt in het kader van vragenlijstonderzoek. In traditioneel onderzoek fungeert de vragenlijst meestal als meetinstrument. Binnen de huidige opzet vormt de vragenlijst een onderzoeksinstrument - een instrument dat op symbolische wijze alle observaties bevat, nodig voor een toets van de hypothesen, i.c. aangaande de facetten van het design. De geformaliseerde theorie beschrijft de te verwachten struktuur in de datamatrix. Indien een eendimensionale struktuur in de data wordt verondersteld, en deze veronderstelling door de onderzoeksresultaten wordt geverifieerd, dan is het mogelijk om subjecten en/of situaties te ordenen - m.a.w. bij de gratie van ons correcte theoretische inzicht hebben we ons in dat geval een meetinstrument verworven.

In dit onderzoek stonden de volgende vragen centraal. De basisvraag was, zoals eerder aangegeven, of de 'empirische ingang' benadering vruchtbaar zou kunnen zijn voor die gebieden binnen de psychologie, die zich tot op heden louter binnen het methodologisch kader van de 'conceptuele ingang' aanpak hebben ontwikkeld. Aangezien Guttmans facetmethodiek een centrale rol is toebedacht in de 'empirische ingang' benadering voor de studie van gevoelens en opinies, zou uitgebreid aandacht worden besteed aan de vraag hoe een facet design moet worden opgesteld, teneinde te kunnen fungeren als coördinatenstelsel voor het identificeren van observaties. Ook zou de vraag aan de orde moeten komen hoe de mogelijke combinaties van facetelementen vertaald moeten worden in leesbare vragenlijstitems

Behalve vragen van methodologische aard beoogde de studie ook een antwoord te bieden op vragen van inhoudelijke aard, gerelateerd aan het domein van de eenzaamheidservaring Er zou worden onderzocht of eenzaamheid kan worden gezien als een unidimensionele latente trek, en gepoogd zou worden om een aantal belangrijke situationele en persoonsgebonden determinanten van de eenzaamheidservaring te identificeren Verder zou worden onderzocht hoe intuitieve hypothesen kunnen worden geformuleerd in termen van de geconstrueerde vragenlijst en vervolgens worden getoetst

In het tweede hoofdstuk is een overzicht gegeven van de achtergrond en reikwijdte van de door Guttman ontwikkelde facetmethodiek Achtergrond van Guttmans werk aan deze methodiek vormde diens onvrede met de praktijk van schaalconstructie in de sociale wetenschappen, waarbij schalen worden ontwikkeld via een proces van verwijdering en toevoeging van items, net zo lang tot er een unidimensionele verzameling items is overgebleven Guttman vond deze werkwijze onwetenschappelijk, en stelde daar de alternatieve praktijk van schaalanalyse tegenover Volgens deze benadering dient een onderzoeker het domein van verschijnselen waar een concept betrekking op heeft nauwkeurig te definiëren, en vervolgens met behulp van data-analyse te onderzoeken of de data een veronderstelde één- of meerdimensionale struktuur vertonen Voor de nauwkeurige definitie van een empirisch domein ontwikkelde Guttman het facet design

Uit zijn werk met betrekking tot schaalanalyse evolueerde uiteindelijk Guttmans facettheorie, een empirisch georiënteerde methodologie waarin domein definitie, theorieconstructie en data-analyse een geïntegreerd geheel vormen In het onderzoeksrecept dat facettheorie vormt, poogt de onderzoeker een correspondentie te vinden tussen een definitioneel systeem voor een universum van observaties (het facet design) en een aspekt van de empirische struktuur van die observaties Het vinden en herhaaldelijk repliceren van zo'n correspondentie betekent de identificatie van een empirische wetmatigheid

Guttman en zijn navolgers hebben als te onderzoeken aspekt van de empirische struktuur van observatiedomeinen voornamelijk gekozen voor gelijkenisdata Op grond van het zogenoemde contiguiteitsprincipe, dat stelt dat twee stimuli empirisch meer op elkaar zullen lijken naarmate zij meer facet elementen gemeen hebben, worden door facet theoretici hypothesen met betrekking tot de struktuur van de correlatiematrix (zgn regionale hypothesen) geformuleerd Deze hypothesen worden vervolgens getoetst met behulp van een multidimensioneel schalingsprogramma, meestal betreft dit 'smallest space' analyse (SSA) Indien de regionale hypothesen juist zijn, zullen in de puntenconfiguratie duidelijk te onderscheiden regio's te vinden zijn, die corresponderen met de partitionerende rol van bepaalde facet-elementen De te verwachten regionale indeling leidt tot een geometrisch patroon dat met behulp van SSA kan worden geidentificeerd (zie voor deze interpretatie van facettheorie Roskam, 1981) Met behulp van de facettheoretische aanpak zijn verschillende wetmatigheden geïdentificeerd, zoals de cylindrexstruktuur van het domein van intelligentie-items (Levy, 1985)

Facettheorie, zoals geconcipieerd door Guttman, kan echter niet worden gezien als een nieuw methodologisch paradigma, de aantrekkingskracht van deze methodologische benadering op sociale wetenschappers is daarvoor te gering gebleken De uitblijvende belangstelling voor facettheorie hangt samen met twijfel aan de wetenschappelijke vruchtbaarheid van deze benadering Deze twijfel wordt tot uitdrukking gebracht in een aantal kritiekpunten Ten eerste kunnen de regionale hypothesen als triviaal worden beschouwd, in de zin dat het voorspellen van orderelaties tussen correlatiecoefficienten aan de hand van een gefacetteerd domein tamelijk eenvoudig kan zijn Daarbij worden de regionale hypothesen geformuleerd op basis van metatheoretische principes die onafhankelijk zijn van de specifieke inhoud van het gefacetteerde domein Als zodanig vormen de regionale hypothesen geen theorie in de gebruikelijke zin van een wetenschappelijke theorie Een met het voorgaande samenhangend bezwaar dat tegen facettheorie is geformuleerd vormt de contaminatie van het facet design als coordinatenstelsel en de theorie die met behulp van het design dient te worden getoetst In de fysica is een theorie over een domein van verschijnselen onafhankelijk van de wijze waarop dat domein in kaart wordt gebracht Dat wil zeggen welıswaar wordt het domein zo gedefinieerd dat een toets op de theorie mogelijk wordt, maar de theorie is niet logisch afhankelijk van de wijze waarop het domein precies wordt gedefinieerd Bij facettheorie is dat niet zo gegeven de wijze waarop het facet design is geconstrueerd, kunnen de hypothesen met betrekking tot het domein worden afgeleid

Een ander kritiekpunt jegens facettheorie betreft het type wetmatigheid dat met de benadering van Guttman wordt blootgelegd Herhaaldelijk gecorroboreerde regionale hypothesen constitueren in de terminologie van facettheoretici 'second laws' (i t t 'first laws', die betrekking hebben op het teken van de correlatiecoefficienten) Het zijn wetten die betrekking hebben op de interne semantische struktuur van een domein van verschijnselen, en als zodanig kunnen deze wetten niet worden beschouwd als algemene uitspraken die een verklaring kunnen bieden voor specifieke gebeurtenissen, zoals in het deductief nomologisch verklaringsmodel dat in de wetenschap gebruikelijk is Het gevolg is dat de wetten uit de facettheorie nauwelijks kunnen fungeren als basis voor cumulatieve theorievorming, hoewel Guttman wel die pretentie had

De exclusieve focus van facettheorie op de interne semantische struktuur van een domein brengt met zich mee dat er veelal geen uitspraken worden gedaan over de subjekten die de data genereerden Weliswaar hebben facettheoretici gezocht naar additionele analyseprocedures die uitspraken over subjekten mogelijk moeten maken, maar de resultaten van deze extra analyses staan min of meer los van de resultaten die door de SSA-analyses worden gegenereerd Een hiermee samenhangend gebrek van de facettheoretische aanpak is dat strukturen die door SSA worden geretourneerd zonder dat deze volgen uit de orderelaties die het onderwerp van de regionale hypothesen vormen, niet kunnen worden begrepen Deze niet begrepen strukturen verwijzen naar een onderliggend data genererend proces, dat het eigenlijke objekt van belangstelling voor met name de psychologie zou moeten zijn

Tenslotte zijn er bezwaren aangevoerd tegen de gekozen analysetechniek van facettheoretici De regionale hypothesen worden getoetst door te zoeken naar een geometrische struktuur in de euclidische SSA-ruimte Uit de hypothesen volgt echter niet dat de orderelaties moeten kunnen worden ingebed in een euclidische metriek, en daarmee lijkt SSA onnodig restrictief Verder kan de uitkomst van de analyse mede afhangen van de gekozen gelijkenismaat Hoewel verschillende gelijkenismaten tot verschillende resultaten aanleiding kunnen geven, wordt de keuze van een specifieke gelijkenismaat door facettheoretici niet beargumenteerd

De genoemde bezwaren tegen de facettheoretische aanpak maken dat deze door Guttman ontwikkelde methodologische benadering niet kan dienen als de 'empirische ingang' benadering die voor de sociale wetenschappen een alternatief zou kunnen vormen voor de gebruikelijke 'conceptuele ingang' benadering. Roskam heeft een alternatieve uitwerking van Guttmans benadering bepleit, die in hoofdstuk 3 wordt besproken en uitgewerkt. Het facet design fungeert hierin als coördinatensysteem voor het identificeren van observaties en dit observatiesysteem blijft onafhankelijk van enigerlei theorie over deze observaties.

De in het derde hoofdstuk besproken methodologische aanpak start met de specificatie van een domein definitie, oftewel de afbakening van het domein van verschijnselen waar de belangstelling van de onderzoeker naar uitgaat. Een theorie over het betreffende domein zal betrekking hebben op responsies (R) van subjecten (P) op een reeks stimuli (S). De onderzoeker specificeert empirische kenmerken van situaties en personen die zijns inziens enerzijds een domein aanduiden, en anderzijds interessante samenhangen zullen vertonen. Het onderbrengen van de relevante situatie- en persoonskenmerken in een facet design levert ons een overzicht van alle mogelijke PxSxR waarnemingen waar de theorie van de onderzoeker betrekking op heeft. Een theorie (en in beginnend onderzoek zal het om niet meer dan een hypothese gaan) voorspelt dat slechts een subset van alle mogelijke situaties zich daadwerkelijk zal voordoen, en dat betekent een uitspaak over de struktuur van de te verwachten datamatrix. Dit zal leiden tot de keuze van een datamodel als formele representatie van de theorie. Als het onderzoek aantoont dat het model een goede beschrijving biedt van de struktuur in de verkregen datamatrix, dan is de theorie daarmee gecorroboreerd. Interessant is dat in dat geval de struktuur bepalende parameters van het model een theoretische interpretatie krijgen: ze vormen theoretische begrippen die op een natuurlijke wijze - d.w.z, los van een willekeurige operationalisatie - verankerd liggen in de empirie. Tevens zal het model het vaak mogelijk maken om personen en situaties te ordenen: m.a.w. het feit dat het model een goede beschrijving biedt van de datastruktuur, levert ons een meetinstrument, zonder dat we deze bewust hebben gecreëerd.

Bij het formuleren van een model ter beschrijving van de struktuur in de datamatrix kan de datatheorie van Coombs behulpzaam zijn. Zo lijkt het door Rasch ontwikkelde eendimensionale logistische model het prototypische datamodel voor vragenlijstdata waarvan we vermoeden dat een cumulatieve eendimensionele ordening van subjecten en vragenlijstitems langs een hypothetische latente trek mogelijk is.

Om te toetsen of de in hoofdstuk 3 ontvouwde 'empirische ingang' methodologie vruchtbaar kan zijn voor die takken van de psychologie die tot dusverre vrij exclusief zijn onderzocht met behulp van een 'conceptuele ingang' benadering, is een onderzoek uitgevoerd naar eenzaamheid, een terrein dat veelvuldig binnen de traditionele methodologische traditie is onderzocht. In hoofdstuk 4 wordt een overzicht gegeven van de resultaten van dat traditionele onderzoek.

De twee belangrijkste theoretische perspektieven staan respektievelijk bekend als de 'sociale behoeften'-benadering en de 'cognitieve'-benadering. De 'sociale behoeften'-benadering, ontwikkeld door Weiss, stelt dat mensen een reeks sociale behoeften kennen die, indien onvervuld, aanleiding kunnen geven tot eenzaamheid. Volgens de theoretici van deze school kan eenzaamheid twee verschillende vormen aannemen, afhankelijk van het soort sociale behoeften dat onvervuld blijft. Indien het individu verstoken blijft van intimiteit kan een toestand van emotionele isolatie optreden De behoefte aan intimiteit wordt gezien als een voortzetting in de volwassenheid van de behoefte van het kind om zich te hechten aan een beschermende figuur Behalve emotionele isolatie kan eenzaamheid zich ook manifesteren in de vorm van sociale isolatie, waarbij het individu vooral verstoken blijft van gezelligheid en sociale erkenning

De cognitieve benadering van eenzaamheid erkent het belang van sociale behoeften in de ontwikkeling van eenzaamheid, maar benadrukt dat de sociale behoeften voor verschillende individuen in verschillende mate een rol spelen Individuen hebben standaards met betrekking tot hun sociaal netwerk zij hebben een bepaalde ideale situatie aangaande hun sociale netwerk voor ogen, en eenzaamheid kan ontstaan indien de verlangens met betrekking tot het sociale netwerk sterk afwijken van de feitelijke sociale situatie waarin het individu mankeert Als de kwaliteit van het sociaal netwerk achterblijft bij de sociale standaards van het individu ontstaat er een cognitieve discrepantie die tot gevoelens van eenzaamheid aanleiding kan geven Het individu zal deze onwenselijke discrepantie pogen te verminderen via verbetering van het netwerk, via verlaging van de standaards, of via ontkenning van het belang van de waargenomen discrepantie Waar deze strategieën ontoereikend blijken, zal een toestand van eenzaamheid resulteren

Binnen het traditionele eenzaamheidsonderzoek wordt gewerkt met verklarende begrippen die meestal een hoog abstractieniveau bezitten Dit maakt het moeilijk om deze begrippen op eenvoudige wijze te operationaliseren en ontlokt diskussies over de validiteit van de ontwikkelde meetinstrumenten Een veel gebruikte eenzaamheidsschaal vormt de 'gemisintensiteitsschaal' van De Jong-Gierveld Ter verdediging van de validiteit van deze schaal worden correlaties gerapporteerd van 51 met het antwoord op de uitspraak 'Ik voel me soms wel eens eenzaam' en van 66 met de self-ratingschaal 'Ik reken mezelf tot de niet, matig, sterk of zeer sterk eenzamen' Theoretische veronderstellingen worden vaak als gecorroboreerd beschouwd indien positieve samenhangen in de orde van grootte van 30 kunnen worden gepresenteerd De in het vierde hoofdstuk geboden bespreking van de theorievorming en het onderzoek op het gebied van eenzaamheid maakt duidelijk dat het traditionele eenzaamheidsonderzoek zich kenmerkt door de gebreken die in de inleiding werden aangevoerd als typerend voor de 'conceptuele ingang' benadering, en die verantwoordelijk worden geacht voor de stagnerende ontwikkeling van het kennisbestand van de sociale wetenschappen

In het vijfde hoofdstuk wordt het onderzoeksvoorstel voor een 'empirische ingang' benadering van eenzaamheid ontvouwd, en wordt geschetst op welke wijze een domein definitie voor eenzaamheidsgevoelens werd geformuleerd De beschrijving van de ontwikkeling van de domein definitie wordt gevolgd door een overzicht van de literatuurstudie die aanleiding gaf tot de articulatie van de domein definitie tot een gedetailleerd facet design dat dienst kan doen als observatieschema voor het doen van daadwerkelijk onderzoek Dit gedetailleerde facet design bevat een vijftal facetten waarvan wordt verondersteld dat ze situationele determinanten van de eenzaamheidservaring zijn Elk van de facetten heeft betrekking op sociale interacties Zo specificeert één facet (in de dissertatie aangeduid als facet A) de richting van de interactie verloopt deze van het subject naar de ander (A_1), van de ander naar het subject (A_2), of valt de interactie als bidirectioneel (A_3) te kenschetsen? Een tweede facet (facet B) specificeert het onderwerp van de interactie gaat deze over een probleem (B_1), over een attitude (B_2), of over een positieve ervaring (B_3)? Een derde facet (facet C) specificeert degene met wie er wordt geïnterakteerd. de levenspartner (C_1), de familieleden (C_2), of vrienden (C_3) Een vierde facet (facet D) geeft de wijze aan waarop geïnterakteerd wordt is er sprake van een fysieke handeling (D_1), of van een verbalisatie (D_2)? Een laatste facet (facet E) slaat terug op het onderwerp van de interactie, en specificeert of dit onderwerp betrekking heeft op het subject (E_1) of op de interactiepartner (E_2) Over deze facetten en facetelementen worden vervolgens hypothesen geformuleerd, die tezamen een (elementaire) theorie vormen over de situationele determinanten van eenzaamheidgevoelens De vragenlijstitems hadden de vorm. 'Als het zelden voorkomt dat ( ), dan zou je je ( ) voelen', met eenzaamheid als één der mogelijke antwoordcategorieën

Behalve situationele determinanten, wordt ook een aantal persoonsgebonden variabelen beschouwd als mogelijke determinanten van eenzaamheidsgevoelens Een tweede versie van het gedetailleerde facet design brengt deze persoonsgebonden determinanten in kaart Een van de veronderstelde persoonsgebonden determinanten betreft het aantal wenselijk geachte sociale interacties waar een subject in zijn/haar persoonlijk leven mee tevreden is (genoteerd als m(S)), ten opzichte van het totaal aantal sociale interacties dat het betreffende subject wenselijk acht (genoteerd als m(V)) Verondersteld wordt dat eenzaamheidsgevoelens afnemen met het groter worden van deze ratio Een tweede persoonsgebonden determinant vormt het aantal wenselijke sociale interacties dat een subject in zijn leven onderhoudt (genoteerd als m(E)), ten opzichte van het aantal wenselijke interacties dat een subject in zijn leven zou kunnen onderhouden (genoteerd als m(C)) Verondersteld wordt dat deze ratio een regulerend effect heeft op de grootte van de invloed van de m(S)/m(V) ratio uit de vorige hypothese Een zelfde regulerende werking wordt verwacht van de derde ratio het aantal wenselijke interacties dat een subject in zijn leven zou kunnen onderhouden (m(C)) ten opzichte van het aantal situaties dat een subject voor wenselijk houdt (m(V))

De in het hoofdstuk ontvouwde elementaire theorie met betrekking tot eenzaamheidsgevoelens vindt zijn formele representatie in het één parameter logistisch model van Rasch Een toets op de hypothesen met betrekking tot situationele determinanten vergt bepaalde restricties op dit model, die een speciale vorm van het model opleveren die bekend staat als het lineair logistisch test model (LLTM) Een toets op de hypothesen met betrekking tot de persoonsgebonden determinanten vergt andere restricties op het algemene model, en deze leveren een variant op die bekend staat als het logistische regressie Rasch model (LRRM)

In het vijfde hoofdstuk wordt tenslotte uitvoerig aandacht besteed aan de wijze waarop de combinaties van facetelementen (z g structuples) dienen te worden vertaald in vragenlijstitems, zodanig dat het facet design een rol kan vervullen als classificatiesysteem voor het categoriseren van observaties Het blijkt noodzakelijk om ten behoeve van dit doel de vragenlijstitems zo nauwkeurig mogelijk te laten corresponderen met de structuples een te vrije vertaling leidt tot idiosyncratische interpretaties door de subjecten

Op grond van de in hoofdstuk 5 gepresenteerde facet designs zijn 108 verschillende situatieschetsen mogelijk, die alle betrekking hebben op een tekortschietende sociale interactiesituatie Om na te gaan of de vragenlijstitems zoals in eerste instantie verwoord begrijpelijk waren, om te zien of vorm en aantal van de items voor onverwachte problemen zouden kunnen zorgen, en om in zijn algemeenheid na te gaan of een item door het subject wordt herkend als een instantie van een structuple uit het facet design, werd een vooronderzoek bij een klein aantal subjecten (N=21) gehouden. Dit vooronderzoek diende tevens ter identificatie van responscategorieën, die naast eenzaamheid bij de items zouden kunnen worden aangeboden.

Het vooronderzoek maakte duidelijk dat het derde element van het 'Richting van de interactie'-facet, 'bidirectioneel', door subjecten altijd op een unidirectionele wijze werd geïnterpreteerd en derhalve niet kan worden gebruikt. Verder bleek dat de elementen van het modaliteitsfacet, 'doen' en 'zeggen', nogal eens dooreen werden gehaald. Een speciaal onderzoeksprobleem deed zich voor bij die specifieke combinatie van facetelementen, waarbij het subject iets doet jegens de ander, met betrekking tot een probleem, een attitude, of een positieve ervaring van hemzelf. Deze constructie bleek voor subjecten onbegrijpelijk en leidde tot idiosyncratische reakties. Verder bleek dat het abstracte en algemene karakter van de items voor oudere en minder ontwikkelde subjecten problemen kan geven.

Op grond van deze bevindingen werd een reeks maatregelen genomen die de kans moesten vergroten dat de items voor alle subjecten eenduidig en taalkundig begrijpelijk zouden zijn. Daarbij werd besloten om, teneinde het aantal items beheersbaar te houden, te kiezen voor een incompleet design. Dit leidde tot vier vragenlijstversies waarin telkens 54 items waren opgenomen die betrekking hadden op eenzaamheid, 27 items die betrekking hadden op wenselijkheid van een bepaalde sociale interactie, 27 items die betrekking hadden op tevredenheid met een bepaalde sociale interactie, en 27 items die betrekking hadden op de vraag of men een bepaalde interactie in het eigen leven onderhield. De items die betrekking hadden op eenzaamheid werden telkens aangeboden met de volgende vier antwoordcategorieën: eenzaam, boos, onverschillig en onzeker.

Hieronder volgt voor elk van de verschillende soorten vragen een voorbeeld.

Als het zelden voorkomt dat naaste familie iets tegen je zegt over belevingen of bezigheden die zij fijn vinden, dan zou je je ... voelen (A2 B3 C2 D2 E2)

Vindt u het belangrijk dat een vriend(in) iets tegen je zegt over zijn/haar problemen? (A2 B1 C3 D2 E2)

Komt het naar uw mening voldoende vaak voor dat uw partner iets tegen voor u doet als het gaat om uw problemen? (A2 B1 C1 D1 E1)

Alleen indien u op de vorige vraag met JA hebt geantwoord:
Bent u tevreden met wat uw partner voor u doet, als het gaat om uw problemen?

In het zevende hoofdstuk wordt verslag gedaan van de resultaten van het eerste hoofdonderzoek. Subjecten voor het eerste hoofdonderzoek waren studenten in verschillende takken van de sociale wetenschappen. De gemiddelde leeftijd lag beneden de 25 jaar. De data uit dit eerste onderzoek werden eerst onderworpen aan een SSA-analyse, om te zien of de verschillende facetten en hun elementen in een meerdimensionele configuratie konden worden teruggevonden Alleen facet A en met enige moeite facet C konden met behulp van SSA worden gelokaliseerd De andere facetten waren niet terug te vinden in duidelijk af te bakenen regio's Een additieve boomanalyse gaf ongeveer hetzelfde resultaat

De klassieke facettheoretische benadering leverde dus niets op Vervolgens werden de data geanalyseerd om te zien of deze als Rasch homogeen konden worden beschouwd Voorafgaand aan alle Rasch analyses wordt in het zevende hoofdstuk ruim aandacht besteed aan technische keuzes en verantwoordingen Raschtoetsen omvatten twee verschillende soorten analyse De zogenaamde eerste orde toets checkt op de assumptie van ICC holomorfie, en de tweede orde toets onderzoekt de data op unidimensionaliteit en lokaal stochastische onafhankelijkheid De gehanteerde eerste orde Raschtoetsen gaven een goede fit van het model aan, maar de tweede orde toetsen toonden schendingen van lokaal stochastische onafhankelijkheid Nadere beschouwing maakte duidelijk dat deze vooral samenhingen met het feit dat sommige items erg sterk op elkaar lijken Besloten werd om de data niettemin als nagenoeg Rasch homogeen te beschouwen, en om de verdere analyses gericht op toetsing van de hypothesen met betrekking tot mogelijke determinanten van de eenzaamheidservaring uit te voeren

De LLTM-analyse, gericht op toetsing van de hypothesen met betrekking tot situationele determinanten van de eenzaamheidservaring, gaf hoofdeffekten aan voor alle facetten behalve facet D (het modaliteitsfacet), en interaktie-effekten voor facet A met B en E, en voor facet B met C en E De hoofdeffekten maakten een toets op de veronderstelde ordening van facetelementen mogelijk Conform de hypothese met betrekking tot facet A bleek dat absentie van sociale interactie geïnitieerd door de ander vaker werd gevoeld als resulterend in eenzaamheid dan absentie van sociale interactie geïnitieerd door het subject

Eveneens in overstemming met de hypothese was de bevinding dat het ontbreken van sociale interactie gericht op problemen sneller tot eenzaamheid aanleiding geeft dan het ontbreken van sociale interacties gericht op positieve ervaringen, en dat de absentie van sociale interacties gericht op attitudes het minst frequent werd gevoeld als resulterend in eenzaamheid

Voor facet C bleek de ordening van de facetelementen niet geheel in overeenstemming met de hypothesen Zo bleek niet het ontbreken van sociale interacties met de partner het meest frequent tot eenzaamheid aanleiding te geven, maar gold dit vooral voor het ontbreken van sociale interacties met familieleden Gebrekkige interacties met de partner en met vrienden bleken niet van elkaar te onderscheiden qua frequentie waarin eenzaamheidsgevoelens door de subjecten aannemelijk werden geacht

Het model gaf aan dat er geen hoofdeffekt voor facet D bestond Het onderscheid tussen zeggen en doen werd door de subjecten in relatie tot eenzaamheid dus niet gemaakt

Voor facet E (om technische redenen ingebed in de nivo's van facet A), werd een ordening gevonden conform de hypothese interacties waarbij het onderwerp (de 'focus') betrekking heeft op het subject blijken frequenter te worden gevoeld als resulterend in eenzaamheid dan interacties waarbij het onderwerp betrekking heeft op de ander

Een toets op de veronderstelde persoonsgebonden determinanten werd niet uitgevoerd, omdat bij het bestuderen van samenhangen tussen de betrokken variabelen bleek dat de veronderstelde persoonsgebonden determinanten geen enkele samenhang vertoonden met de somskore op de eenzaamheidsitems.

Hoofdstuk 7 sluit af met exploratief onderzoek naar de waardering van, de mogelijkheid tot deelname aan, de feitelijke deelname aan, en de satisfactie met sociale interacties, en met exploratief onderzoek naar boosheid, onverschilligheid en onzekerheid met betrekking tot het ontbreken van bepaalde sociale interacties. Eerste orde Raschanalyse liet zien dat vrijwel alle betrokken datasets (de dataset die betrekking had op feitelijke deelname aan sociale interacties, en de set die betrekking had op onverschilligheid uitgezonderd) konden worden beschouwd als bij benadering Rasch homogeen. In het hoofdstuk wordt verder voor al deze schalen nader bekeken hoe bepaalde facetelementen een rol spelen bij het bepalen van de itemmoeilijkheid.

In hoofdstuk 8 wordt verslag gedaan van de resultaten van het tweede hoofdonderzoek. Gepoogd werd om bij een tweede steekproef, ditmaal een vrij heterogene steekproef uit inwoners van Nijmegen, de in het eerste hoofdonderzoek gevonden resultaten te repliceren. De data met betrekking tot eenzaamheid bleken ook voor de tweede steekproef bij benadering Rasch homogeen: de eerste orde tests gaven een goede Raschschaal aan, maar de tweede orde tests wezen op enkele schendingen van lokaal stochastische onafhankelijkheid. Opnieuw leken deze samen te hangen met het feit dat sommige items qua formulering sterk op elkaar lijken.

De LLTM-analyse gaf opnieuw hoofdeffekten voor de facetten A, B, C en E weer, en reproduceerde eveneens de interaktie-effekten voor ABE en BCE. Tevens werd ditmaal een nieuw interaktie-effekt (CE) gevonden. Daarmee werd het LLTM uit de eerste steekproef in essentie bevestigd. Ook de basisparameters voor de facetelementen bleken goed vergelijkbaar. Samenhangend met dit laatste bleken de hypothesen voor facetten A, B en E gecorroboreerd, terwijl facet D opnieuw geen effekt liet zien. Facet C gaf een nieuw beeld te zien.

Waar voor de relatief jonge groep studenten uit de eerste steekproef het ontbreken van interacties met familieleden het meest frequent werd gevoeld als resulterend in eenzaamheid, daar gold dit voor de qua leeftijd gemiddeld oudere subjecten uit de tweede steekproef vooral voor het ontbreken van interacties met de levenspartner. Het leeftijdsverschil lijkt een plausibele verklaring te bieden voor dit verschillende resultaat voor de beide steekproeven: voor de studenten bevinden de partnerrelaties zich nog in een experimenteel stadium, en worden de meest intieme relaties nog gevormd met de familieleden. Voor de andere subjecten uit de Nijmeegse steekproef zijn de familiebanden van secondair belang geworden, en levert de partnerrelatie de meest intieme band.

Evenals voor de eerste steekproef, gold ook voor de tweede steekproef dat geen der veronderstelde persoonsgebonden determinanten van de eenzaamheidservaring enig verband vertoonde met eenzaamheid. Verder bleek van de achtergrondvariabelen alleen geslacht samen te hangen met de eenzaamheidservaring: vrouwen voelen zich met name bij het ontbreken van sociale interacties met vrienden vaker eenzaam dan mannen. Hoofdstuk 8 sluit af met een overzicht van de resultaten van het exploratief onderzoek naar de alternatieve responscategorieen boosheid en onzekerheid, en naar de waardering van, en de satisfactie met sociale interacties. Het blijkt dat vele van de in de eerste steekproef gevonden patronen in de tweede steekproef werden teruggevonden

Zo werd met betrekking tot de waardering van sociale interacties voor beide steekproeven gevonden dat subjecten interacties die betrekking hebben op problemen het meest belangrijk achten, en interacties met betrekking tot opvattingen het minst belangrijk Deze ordening lijkt samen te hangen met het feit dat problemen en positieve ervaringen een emotionele lading hebben, terwijl opvattingen primair cognitief van aard lijken Verder worden interacties met de partner belangrijker geacht dan sociale interacties met vrienden, en worden interacties met de naaste familie het minst belangrijk geacht Een interessant gegeven is het feit dat, in tegenstelling tot de data met betrekking tot eenzaamheidsgevoelens, voor de waarderingsdata geldt dat subjecten een duidelijk onderscheid maakten tussen interacties waarbij sprake is van een verbalisatie en interacties waarbij sprake is van een fysieke handeling Verbale interacties werden als belangrijker ervaren dan fysieke interacties Curieus was verder de bevinding dat, terwijl interacties die betrekking hebben op een probleem altijd als belangrijk ervaren worden, interacties met betrekking tot met name opvattingen alleen belangrijk worden gevonden wanneer het gaat om opvattingen van de interactiepartner Voor de eerste steekproef geldt dit gegeven eveneens voor positieve belevingen of bezigheden alleen indien deze de interactiepartner betreffen, worden interacties met betrekking tot een dergelijke focus als belangrijk ervaren

Voor de satisfactiedata bleek, evenals voor de gegevens met betrekking tot eenzaamheidsgevoelens, dat de studenten uit de eerste steekproef meer tevredenheid voelden met betrekking tot interacties met de naaste familie dan met interacties met de partner, en dat dit voor de subjecten uit de Nijmeegse steekproef precies andersom gold Verder bleek dat subjecten meer tevreden zijn met interacties waarbij het onderwerp van gesprek (dus de 'focus') op de interactiepartner betrekking heeft, dan met interacties waarbij het om opvattingen of ervaringen van het subject gaat Eén interactie-effect laat echter een uitzondering op deze regel zien als de focus van de interactie een probleem vormt, blijkt dat de subjecten meer tevreden zijn indien het om hun eigen problemen gaat

Voor de data met betrekking tot onzekerheid bleef slechts één hoofdeffekt voor de facetten B en C in beide steekproeven overeind Het blijkt dat onzekerheid met name wordt uitgelokt waar het ontbreekt aan interacties met betrekking tot opvattingen Dit lijkt samen te hangen met het feit dat in onze cultuur het kunnen verdedigen en het uitdragen van eigen opvattingen een belangrijke bron van eigenwaarde vormt Waar men er niet in slaagt om bevredigend te interacteren met betrekking tot opvattingen wordt deze bron afgesloten en neigt men snel naar onzekerheid

De data met betrekking tot boosheid laten zien dat boosheid het vaakst ontstaat indien het ontbreekt aan sociale interactie met de partner, en het minst snel wanneer het gaat om gebrekkige interactie met naaste familie In tegenstelling tot de data met betrekking tot eenzaamheidsgevoelens geldt dit zowel voor de subjecten voor de studentensteekproef als voor de subjecten uit de Nijmeegse steekproef Een ander interessant verschil met de eenzaamheidsdata is dat het ontbreken van interacties waarin men iets doet vaker aanleiding geeft tot boosheid dan het ontbreken van interacties waarin men alleen maar iets zegt

In het slothoofdstuk worden de resultaten geïnventariseerd en geevalueerd in het licht van de probleemstelling Tevens worden enige suggesties gedaan voor vervolgonderzoek De eindconclusie luidt dat het huidige onderzoek heeft aangetoond dat de voorgestelde empirische ingang voor de studie van opinies en gevoelens methodologisch een vruchtbaar alternatief biedt voor de traditionele onderzoeksmethodologie.

CURRICULUM VITAE

De auteur is geboren op 2 juli 1958 te Den Haag Hij bezocht ondermeer het Dalton Lyceum te Den Haag waar hij in mei 1980 het diploma Atheneum-A behaalde Van 1980 tot 1987 studeerde hij psychologie aan de Universiteit van Amsterdam met als hoofdrichting methodenleer Januari 1988 werd hij aangesteld als assistent-onderzoeker in opleiding, op het project 'Methodologie van de constructie van vragenlijsten', gefinancierd uit de universitaire onderzoekspool van de Katholieke Universiteit Nijmegen, onder leiding van prof dr E E Ch I Roskam Sindsdien is hij werkzaam bij de vakgroep Methoden en Technieken van de Faculteit Sociaal Culturele Wetenschappen der Vrije Universiteit, waar hij de colleges in de methoden en technieken van de sociale wetenschappen verzorgt

Addendum

By mistake some of the stepwise multiple regression analyses reported in chapters 7 and 8 were based on a slightly different set of contrasts as were used in the final analysis of the loneliness data, thereby impeding a straightforward comparison The difference only concerns the coding of contrasts involving facet B For the sake of completeness, the contrasts used to analyze the loneliness data (as with tables 7 24 and 8 21) are given at the end of this addendum The reader should replace tables 7 30 and 8 38, 7 34 and 8 41, 7 41 and 8 46, and lastly 7 45 and 8 53 by the ones given on the next pages, based on these contrasts As can be seen from the tables below, many of the changes concern a replacement of contrasts involving B2 by contrasts involving B1 and vice versa, or a vanishing of such contrasts
Moreover, due to the fact that some items not fitting the Rasch model were deleted the contrasts are no longer fully orthogonal This has some consequences for the interpretation of the results

a) *Valuation*
Re tables 7 30 and 8 38 The same main and interaction effects were retained as reported on pages 203 205 and 266 272, and the interpretations therefore could remain unaltered Some differences between the first and second samples (C1E disappeared, and C1 and A2E appeared in the second sample), were apparently due to correlations between C1 and C1E (r = 78) and between C1E and A2E (r = - 33) Therefore we decided to redo the analysis without the C1E contrast Results of that analysis are given in the table below, which replaces the original tables 7 30 and 8 38 The results are now practically identical for both samples, but show a different picture for the first sample due to omitting C1E the main effect of C, discussed on page 203 is apparently confounded with a CE interaction, and should so be interpreted The appearance of A2E highlights the effect of E (locus), as it did with respect to loneliness B2 has disappeared in the first sample, indicating the greater efficiency of the present coding for that sample

First sample				Second sample			
Step	Contrast	1st order r	Mult R	Step	Contrast	1st order r	Mult R
1	C1	61	61	1	C1	72	72
2	A2E	18	73	2	C2	34	80
3	D	- 37	82	3	D	26	84
4	C2	29	87	4	A2E	19	88
5	B1	29	92	5	B2	17	91
6	B1D	28	96	6	B1	23	94
7	B1A2E	18	97	7	B1D	17	96
8	B1C1D	12	98	8	B1A2E	22	97

Tables 7 30 and 8 38 Stepwise multiple regression of valuation parameters on contrasts Contrasts involving A and A1E were left out because the valuation items contain no A_1 items C1E has been omitted as well

b) *Satisfaction*

Re tables 7 34 and 8 41 The results have not much changed and the interpretations on pages 206 210 (first sample) and 273 280 (both samples) do not alter Since the pairs of contrasts {C1E C1} and {C2E C2} are mildly correlated (33) in both samples the differences between the samples have little significance C2E seems to act as a suppressor variable The small CD interaction effect mentioned on page 273 for the second sample has vanished now

First sample				Second sample			
Step	Contrast	1st Order R	Mult R	Step	Contrast	1st Order R	Mult R
1	C1	57	57	1	C2	63	63
2	C2	45	72	2	B2	48	79
3	B2	43	84	3	D	35	87
4	B1	26	88	4	B1	20	89
5	D	25	92	5	B2D	17	91
6	C2E	05	94	6	C1E	17	92
7	A2E	17	95	7	B2A2E	15	94
8	B2A2E	13	96	8	A2E	15	95

Tables 7 34 and 8 41 Stepwise multiple regression on satisfaction parameters, first and second samples 22 Contrasts were used (A, AB1, AB2 and all contrasts involving A1E were left out since no A_1 items were administered)

c) *Uncertainty*

Re tables 7 41 and 8 46 A small effect for facet D is now also found in the second sample Because of many small correlations between the contrasts (due to omitting a few items) little significance can be attributed to the details of the results, except for the C1 effect in the first sample where 'uncertainty' appears to be stronger related to a partner relation than it is in the second sample As with satisfaction, C2E appears to be a suppressor variable

First sample				Second sample			
Step	Contrast	1st Order R	Mult R	Step	Contrast	1st Order R	Mult R
1	C2	44	44	1	C2	53	53
2	A2E	34	58	2	A2E	31	64
3	C1	28	67	3	A	21	72
4	AB1	35	74	4	B2	16	75
5	D	24	78	5	B1D	16	77
6	B1C2E	21	81	6	B1A1E	19	80
7	C2E	08	84	7	B2C2E	29	81
8	B1A1E	17	86	8	AB2	31	84
9	B1	24	88	9	B1C1D	17	85
10	B1A2E	18	89	10	D	17	86
11	B2A2E	21	90	11	B2C1D	17	88
12	AB2	24	92	12	C2D	17	89

Tables 7 41 and 8 46 Stepwise multiple regression on uncertainty parameters, 1st and 2nd samples 28 Contrasts were used The same 46 items were analyzed in both samples

d) *Angryness*

Re tables 7 45 and 8 53 The interpretations given on pages 219 224 and 290 301 are not affected except that the (minor) ABF interaction discussed on page 223 has now vanished in the first sample It is apparently captured by A2F with which B2A2F is correlated (51) due to omitting 15 items in the first sample For the second sample a small BCD interaction has emerged The low first order correlation between the B2C1D contrast and the angryness para meters suggests that the appearance of this contrast in the equation may be due to sampling fluctuations This contrast is also slightly correlated in the second sample with contrasts involving B2 C1 and D and so also acts as a suppressor variable

First sample				Second sample			
Step	Contrast	1st Order R	Mult R	Step	Contrast	1st Order R	Mult R
1	A	51	51	1	A	74	74
2	A1F	43	69	2	A1E	37	82
3	D	42	79	3	C1	28	87
4	C1	33	85	4	D	21	89
5	B1	20	89	5	B2A1F	16	90
6	A2F	29	91	6	B1	16	91
7	B2	16	93	7	C1F	10	92
8	B1C2F	25	94	8	B2C1D	13	93
9	B1D	14	95	9	A2F	07	93

Tables 7 45 and 8 53 Stepwise multiple regression on angryness parameters first and second samples 28 Contrasts were used 37 Items were analyzed in the first sample and 52 items were analyzed in the second sample

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Contrast coding for all tables

Facet Level	A	B1	B2	C1	C2
	J contrast codes for main effects				
1	1	2	0	2	0
2	1	2	0	1	1
3		0	2	1	1

Facet combinations	A1E	A2E	D
	J contrast codes for pseudo main effects		
A1 D1 F1	2	0	0
A1 D1 F2	1	0	1
A1 D2 F1	2	0	0
A1 D2 F2	1	0	1
A2 D1 F1	0	1	1
A2 D1 F2	0	2	0
A2 D2 F1	0	1	1
A2 D2 F2	0	2	0

Facet combinations	*J contrast codes for AB and ABE interaction effects*					
	AB1	AB2	B1A1E	B1A2E	B2A1E	B2A2E
A1 B1 E1	1	1	2	0	2	0
A1 B1 E2	1	1	1	0	1	0
A1 B2 E1	2	0	4	0	0	0
A1 B2 E2	2	0	2	0	0	0
A1 B3 E1	1	1	2	0	2	0
A1 B3 E2	1	1	1	0	1	0
A2 B1 E1	1	1	0	1	0	1
A2 B1 E2	1	1	0	2	0	2
A2 B2 E1	2	0	0	2	0	0
A2 B2 E2	2	0	0	4	0	0
A2 B3 E1	1	1	0	1	0	1
A2 B3 E2	1	1	0	2	0	2

Facet combinations	*J contrast codes for BD, CD, and BCD interaction effects*							
	B1D	B2D	B1C1D	B1C2D	B2C1D	B2C2D	C1D	C2D
B1 C1 D1	1	1	2	0	2	0	2	0
B1 C1 D2	1	1	2	0	2	0	2	0
B1 C2 D1	1	1	1	1	1	1	1	1
B1 C2 D2	1	1	1	1	1	1	1	1
B1 C3 D1	1	1	1	1	1	1	1	1
B1 C3 D2	1	1	1	1	1	1	1	1
B2 C1 D1	2	0	4	0	0	0	2	0
B2 C1 D2	2	0	4	0	0	0	2	0
B2 C2 D1	2	0	2	2	0	0	1	1
B2 C2 D2	2	0	2	2	0	0	1	1
B2 C3 D1	2	0	2	2	0	0	1	-1
B2 C3 D2	2	0	2	2	0	0	1	1
B3 C1 D1	1	1	2	0	2	0	2	0
B3 C1 D2	1	1	2	0	2	0	2	0
B3 C2 D1	1	1	1	1	1	1	1	1
B3 C2 D2	1	1	1	1	1	1	1	1
B3 C3 D1	1	1	1	1	1	1	1	1
B3 C3 D2	1	1	1	1	1	1	1	1

Facet combinations	*J contrast codes for CE and BCE interaction effects*					
	C1E	C2E	B1C1E	B1C2E	B2C1E	B2C2E
B1 C1 E1	2	0	2	0	2	0
B1 C1 E2	2	0	2	0	2	0
B1 C2 E1	1	1	1	1	1	1
B1 C2 E2	1	1	1	1	1	1
B1 C3 E1	1	1	1	1	1	1
B1 C3 E2	1	1	1	1	1	1
B2 C1 E1	2	0	4	0	0	0
B2 C1 E2	2	0	4	0	0	0
B2 C2 E1	1	1	2	2	0	0
B2 C2 E2	1	1	2	2	0	0
B2 C3 E1	1	1	2	2	0	0
B2 C3 E2	1	1	2	2	0	0
B3 C1 E1	2	0	2	0	2	0
B3 C1 E2	2	0	2	0	2	0
B3 C2 E1	1	1	1	1	1	1
B3 C2 E2	1	1	1	1	1	1
B3 C3 E1	1	1	1	1	1	1
B3 C3 E2	1	1	1	1	1	1

STELLINGEN

behorend bij het proefschrift

FORMALIZED THEORY OF APPRAISIVE JUDGMENTS

A general methodology for questionnaire research integrating facet design, theory construction and psychometrics

Nick Broers

Nijmegen

24 januari 1994

Proefschrift

1 De gemisintensiteitsschaal van De Jong-Gierveld meet geen eenzaamheid, maar specificeert mogelijke determinanten van deze ervaring

(J de Jong-Gierveld (1984) *Eenzaamheid Een meersporig onderzoek* Deventer Van Loghum-Slaterus)

2 De kunst van het opstellen van een facet design is niet het aaneensmeden van diverse persoons-, situatie- en responsfacetten tot een goed lopende zin, maar het weten te kiezen van facetten en facet-elementen die interessante empirische samenhangen opleveren

3 Het modaliteitsfacet in Guttmans facet design voor attitude items vervult geen funktie en is dus overbodig

4 Indien men een schaal heeft geconstrueerd via een proces van geleidelijke verwijdering van slecht passende items, dan kan men de validering van het meetinstrument wel achterwege laten de empirie heeft in eerste instantie immers al laten weten dat het observatiedomein zoals oorspron kelijk gedefinieerd geen eendimensionale schaalbaarheid toelaat

5 Theorievorming over psychologische toestanden als eenzaamheid en onveiligheidsbeleving vergt geen conceptualisatie van mogelijk verklarende begrippen, maar vraagt om een nauwgezette definitie van het domein van verschijnselen waar deze toestanden betrekking op hebben

6 Teneinde idiosyncratische interpretaties van de vragenlijstitems te voorkomen, dient het aan de items ten grondslag liggende facet design bij voorkeur te worden geconstrueerd in de vorm van een goed lopende zin en moeten de items zoveel mogelijk worden geconstrueerd conform deze zin

Algemeen:

7. Darwins theorie over de rol der natuurlijke selectie in het evolutieproces betekent de doodsteek voor iedere poging om te filosoferen over een diepere zin achter het bestaan. Het is daarom van belang om te benadrukken dat, hoewel de evolutie der soorten een empirisch feit constitueert, de darwinistische interpretatie van dit proces slechts een goed verdedigbare overtuiging vormt.

8 Voor een psychologisch begrip van Hitlers drijfveren heeft men meer aan de analytische psychologie van Jung dan aan de psychoanalyse van Freud.

   (A.Bullock (1962). *Hitler A study in tyranny*. 2nd ed. Middlesex. Penguin Books).

9. Het verschijnsel van de meervoudige persoonlijkheid is niet zo zeldzaam als dat der eenvoudige persoonlijkheid.

10. Wie zich van de antipsychiatrische slagzin 'Ooit een normaal mens gezien? En. .beviel het?' bedient, geeft daarmee vooral aan zelf nog nooit een abnormaal mens te hebben gezien.

11. De term fascisme is verworden tot een toverwoord dat cultuur- en waarderelativisten nodig hebben om, niettegenstaande hun geloof, absolute ethische oordelen te vellen

12. De interpretatie van een schijnbaar betekenisvolle samenloop van omstandigheden als daadwerkelijk betekenisvol hoeft niet minder redelijk te zijn dan de interpretatie van een dergelijke gebeurtenis als zuiver toevallig

   (C.G.Jung Opmerkingen over synchroniciteit In: *Verzameld Werk van Jung (2)· Archetype en onbewuste*. Rotterdam: Lemniscaat).

13 Een goed empirisch onderzoek naar discriminatiegedrag is niet mogelijk zonder een nauwkeurige domeindefinitie. Het gebruik van facet design is voor een dergelijk onderzoek dan ook een geschikt, zo niet noodzakelijk, hulpmiddel.

14. De moeizame pogingen om schizofrenie te definieren als een van verwante ziektebeelden te onderscheiden syndroom moeten vooralsnog tot de conclusie leiden dat het eenvoudiger en wetenschappelijk gezien zuiverder is om het maar gewoon te laten bij de algemenere diagnostische categorie 'psychose'

   (I.I. Gottesman (1991). *Schizophrenia genesis*. New York: Freeman.)

15. Het spreekwoord 'De soep wordt niet zo heet gegeten als hij wordt opgediend' wordt ten onrechte ter geruststelling aangevoerd. Men kan er immers evenzogoed de lippen aan branden.

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