A PSYCHOLINGUISTIC STUDY OF SOME ASPECTS OF GRADABILITY, WITH SPECIAL REFERENCE TO CHILD LANGUAGE

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Declaration:

I hereby declare that this thesis is my own original composition. The work is my own, and the empirical child language data used in this thesis was collected by me and under my direction in 1975.

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ABSTRACT

This thesis is intended to provide an outline of some of the relevant developmental and psycholinguistic factors influencing the evolution of gradability as a structured cognitive system, and to supply a partial theoretical description of adjectives used in the expression and comprehension of a limited number of gradable concepts in English, namely those associated with the relative physical dimensions of perceived entities (size, height, and length), and those involved in judgements of conformity to or implicit deviance from a norm.

The first two chapters treat the subject of gradability very broadly from the philosophical, linguistic, psychological and developmental points of view. Previous work is surveyed and a number of theoretical inconsistencies are found, particularly with respect to earlier semantic and syntactic analyses of gradable adjective structure.

The remaining parts of the thesis describe a pilot study and two clinical studies of a limited area of adjective vocabulary in children aged 8-11 years and 11-13 years, who were compared with a group of 19 adults from mixed academic backgrounds, the majority in higher education. The small-scale pilot study used picture cards in sets of seven as a stimulus for oral judgements which were recorded; the second study used a written-completion method with a six-page questionnaire containing pictures and captions; and the third study focused on the comprehension of one pair of gradable antonyms and their negatives in such a way that "category widths" could be established for each participant over two fields of referents.

The data from these studies generally support a hypothesis that "relative coding" is cognitively earlier in development than "absolute coding", as reflected in children's use of different adjective forms

and types, and the result was found to be well explained by recourse to Bryant's perceptual framework theory. There were seen to be both linguistic and cognitive differences between younger and older children and between boys and girls in the 8-13 age range. Perceptual and linguistic grading were found to differ less with increasing age; boys appeared actively to master extremal polar adjectives (particularly negative) at a faster rate than girls and to develop antonymic structure sooner, while girls possessed a richer vocabulary for norm-related concepts (e.g. _medium_, _average_, etc.); though girls developed a stable dyadic logic for antonyms earlier than boys, this was a transitory stage through which boys seemed to move much faster to achieve a triadic logical structure postulated to underlie gradable antonym usage.

This study indicates that the accurate use and comprehension of gradable adjectives is much slower to develop than was previously thought, and passes through a number of stages of stability and flux. Existing theories of language acquisition, particularly Clark's Semantic Feature Hypothesis, are examined and found not to account fully for the stages of development postulated to be discernible in the above data. A theory that takes account of frameworks, and the difference between filled and empty space, is better able to explain the kinds of difficulty children have in distinguishing the meanings of size adjectives. As an outcome of these considerations, an analysis of comparison sentences is provided that will act as a testable basis for future research. The practical implications of the results of the present study for education in the middle years of school life, particularly with regard to science subjects, are briefly considered.

CHAPTER 3

PILOT STUDY OF GRADABILITY

3.1. Aims

Apart from assessing the feasibility of using picture stimuli in gradable arrays in order to elicit both grading behaviour and the use of gradable adjectives, the main purpose of the study was to examine the degree of difficulty which might be inherent in the following variables:

(a) Type of concept.

This could be broken down into a number of sub-problems, such as:

(i) Specificity. This applies particulary to physical dimensions, where there is a large body of research showing that global concepts, such as SIZE (e.g. _big_ and _small_) are learned more easily and earlier than specialised concepts such as HEIGHT (e.g. _tall_ and _short_, _high_ and _low_).

(ii) Abstractness. Physical gradable concepts like SIZE and HEIGHT seem to be differentiated earlier than 'abstract' concepts like those which are associated with adjectives such as _happy_, _pretty_ and _clean_ (Ervin and Foster, 1960).

(iii) Presence of a norm. This might possibly make grading easier.

(iv) Constancy of a norm. Norms for arrays of gradable entities may be thought of either as "relatively absolute" or as contingent. Classes of "natural" entities tend to have relatively absolute norms for physical dimensions, for example, whereas on some particular occasion and for some particular purpose the norm may be seen to be contingent, for a sub-class of these entities; or it may alternatively be imposed, in equally contingent fashion, on a class of "artificial" or synthetic entities. We might illustrate these three types of norming by reference to the class of animals, the sub-class mice, and the class rectangles, respectively.

(v) Concept binding. This is a further aspect of the preceding two points. By concept-binding I mean the degree to which a concept is bound to or determined by a particular object class, and takes its meaning from that class. One aspect of this problem is found in Bierwisch's discussion of genus proximum[1] (1970 a).

Another aspect of the problem is that object categories which might be graded with respect to the "same" concept may not be equivalent, although the gradable adjectives used in each case are formally the same: a long road is not, usually, equivalent in length to a long piece of string (Small, 1923).

(b) Presentation of concept.

The aspect of the problem of interest here was the size of the gradable array, i.e. the number of instances of a concept presented for grading. Most previous studies have presented arrays of between two and four objects to represent gradable concepts, but the reasons for doing so have rarely been stated. There seems to have been an implicit assumption, either that such arrays were sufficient for elicitation of the behaviour under investigation, or that young children's cognitive capacity is not sufficiently well-developed for them to be able to organise larger arrays, since organisation would be inhibited by variables such as memory-span. Although the problem of array-size has generally been ignored, it is a variable worthy of attention if one wishes to make strong claims on the nature and development of gradability in children.[2] It is arguable that arrays of three instances are the very minimum, if one is to investigate any of the following:

(i) Serial ordering on the basis of gradably organised percepts.

(ii) Ability to use the following linguistic correlates of gradability: comparative and superlative forms of adjective; absolute forms of gradable adjective; equative structures; negative equative and negative comparative structures; 'intermediary' (i.e. norm-related) adjectives.

However, if one is interested in the way the various linguistic structures might be organised into a more complex, integrated structure, it is necessary to extend the number of concept-instances presented in an array, so as to allow for differentiation between these structures in the way they might be applied. Different structures might be preferred, according to the part of an array being described.[3]

3.2. Method

3.2.1. Design

Six gradable concepts were chosen as follows:

I. HEIGHT: As a specialised concept, this could also be represented globally, and therefore more simply, as SIZE. The kinds of gradable adjectives (only the absolute forms are given) which were expected were: tall, short, big, small, huge, gigantic, tiny, minute, etc.

II. SIZE: If a global mode of judgement were used, the expected adjectives would be: big, small, huge, tiny, etc. It was also possible to consider one aspect of the concept (For the reason why, see Section 3.2.3., below), and use the more specialised adjectives associated with LENGTH: long and short.

III. WIDTH: The kinds of adjectives expected were: wide, narrow and broad, and if subjects simplified from specialised to global concept, then big, small, etc. would occur.

IV. MEASURE: Adjectives expected were: long, short, endless, and less specifically, big, small, huge, tiny, etc.

V. DIRTINESS: Expected adjectives: clean, dirty, mucky, filthy, black, rotten.

VI. DEVIANCE: Expected adjectives: abnormal, odd, peculiar, strange, funny, mad.

Each concept was exemplified by an array of seven members which could be serially arranged on the basis of the concept. For the first five concepts total seriation was possible, whereas for the last it was not, since in some cases the examples were equivalent, and so only partial seriation was possible. Concept IV, MEASURE, was presented verbally as a set of (written) quantities. The other five concepts were represented visually by means of 'pictures'. (See 3.2.3.).

3.2.2. Subjects

The child subjects were a small sample of pupils at Aberdour Primary School, Fife. As this is a village school, and most of the village's inhabitants worked locally, the school population was fairly homogeneous. The sample was chosen to be representative of three age-groups, as represented by classes Four, Five and Six at the school. The class teachers were requested to select pupils from those they considered the most advanced, those they considered the least advanced, and those they considered to be about average from the point of view of general ability. This gave 8 pupils from Class Four, 10 from Class Five, and a truncated sample (excluded middle) from Class Six. These twenty-two children were divided into the following groups by age and sex:

	Age	Male	Female	N
Group 1	7;11 - 8;11	4	5	9
Group 2	9;00 - 9;10	5	4	9
Group 3	9;11 - 10;11	2	2	4

A girl from Class Five was put in Group 1 on the basis of age.

In order to have some idea how adults would deal with the grading problems that were given to the children, a written elicitation using the same stimulus materials was subsequently conducted with a small group of staff and students (N=6) at the Department of Applied Linguistics, University of Edinburgh. These adults obviously do not constitute a random sample; the group was balanced for sex, but two of the females were not native speakers of English despite having used English as a first language for a number of years.

3.2.3. Stimuli

The stimuli were presented on plain postcards in six sets of seven. Each array of seven cards illustrated one gradable concept, usually by pictorial means. Within its set each card was assigned a randomly-chosen letter of the alphabet for identification purposes, and this letter was written on the address-side of the postcard - later it was typed in the top left-hand corner of the picture-side for the written elicitation with the adult group. The sets of cards were designed as follows:

Set I. (HEIGHT): each card contained a man on the left, facing an elephant on the right of the picture. The heights of man and elephant varied from card to card, so that some cards showed the elephant taller than the man, and others the man taller than the elephant. The array of seven cards could be graded on the relationship of proportion that held between the two sets of heights. Subjects could, alternatively, ignore one set of heights (e.g. the man's), and grade according to the other (e.g. the elephant's). This would be a simpler task, but could not have the result that the heights which were ignored would also appear in graded order. It was hypothesised that this co-variance would be the most difficult for the child subjects to deal with. Order of cards: F, S, A, L, Z, D, B, for covarying heights.

Set II. (SIZE): cards in this set each had a drawing of a bug-like insect which was a cross between an ant and a beetle. The body lengths by widths were as follows:

C	45 x 14 (45) mm.	(The brackets give leg-spans)
P	18 x 7 (18) mm.	
W	9 x 3 (9) mm.	
D	6 x 2 (6) mm.	
K	3 x 1 (3) mm.	
U	2 x 0.5 (2) mm.	
O	1 x 1 mm.	

It was hypothesised that child subjects would vary the language they used according to whether they attended to length or width individually or judged in global terms; and also if they thought the drawings represented ants or beetles.

Set III. (WIDTH): rectangular strips of black sugar-paper of constant length (110 mm) but of varying width were cut and glued on to postcards. The widths were as follows: C = 875 mm; N = 34 mm; I = 19 mm; A = 15 mm; G = 14 mm; D = 11 mm; M = 3 mm.

Set IV (MEASURE): seven different measures were written on the cards of this set, as follows: P = 400 miles; D = 2 miles; M = 2000 yards; B = 300 feet; A = 12 yards; C = 48 inches; Q = 6 inches. The kind of difficulty presented here is similar to that for Set I, since children had to grade by connecting number to measure. Grading number alone, or measure alone, could not solve the problem.

Set V (DIRTINESS): six cards of the set were dirtied with mud and ash and ink, in varying degrees, and the seventh was left clean.

Set VI (DEVIANCE): the cards in this array contained drawings of animate beings of varying appearance, from slightly to grossly irregular. As they are in many cases surreal, they are not described, but are presented, together with the drawings for Set I, in the Appendix (See Appendix 1).

3.2.4. Apparatus

A4 Record Sheets were designed for use during the elicitation with the child subjects; the sheets contained the list of concepts and the identifying letters of the cards in each set. Space was left so that the order of presentation of cards could be noted, and also up to three choices of gradable adjective per card for each individual subject.

Elicitation sheets were designed, one per concept, for use later with the adult group. These sheets reproduced in essence, although more rigorously and formally, the oral elicitation method used with the child subjects. Copies of both record and elicitation sheets can be found in Appendix 1.

The pilot study at Aberdour School was recorded, using an Uher portable tape-recorder, on three 5 inch L.P. tapes (2700 ft.), for the purpose of cross-checking with the record-sheets, which could only hold a limited amount of information.

3.2.5. Procedure

Subjects at Aberdour were chosen by the class teacher in each case, and were interviewed in a quiet classroom which was not being used. They were interviewed in twos so that they would not feel nervous or shy. They were seated on one side of a classroom worktable, and I sat on the other, with the microphone on the table between us. Their class teachers had already spent some time the previous week recording them speaking, so that they did not feel inhibited by the presence of a tape-recorder nearby. I explained that I was interested in the words they used to describe things, and that was why I was recording them. Three cards had been previously taken from each concept set (always the same cards for each group) and shuffled together. These eighteen cards were then given to the subjects, who were given the following instructions:

> "Can you look at these cards? Some of them belong together because they are the same in some way. If you find cards that are the same, put them in a pile on the desk here. Maybe some of them don't belong together. You can leave those in a pile at the side."

Whether subjects could recognise the gradable concept or not, they were generally able to regroup the cards into threes by recourse to class concepts, since each set of representations was fairly distinct from the others (e.g. elephants do not have much in common with black strips of paper!). Once they had regrouped the cards, they were then asked to consider individual groups of cards and say what they were and whether there was a difference. If they said that there was a difference, they were given the instruction:

> "Can you put them in order, according to the difference?"

Each subject was then asked to justify the ordering by describing the way each card related to the others in the series.

On completion of the description of the first three cards of a set, subjects were presented with the other cards of the set one at a time, asked to place each new card in its ordered rank in the set, and requested to describe it in the same way as had been done for previous cards. Their answers were again recorded, and when the set of seven cards had been seriated across the work-table in front of the subjects, they were asked to recapitulate what they had previously said.

Thus the procedure elicited intuitive serialisation of the first three cards of a set, followed by operational serialisation, where new members were incorporated into the already-constructed series. At the same time, the initial description of the three ordered cards, the verbal commentary during the continual restructuring of the serial ordering, and the recapitulation at the end of the structuring process, might allow different aspects of verbal grading to emerge.

With the adult group the procedure was slightly different. Set I of the cards was not used, since there was no means of comparison with the behaviour of the child subjects. Furthermore, the adults were not asked to sort the shuffled cards into groups, but were given three cards from a set and asked to give a name to the group of three cards (class concept) and then write down what the difference was. For each of the three cards, which they were asked to order according to the difference, the adult subjects were requested to complete three sentence-blanks:

This one is ....

It's a .... one

and This is a ....

The identifying letter of each card was recorded at the side of the sentence blanks which were relevant to it. The adult subjects were then given one more card at a time and asked to write down the identification letters of the reconstituted series and describe the newly added card. When all seven cards were arranged, the subjects were given the opportunity to re-describe the whole set of cards one by one by writing the card-identity letters on the elicitation sheet and completing one sentence-blank:

This is a ....

3.3. Results

Various difficulties were encountered by the child subjects when they attempted to grade. Four of the children in Group One failed to sort the cards into classes at the beginning of the task (Sets IV, V, and VI, and one pair on Set V), and in Group Two one pair of female subjects failed to group sets IV and VI. On the seriation tasks, all the children found Set I difficult, and only two children, one in Group Two and one in Group Three, noticed the proportionate height relationship between the man and the elephant. Set VI was the most difficult to grade, and it was clear that the pictures in this set were too diverse to allow adequate seriation of the concept-cards, although in many cases the subjects had appropriate vocabulary to discuss the difference.

Some subjects spoke freely, and others could hardly be brought to say anything, although quite a deal of coaxing and prompting was used. The language data gained could therefore not be tabulated and compared very easily from group to group or even from one pair of subjects to the next. Nevertheless, two valuable observations were made, one concerning the type of vocabulary used, and the other concerning the preferred form of it for grading.

Firstly, there was a difference in frequency between the occurrences of specialised and global types of adjectives. This was mainly, although not entirely, confined to those concepts (I, II, III, IV) concerning some aspect of size. For example, for the elephants and men of card-set I, the word tall and its derivatives was used by two subjects in Group One, one in Group Two, and two in Group Three. There were as many subjects using fat and thin as there were using tall, which cast doubt on the meaning of these terms in the children's vocabulary. Even the subjects using these specialised adjectives, however, used global adjectives more frequently, and this type was the most frequent for concepts relating to physical dimensions. In Group One, three subjects graded verbally by using terms from the set _mummy_-_daddy_-_baby_ instead of size adjectives. These words seemed to have lost some of their more normal meaning, since there was even one case of _a baby man_ being used to describe lack of height in Set I!

In Set II (the bugs), which was intended to elicit global adjectives, three subjects in Group Two chose specialised adjectives _fat_ and _long_ instead of _big_ and _small_. This behaviour was not found in either Group One or Group Three, or among the adult group, who all used global adjectives _big_, _small_, _huge_, _tiny_, etc.

Picture Set III brought forth the largest number of specialised adjectives as opposed to global types, but it was noticeable that in all three child groups _thick_, _thin_, _fat_ and _skinny_ were used approximately three times as frequently as _broad_, _narrow_ and _wide_, which were the adjectives expected. Four of the adults out of six also used _thick_ and _thin_, the other two preferring _narrow_-_large_ and _skinny_-_fat_-_thin_ respectively; _wide_ and _broad_ did not occur independently of these, although they were used by two adults.

In Set IV, _long_ occurred in all three groups of children, showing that it might be an early adjective to be established; with one exception, however, _short_ occurred only in Group Three among the children. In Groups One and Two, _high_ and _low_ occurred in relation to the numbers on the cards, and _thin_ also occurred once. Generally children in all groups had difficulty grading this set, since the measure phrases were not understood. I had overlooked the fact that maths teaching had gone metric, and I had used miles, yards, feet and inches instead of kilometres in the phrases constructed. During the interviews with the children I had tried to vary the object class to which the measure-phrases might be applied, and had asked them to imagine either _lengths of string_ or _roads_ when deciding how long a particular measure was. This proved rather difficult to manage. The adults were asked to imagine only roads when describing the measure phrases, and it was noticeable that they vacillated between long, short and wide and narrow according to the quantity mentioned in the measure phrases, their knowledge of the characteristic norms for roads playing a crucial part in the decision on which word to use. This was not a type of behaviour found with the child groups - many of whom could not make such a distinction anyway because they used global adjectives big and small etc.

In picture Sets IV, V, and VI, there were attempts made in all three child groups to quantify the stimulus information in deviant fashion. For example, they looked at the numbers alone in Set IV; there were statements like this muck is the biggest and this one takes up more muck for Set V; and subjects counted the number of legs in the pictures of Set IV. This sort of verbal behaviour may have been a result of four out of the six sets of cards relating to aspects of SIZE, so that children were induced to follow a certain set pattern of reply.

Generally, although most of the children had language appropriate to the discussion of card Sets V and VI, there was no evidence of them organising this vocabulary gradably: i.e. although smudged, mucky, dirty, filthy and black all appeared for Set V, they were not all used by the same individual, since children used a (for them) far simpler verbal grading strategy: compared forms of adjective. This bring us to the second observation of note.

In comparison with the adult group, child subjects used more comparative and superlative forms of adjective than uninflected (absolute) forms. The adults used relatively few compared forms. This difference can be seen from Table 3.3.A., where the mean occurrence of compared adjective forms per subject for three concepts, SIZE, WIDTH and MEASURE (i.e. Sets II, III and IV) is presented for Groups One and Two, and adults (A). As there were only four children in Group Three, it has been omitted. Initial and final judgements of subjects for the cards in the sets were examined. This gave 14 judgements per set for each subject, and theoretically it was possible for a maximum of twelve of these to be compared forms, since each set of seven judgements had to start with an 'end-link' term which could not be of compared-type. The compared forms were analysed first into comparative (er); superlative (est); or count superlative (count est), e.g. fifth biggest; then subsequently the directionality of the stem adjective was noted as + or -, according to whether it was a form like bigger, or one like smaller. This gave six rows to the table. The seventh row contains the mean total of compared forms generally.

The differences between children and adults in use of compared forms becomes the more noteworthy when it is realised that all but three of the compared forms found in the adult data came from the two women in the group who were non-native speakers of English.

However, it is arguable that the data presented in Table 3.3.A. do not allow true comparisons between groups, since the presentation-order of cards varied from group to group, the first three cards having been switched between interviews of Groups One and Two. The adult group had the same order of presentation as Group One for Sets II and IV, so the results here are truly comparable; and it is here that the greatest discrepancy can be seen between the eight-year-olds and the adults. Group Two can be seen to fluctuate between fairly low and extremely high mean frequencies for compared forms. If one takes the polarity features (+ and -) to be directional, as seems reasonable in view of the manner of presentation of the series of cards, the dominant feature of the two in each of the child-groups' results can be predicted from the location, in the total series, of the first three cards presented. Where the first three cards instanced the 'extensive' end of a concept-scale, the negative polarity was the dominant one; and where the first three were examples of the 'diminutive' end, the positive polarity dominated[4], in the initial and final judgements for the set as a whole.

TABLE 3.3.A.

Mean occurrences (max = 12) per subject of compared forms of adjective across three concepts.

Concept:	II SIZE			III WIDTH			IV MEASURE		
Group:	1	2	A	1	2	A	1	2	A
N =	9	9	6	7	9	6	5	9	6
+ er	1.11	0.77	0.17	2.43	1.56	1.5	3.6	4.78	0.17
+ est	0.56	0.11	0.17	1.83	2.11	0.5	0.6	1.67	0.33
count + est	0.11	0.33	0.17	0.29	0.0	0.0	0.00	0.0	0.00
- er	1.89	1.44	0.37	1.86	0.56	1.17	1.2	2.00	0.17
- est	1.44	0.55	0.17	1.00	1.89	0.17	0.4	0.89	0.17
count - est	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total:	6.00	3.33	1.17	7.29	6.12	3.34	5.8	9.32	0.84

3.4 Discussion

It was clear after the pilot elicitation was performed that a number of improvements needed to be made to the method of presentation of gradable concepts, and that these latter needed to be made less difficult, in view of the problems that had been caused. The idea of using a large array of examples of a concept seemed to be a good one, as did that of using pictures. The oral elicitation method, however, seemed to be too time-consuming, since it took four days to collect the data from Groups One and Two; this was no inconvenience for me, but it did disrupt the class-room routine of the school. The written version of the elicitation with the adult group, on the other hand, had proved easy to administer and relatively trouble-free to analyse, and it suggested that a questionnaire format combining pictures and sentences might be more in order for large numbers of subjects.

On the theoretical level, the pilot-study raised more questions than it answered, since it suggested that the approach to the whole subject of gradability was in need of refinement. It looked, for example, as if it was easier or more natural for children 8 - 10 years old to use global rather than specialised adjectives to describe differences in physical dimensions: i.e. big and huge instead of long or wide. Even where they used specialised adjectives, they did not appear to know the complete meanings, and this was a finding similar to those made by earlier researchers (see, for example, E. Clark, 1972). Where the present results seemed to differ was in the suggestion that perhaps adults do not always have a full set of meanings, either: the results in Set III (WIDTH) had certainly indicated this.

More interestingly, the data on compared forms strongly suggested that for some reason it was easier for children to use compared than uninflected forms of adjective. This was not necessarily predicted by current theory, since the uninflected adjective forms (big, small, for example) are known to appear first in child language (McNeill, 1970 : 25-26; Brown, 1970, 92-93), around the age of two, whereas comparatives and superlatives develop around the age of 4 - 5 years (Donaldson and Wales, 1970; Stern and Bryson, 1970) and later. Why were compared forms of adjective so frequent, and would they disappear if the situation for grading changed? It seemed likely that their frequency would decrease with age (and presumably development), if the adult data were valid.

Let us consider the problem in more detail. It does not take long to realise that compared forms are easier to use, since they limit the perceptual data that has to be processed in a grading situation. To use a comparative adjective acceptably, one needs only two objects that are comparable along some parameter. To use a superlative - depending on one's degree of grammaticality, of course - one usually needs at least three objects. The data one can dispense with are perceptual and also cognitive. The cognitive data that can be ignored are the relevant norms for judgement of the object-class on the chosen parameter, which may or may not be present in the situation where grading occurs. These norms (Cf. Bierwisch, 1970a) are essential for full grading using uninflected gradable adjectives, and if they are not present in the situation they must be recalled from memory, where they have been stored as the result of learning in previous grading situations; something like this probably happens with adults - witness the data for card Set IV, MEASURE, where the adults, but not the children, switched from adjectives denoting primary to adjectives denoting secondary dimensions.

Children fail to use these norms because they do not yet know them, perhaps, and this would explain the higher frequency of compared forms in the data from Groups One and Two. There is of course another possibility, which could exercise joint or independent influence on the frequency, and that is that compared forms also allow the grader to dispense with perceptual information, thus easing the load on processing capacity, since if comparatives are used he need only attend to two objects at any moment, and can ignore any others that happen to be around at the time. With the superlative this is more difficult to do, supposedly, since all the objects might need to be considered as a group. However, if non-verbal seriation of objects precedes verbal description, it is possible to use a superlative correctly if one knows: (a) the direction of the grade and (b) what end-of-row is as a concept.[5] As the comparative also makes use of (a), and makes use of another object, but does not use concept (b), the two adjective forms should use about the same amount of processing capacity.

What would happen if children were presented with a norm for an object class? Would they know how to use it? Would the presence of the whole array of seven instances of a concept inhibit the use of compared forms? And intermediary adjectives like middle-sized: they had occurred in the data from the pilot scheme, but had moved about in volatile and inscrutable fashion, depending on factors like the number of cards laid out, and how they were presented. Could the use of these adjectives be observed more systematically? These were all questions which the main elicitation scheme sought answers for.

CHAPTER 4

GRADABLE ADJECTIVES IN USE: AN ELICITATION

4.1. Aims

The elicitation scheme described here is understood as having a clinical rather than an experimental function. The paramount aim was to gather linguistic data and to try and assess the nature of the relation between cognition and language in children going through the concrete operational stage of thinking, as described by Piaget (Piaget, 1962). Owing to the amount of data generated, only a selection of gradable adjectives was possible, and the main focus of interest was on those adjectives connected with physical dimensions. More will be said about these in Section 4.3.1.

In designing and operating the elicitation scheme, five factors were borne in mind as being worthy of attention:

a. The vocabulary to be used by the subjects was to be constrained as little as possible. Opportunity should be given to use other classes of word apart from adjectives, so that the choice of gradable adjectives to convey a concept would reflect a genuine preference on the part of a subject, and differences in vocabulary structure would more likely represent natural dispositions.

b. Positive attention was to be given to the syntactic form of the utterance in which gradable adjectives were used, as there seemed to be important semantic implications for the choice of predicative and attributive uses of adjective. This had not been attended to in any principled way during the pilot study, and it looked as if the relative distribution of what I am terming global or primary adjectives (e.g. BIG - SMALL), and secondary or specialised adjectives (High, Short), might differ significantly.

c. A constant order for presentation of instances of gradable concepts had to be maintained if age-dependent language differences - and also cognitive differences - were to be observed. The pilot-scheme had only partly controlled the order of presentation - the first three cards of a set - and the uncontrolled random factors had reduced the possibility of making meaningful comparisons between subjects. On the other hand, keeping the order of presentation constant for any one concept meant that the frequency of elicitation of particular types of adjective, and other lexical items, might be affected, and so it would be important to try to gauge what strength the order-effect might have, and whether reversal of order of presentation would have an equal opposite effect.

d. Not enough attention had been paid previously to the possibility of a connection between cognitive preference and linguistic preference in grading. This had been totally ignored during the pilot-scheme, and had only been considered as important when the "results" were analysed. To put it simply: would a subject who first chose, say, the longest of three objects when ordering them for length, thus showing a cognitive preference for the more extended end of the dimension, also give the same object privilege of first mention in description, calling it long? If it were possible to assess cognitive ordering separately from linguistic ordering, this might allow evidence to be gathered to support or reject the hypothesis that words like long and short, along with other gradable adjectives connected with size, were instances of what McNeill has called "weak linguistic universals" (McNeill, 1970, p.73 ff). Strong isomorphism between cognitive preference for the so-called positive aspect of an attribute, and dominance, on first-mention, of the positive polar adjective, would suggest the existence of such universals, whereas mismatch between cognitive ordering and linguistic ordering would constitute evidence against such a hypothesis and in fact suggest the presence of "strong linguistic universals".

e. Some attempt was made at creating more favourable conditions for the elicitation of cognitively complex forms of behaviour related to grading to a norm. It seems that the idea of a "norm" for a certain class of objects must develop somehow from an iconic mode of thinking where the triad is a fairly basic configuration, whose existence is a precondition for grading to occur. It will be recalled that in the pilot-scheme three cards had been presented to subjects, who arranged them in order according to the gradable concept represented. The card located physically in the middle of the array was always chosen as <u>middle-sized</u>, <u>average</u> or <u>medium</u>, where these words were used at all. A tendency was noted for these terms to disappear when the whole array of seven cards was described, and it seemed worthwhile investigating this phenomenon more formally. Piaget noted (Piaget, 1952 : 130) that, with younger children than those I was studying:

> It is a remarkable phenomenon, which appears to be constant, that the construction of a series is easier than the insertion of new elements.
>
> (Piaget, 1952 : 130)

He suggested that this is because the operation cannot be replaced so easily by intuition.

It was intriguing to contemplate what would be the reaction of subjects presented with three instances of a gradable concept against a visible background of other instances of that concept. Given that the choice could be designed in such a way that the middle instance in the triad did not coincide with the middle instance in the array as a whole, if the subjects used an intermediate term at all, one of two behaviours could occur:

(i) Iconic. The conceptually simpler solution, which would suggest the dominance of an iconic mode of thought, as described by Bruner (1968), would be to treat the triad and the rest of the array as two distinct arrays and grade them separately. This would lead to the use of the word middle size, or its equivalent, twice, but on neither occasion in the middle of the array as a whole.

(ii) Quasi-Representational. The more advanced solution would be to treat the array as a whole and to designate one or more instances from the middle of the range as middle size or whatever. The mode of thought necessary to produce such behaviour would have some of those features which Bruner (op. cit.) says are characteristic of representational thought.

It will be noted that the second sort of behaviour could arise as the result of a fairly simple counting strategy, but one which is more advanced than that exemplified by iconic behaviour. The difference might merely be the result of a quantitative rather than a qualitative development in the cognitive processing abilities of subjects, and might be explicable in terms of some theory of memory span or capacity[1] (See, for example, Miller, 1956). It would nevertheless be necessary to postulate quasi-representational behaviour, or something analogous, as the link to the completely representational mode of thought necessary to carry out logical grading, where one characterises a set of objects according to some abstracted schema of gradable concepts that might be relatively independent of the particular set of objects to which it is applied. The question then naturally arose of whether or not it was possible to elicit grading behaviour which would give evidence of an entirely representational mode of thinking. There did seem to be such a possibility. The solution seemed to lie in choosing for the array of instances of a concept a set of familiar objects for which there was a known norm, the relative position of which in the array corresponded to neither of the positions which would be selected by a subject if his mode of thinking were what I have designated iconic or quasi-representational.

To sum up, there seemed to be three, not two, types of thought-structure involved in using words like medium, middle-sized, average, etc. and the three types are potentially susceptible to exposure and analysis because they may give three different linguistic results in some situations where grading is involved. These three types of thinking are assumed to represent three stages of development, and are called Iconic, Quasi-Representational, and Representational.

4.2. Problems

Before going on to a detailed description of the design of the stimuli used in the elicitation scheme, it is necessary to outline some of the problems that arose as a result of the particular circumstances as well as the aims of the elicitation.

Experiences during the pilot-study had shown that to use an oral method of elicitation was a dauntingly time-consuming task if large numbers of subjects were to be involved, since they could not be interviewed more than two at a time. And yet a large number of subjects would be necessary, if any general developmental hypotheses were to result. Accordingly, a form of written questionnaire was devised which combined sentences and sets of pictures. The potential problem of lack of writing or spelling ability in the subjects was then overcome by having them write only one word - or more if they wished - to fill a space in pre-typed sentences accompanying each picture.

To avoid the occurrence of mass collusion between subjects who would be simultaneously completing the questionnaire, two different versions of it, Form A and Form B, were contrived, and in each version some pages were scrambled, so that, with the exception of the first page, subjects in any one group would not be completing parts of the questionnaire at the same time as someone sitting in the next seat.

A third problem area was connected with the choice of pictures in order to represent concepts. A number of studies of comparison and gradability have used pictures as an elicitation device, especially for studying the comprehension and use of physical dimension words such as _tall_, and _short_, _wide_ and _narrow_, etc. (e.g. Wales and Campbell, 1970). But one of the limitations imposed by using pictures instead of real objects is that judgements of size, for example, are contingent upon the actual sizes of the pictures themselves, and a subject cannot judge in absolute terms whether objects portrayed in pictures are "really" big or small. The decision to use pictures to represent gradable concepts, made for reasons of administrative convenience, thus appeared to entail the acceptance of several limitations inherent in this medium. As has already been implied, the most immediate of these problems was that pictures could be used to expose the mechanism of grading only in the iconic mode, without offering any prospect of observing the representational mode of thought.

Two complementary solutions offered themselves, and both were tried in the design of the sets of pictures for the questionnaire. The first was to use geometric figures, such as rectangles, not found in the world of natural objects, and for which no external, independent dimensional norm exists. The second solution, and one that seemed to offer greater chances of success, was to include in the set of pictures something that could act as a point of reference to the outside world, in much the same way as the scale-of-miles functions on a map, or the caption "magnified five hundred times" on a photograph. Supplying some sort of external reference in this way would allow indirect observation of whether any of the children in the age-groups represented in the study could grade to an "implicit norm" (Sapir, 1949, p. 129).

A less obvious problem associated with using pictures in elicitation, and one which was vaguely foreseen without in any way being solved, was the risk factor in what is perhaps best referred to as the _spatial metaphor_ involved in pictorial representation. I shall return to a fuller consideration of this in the discussion of the data, but it is worth pointing out here that the spatial metaphor is the source of a number of specific orientation problems and has strong implications for the design of pictorial aids for the elicitation of gradable adjectives.

Quite briefly, the spatial metaphor occurs when the three-dimensional world of real objects is collapsed into the two-dimensional world of the picture. Simple enough, one may think, but if one considers that the picture itself may be contemplated either as a vertical plane (i.e. on a wall) or as a horizontal plane (for example on a desk or table), matters become complicated. They become even more complicated when one considers that if the piece of paper containing a drawing or drawings is rectangular it will have two named dimensions, depending on its orientation to the viewer and two further dimensions, depending on its orientation in space. Let us first look at the situation where the drawing is displayed on a wall. If the more extended dimension of the piece of rectangular paper is the vertical, this will be referred to as _height_, and the other dimension as _width_. On the other hand, if the more extended dimension is in the horizontal plane, this will be now called _length_ and the lesser, vertical dimension again called width (or, by some speakers of English, height, thus maximally confusing matters). In an attempt to remove the problem, we put the paper on the table. What happens? We now find that the object portrayed in the drawing is no longer what it was. Whereas when the picture was hanging on the wall the vertical dimension of the object portrayed and that of the picture itself were one and the same, now they are no longer so. Now, for example, the words top and bottom, normally applied to the upper and lower extremities of real objects extended in the vertical plane, are used to refer to the relation of far and near represented by the laterally orientated edges of the paper viewed in the horizontal plane. Furthermore, the orientation of the more extended dimension of the paper may determine, somewhat paradoxically, that the length dimension of the paper coincides with the height dimension of the object drawn, whereas the paper's width corresponds to the length of the real-world object. This is the case where the rectangular sheet of paper has its more extended dimension on the far-near axis. If we move it into the left-right axis, and draw vertical objects on the piece of paper, then the width of the paper now contains the height of the object, and the paper's length coincides with that of the object.

The last point to be made here is this: so far we have acted as if our real-world, vertically extended object consisted only of two dimensions, namely height, and length. However, it is an unfortunate fact of life that many vertically extended objects have three dimensions, not two - or if they have two, the second is referred to as width or thickness - and the reader can imagine that in these circumstances the linguistic confusion created by the spatial metaphor is simply mind-boggling for the observer asked to use appropriate dimensional adjectives to describe pictures.

This confusion was found with both adults and children during the elicitation scheme, although its symptoms, and the strategies used to counteract it, differed between children and adults. It seems that this metaphor is particularly difficult for children to deal with at the age-level represented in this study, since they may well have only a hazy cognitive appreciation of the dimensional differences anyway. A discussion of this phenomenon at greater length will be found at the end of this chapter and in Chapter 6.

4.3. Method

4.3.1. Design

The total number of questionnaire pages designed was nine, of which six appeared in each form of the questionnaire. There were two different selections of pages, Form A and Form B, and within each selection two different orderings of pages, so that altogether there were four versions of the questionnaire. Three of the pages were common to all versions. The working-title of each page, and its order of appearance in the forms of questionnaire, was as follows:

	FORM A		FORM B	
p.1.	Rectangles		Rectangles	
p.2.	(Version 1)	Big Bees	(Version 1)	Big Trees
	(Version 2)	Small Bees	(Version 2)	Small Trees
p.3.	Bottles		Faces	
p.4.	Buildings		Buildings	
p.5.	Persons		Persons	
p.6.	(Version 1)	Small Bees	(Version 1)	Small Trees
	(Version 2)	Big Bees	(Version 2)	Big Trees

Each A4-size page of the questionnaire bore a set of drawings representing <u>one</u> gradable concept, with which a number of gradable and polar adjectives could be associated. The concepts and expected adjectives were as follows:[2]

Page, title		Gradable Concept	Adjectives
1.	Rectangles	LENGTH	long - short, big - small
2,6.	Bees	SIZE	big - small (possibly fat - thin?)
2,6.	Trees	HEIGHT	high - low, tall - low, big - small.
3.	Bottles	CONFORMITY	normal - abnormal, perfect - imperfect, nice - awful, good - bad.
3.	Faces	CONFORMITY	normal - abnormal, proper - deformed, good - bad, fine - horrible.
4.	Buildings	HEIGHT	high - low, tall - low, big - small.
5.	Persons	HEIGHT	tall - short, big - small.

It can be seen that with the exception of page 3, the concepts portrayed were all concerned with physical dimensions. The two versions of page three, on the other hand, were an attempt at eliciting adjectives connected with a different conceptual paradigm, those concerned with "goodness of fit" and with judgements relating to class-membership and to conformity with category-norms for classes of object. These pages were a second excursion into the experimental zone of using pictures as stimuli outside the more commonly researched areas of language use.[3] One of the main uses of page three, however, was to prevent subjects from developing a particular attentional predisposition to complete all pages of the questionnaire in the same way and ignoring perceptual differences.

With the exception of page five, Persons, all the stimulus materials were designed in the same way. Across the top of the page were three drawings representing three instances of a concept, arranged in random order. Depending on space available, either three or four more drawings, representing further instances of the concept, were arrayed in random order down the left-hand side of the page. It was a condition for all pages that the three drawings across the top should be selected so as to be off-centre for the gradably ordered array as a whole. This would mean that behaviour dictated by an iconic mode of thought would show up clearly, as the drawing designated as "middle" of the gradable triad would never coincide with the conceptual "middle" of the array as a whole. Further to this, on pages one, three and four, the arrays were designed in such a way that they always contained both a more positively and a more negatively directed instance of the concept than any of those appearing across the top of the page. This would further emphasise any occurrences of iconic-dominated selection, of superlative forms of adjective for instance, which might occur in the initial triad.

Pages two and six presented a slight difference in the selection of the initial triad, where the extreme three instances of the array were presented across the top. The "Big" versions of each page contained the most extremely extended instances of the concepts in the initial triad, and the "Small" versions took the least extended instances for display across the page. As subjects would do both versions of either the Bees or the Trees page, there would be an opportunity, while analysing the data, to assess the effect of ordering on constancy of judgement displayed by subjects asked to judge two different presentations of what was essentially the same array.[4] A representational mode of thinking would favour constancy of judgement, whereas an iconic mode would lead to inconstancy.

Under each of the three drawings at the top of a page, there was a letter of the alphabet to identify it. The letters of the alphabet were randomly chosen, and did not correspond in any way to the order of seriation for the gradable concept represented by the drawings. Above the three drawings the name of the objects represented in the array was given in the form of a statement: "These are ..... " so that there should be no ambiguity as to what the drawings were supposed to represent. Below the three drawings was the typed statement The order of difference is:, alongside which there was a three-cell grid where the three identifying letters of the drawings could be written. Below this on the page was a three-row, two-column grid, above which was the instruction Describe the difference:, The left-hand column was blank, and on completion of the task would contain the identifying letters of the first three drawings once again, not necessarily in the same order as first chosen, but presumably in the order that the subject felt to be linguistically most comfortable for the description task. For each letter entered in the left-hand column, the right-hand column contained two sentence blanks to be completed by the subject, the first blank allowing for any type of grammatical complement of be, and the second blank demanding completion by insertion of an attributive adjective.

Below this grid, depending on the space taken up by the drawings, either three or four more examples of the gradable concept were presented individually; beside or below each drawing - according to its direction of major extension - was the typewritten instruction Describe this one, and again there were the same two sentence blanks for completion. Each drawing was separated from the ones above and below it by a horizontal line from the left-hand side of the page to the right-hand margin, which contained a numbered grid for later computer-processing of the data.

Page five, the page containing Persons, differed from the pages described above in that at the top of the page there was a drawing of a human figure named as Norman or Norma, depending on whether the subject was male or female, and below the drawing was the typewritten caption: This is Norma(n). Norma(n) is exactly like you. (This was clarified by the elicitor, when instructions were given, as meaning "exactly the same size", as it seemed that the statement was otherwise ambiguous!). Below the single drawing were seven more similar figures of differing heights in a random array across the page, and each identified by a letter of the alphabet typed below it. Below these drawings was a grid similar to those in the rest of the booklet, where subjects were asked to state the order of difference and then to describe each figure in turn by completing the two sentence blanks already mentioned.

On the Persons page the subjects had to grade all seven instances of the concept at once, and no opportunity was given to break the array into three and four elements, as was the case on other pages, so that subjects who were capable of only processing a small number of instances simultaneously - so ran the hypothesis - would not be able to order the array successfully. Furthermore, by presenting the figure of Norma(n) at the top of the page, a point of relationship to the real world was established, albeit indirectly, and this would allow those subjects with a representational mode of thought to grade according to "real" norms. Only one of the seven figures in the array resembled Norma(n) in size, and it was hypothesised that children would use different words to describe this figure from the words adult subjects would use, since the two types of subject would see themselves as occupying different positions in the scale of height. Adults might reasonably regard Norma(n) as of average height for a person, if they themselves were of average stature, whereas children ought to displace the figure of Norma(n) towards the diminutive end of the SIZE gradient for persons, and describe him/her as <u>short</u> or <u>small</u>, or <u>below average height</u>, etc. It was theoretically possible in this way to discover whether the child subjects' concept of SIZE for persons was isomorphic with that of adults, and if it differed, to observe some of the linguistic correlations of that difference.

Copies of both forms of the questionnaire are presented in

Appendix 2 .

4.3.2. Subjects

The child subjects in the elicitation sample were all pupils at Aberdour Primary School, Fife, Scotland, where they made up the total membership of classes Primary Four, Five and Six. The numbers in each group, breakdown by sex, and ages were as follows:-

Group	Class	Males	Females	Total N	Age - Range	Mean (yrs; months)
1	Primary Four	15	18	33	8;01 - 9;02	8;08
2	Primary Five	11	15	26	9;03 - 10;01	9;09
3	Primary Six	11	12	23	10;02 - 11;02	10;07

Although, as can be seen, the classes were not exactly balanced on the variable of sex, the differences were slight when equal distribution over sub-groups for the four versions of the questionnaire was ensured.

IQ data were available only for Class Six, and the class teacher was not willing to part with detailed information. She would only say which children were above IQ 118 and below IQ 100, thus giving a breakdown into three groups. There was no significant correlation between sex and IQ for this group. A subjective ranking was obtained from the class-teacher of Primary Five, who ranked the children on a nine-point ordinal scale for intelligence. Again, there was no significant correlation for sex and IQ. There were no IQ data available for Primary Four, and the class teacher was averse to making any sort of ranking.

For the purpose of comparing results, a random sample of adults (N = 20) completed Form B of the questionnaire. (Originally it was planned to have the adults complete all nine questionnaire pages, but the extra pages were lost in the post and the volunteers were unwilling to complete the missing pages a second time.) Of the twenty completed questionnaires, one was not considered because the subject had not treated the task instructions seriously. This left nineteen scripts. Unfortunately, there was a heavy sex bias in the sample, as sixteen of the scripts came from women, and this may have affected results. Fourteen of the adults were in higher education in London, many of them in first year studies at a school of Speech Therapy. None of them was involved in the study of Linguistics. The age-range of the adult sample was nineteen years to thirty-three years, with Mean Age of twenty-two years three months.

In the discussion of results, subjects are grouped by age and by Form of the questionnaire as follows:

GROUP	SUBGROUP A			SUBGROUP B		
	Males	Females	Total	Males	Females	Total
1 (Primary Four)	7	9	16	8	9	17
2 (Primary Five)	6	7	13	5	8	13
3 (Primary Six)	6	6	12	5	6	11
6 (Adults)				3	16	19
Total N:	19	22	41	21	39	60

The groups are numbered in this way because they also took part in another experiment, described in Chapter 5, where there were two further groups of children.

4.3.3. Procedure

The elicitation scheme was implemented in March, 1975, personally supervised by me at Aberdour Primary School over the course of two days. The elicitation with the adult group was not personally supervised by me, but by my sister. At Aberdour, as only a limited amount of time could be set aside, and because I wished to cause minimum disruption to the school timetable, each class filled in the questionnaire together in the classroom.

As mentioned in the second section, 4.2., certain design features were incorporated to counteract collusion.

On commencement, the following instructions were given to subjects, the first paragraph being varied in the case of the adult subjects.

Instructions

"I'm interested in the words people use to describe things, and I would like you to help me if you can. It's a kind of word game with puzzles. In this game, you have to look at some pictures, and find the difference between them. When you find what the difference is, use the difference to choose words and describe each of the pictures. It's very easy, and I'll show you how to do it. Now in a moment I am going to give you each a little booklet with six pages in it, and on each page there are some pictures for you to describe. When I give you the booklet, put your full name on the front at the top, here," (a booklet was held up) "where it says Name, and then wait till I tell you what to do."

(The booklets were then distributed by me and the class teacher, who remained present throughout the proceedings.)

"Now, some booklets have different pictures in them, but all of you have the same first page, so we can see what to do. Ready? At the top of each page there's a name for the pictures. Here on the first page, you can see that those things are called rectangles." (A booklet was held up, and all the features mentioned were indicated by the elicitor as the instructions proceeded.) "How many are there on the page altogether? Good. Now you can see that at the top there are three rectangles, here, and under each one there's a letter of the alphabet. Which letters are they? Good. Now the rectangles are not exactly the same, are they. What do you think the difference is? Good. Now, can you put them in order of the difference? If you can, then write the proper order, the order of difference, on the page, here, next to where it says The order of difference is. You can see there are three boxes there. There's a box for each letter of the rectangle. What letter goes in the middle box? Right. It's X. X goes in this box. What's the proper order then? Yes, it doesn't matter which order you put. They're both right. Write the letters in the boxes now.

"Now the next thing to do. You choose one of the rectangles from the top, and describe it: write a letter in the box at the side, here, and put a word in to finish those two sentences next door to the box, under where it says Describe the difference. Do it now.

"Ready? Then write the letter of another rectangle from the three, and describe it too. Remember, look at the difference and then choose a word. And choose your words carefully so that they fit properly into the sentences." (Subjects were then allowed to proceed with the task.)

"When you have described the first three pictures at the top, go on to the next part and describe that picture in the same way. Then do the next picture, and so on, until you come to the bottom of the page. Then turn over, and do the next page in a similar way. You will find that the pictures don't always have the same difference, so be careful with the words you choose to describe them."

"Leave out any difficult pictures if you really can't think of words to describe the differences. And when you come to page five, that's the page with the Persons on it, stop. Do you understand? Stop and put your hand up, and I'll come and tell you what to do."

(All the above instructions were spaced out so as not to cause confusion. Subjects completed the first four pages at varying speeds. As each subject completed this part of the questionnaire, the elicitor then detached the first four pages, leaving the subject with two, the Persons page, and the reversed-order presentation of whatever had been on the subject's page two. Subjects were then individually given the following instructions:)

"Now the <u>persons</u> page is a little bit different. At the top of the page, here, there's a person called Norma(n). I want you to imagine that Norma(n) is really exactly the same size as you are. Is that clear? Underneath here, there are seven other persons, and you must put them in order of the difference, and then describe each of them. You can describe them in the same way as before, in these sentences here. Okay? Then, go on and do the last page in the same way as the other ones."

At the end of the task, those children who finished early were given books to read so that they did not distract the others after they had handed in their final pages of the questionnaire. No time limit was set, and subjects took between one hour and two-and-a-half hours to complete the booklet. In the conduct of the elicitation, several unscripted statements were given to the effect that the same word could be used more than once on a page, and that spelling was of no importance in this case.

4.4. Results

The data obtained during the elicitation were analysed on two levels, which may be best characterised by the terms macro and micro. The macro-level analysis treated each group as a whole in order to reveal any general characteristics which distinguished a particular age-group from the others. Trends which were revealed by this broad analysis were then pursued in greater detail at the micro-level by analysing individual features which the macro-level analysis tended to obscure.

As has already been mentioned (4.3.1.), the questionnaire had been designed in such a way that the data could be computer-coded. Both the ordering task at the top of each page, and the descriptions used for the pictures, were coded and analysed using the University of Edinburgh's S.P.S.S. (Statistical Package for the Social Sciences) computer programs. The output results formed the main body of the macro-level analysis, which will now be discussed. The micro-level analysis is presented in Section 4.4.2.

4.4.1. Macro-level

4.4.1.1. Sorting Task

At the top of each page, it will be recalled, subjects were asked to sort three instances of a concept into graded order, the Order of difference, and then to describe those three instances. There were thus two orders given by subjects, namely the order given non-verbally and that preferred for verbal description. Both of these aspects of sorting were analysed. In each case, there were seven types of sorting order, and seven orders for description. These were abbreviated as follows:

Abbreviation	Order of Sorting
M	1. Diminutive. 2. Middle. 3. Extended
U	1. Extended. 2. Middle. 3. Diminutive
R	Right to Left, as presented
L	Left to Right, as presented
H	Haphazard ordering : none of the above
P	Partial ordering
O	No ordering

It will be noted that M and U are mnemonics for Marked and Unmarked, but they are being used merely to denote ordering from the Diminutive and Excessive ends of the physical dimensions, respectively, without prejudice as to whether these ends are marked or unmarked in the linguistic sense(s) discussed in Chapter 1. The same abbreviations are used in discussing the more abstract forms of grading for page three of the questionnaire, which represented the concept referred to as CONFORMITY. In these cases, M is used to refer to the deviance or abnormality end of the scale, and U is used to refer to the normality end, again without prejudice.

4.4.1.1.a. Failures

The first matter to be noted in the analysis was the degree of difficulty presented to subjects by the sorting task alone. There were only two orderings which gave acceptable evidence of grading ability, namely those classed as U or M. There were in every group, including the adults, people who consistently failed to give evidence of grading, and there were others whose grading ability fluctuated with the difficulty of the concept, or of the task. Failures to grade are tabulated in Table 4.4.1.A. Sub-group structures have been removed at first, but are represented below with their relative percentages.

TABLE 4.4.1.1.A.

Failures to grade by concept. Frequencies in each group are followed by relative percentages in brackets. Percentages are rounded.

		GP1(N=33)		GP2(N=26)		GP3(N=23)		GP6(N=19)	
Page	Concept	N	%	N	%	N	%	N	%
Rectangles	LENGTH	3	(9)	8	(31)	2	(9)	1	(5)
Buildings	HEIGHT	4	(12)	9	(35)	4	(17)	1	(5)
Persons	HEIGHT	7	(21)	3	(12)	2	(9)	2	(11)
Bees, Trees	SIZE, HEIGHT	7	(21)	8	(31)	2	(9)	1	(5)
Bottles, Faces	CONFORMITY	16	(48)	12	(47)	6	(26)	3	(16)

Sub-Groups:

			GP1 N	GP1 %	GP2 N	GP2 %	GP3 N	GP3 %	GP6 N	GP6 %
A.	Bees	SIZE	4	(25)	2	(15)	1	(8)		
B.	Trees	HEIGHT	3	(18)	6	(46)	1	(9)	1	(5)
A.	Bottles	CONFORMITY	9	(56)	3	(23)	1	(8)		
B.	Faces	CONFORMITY	7	(41)	9	(69)	5	(45)	3	(16)

Generally, we may note that there is a sizable reduction in the difficulty presented by the sorting tasks by the time Group Three is reached (mean age 10;07). The two pages representing the more abstract concept of CONFORMITY were the most difficult, particularly the Faces page - which suggests a design failure, especially in view of the fact that three of the adults could not grade the concept either.

The interesting observation to make is that a noticeably greater percentage of subjects from Group Two failed than subjects from Group One on the sorting task. If we look only at the pages concerned with physical dimensions, we see that the difference is one that can be broken down further according to whether the dimension was linear or areal. On all the linear dimensions, Group Two had a larger number of failures than Group One - the exception being the Persons page, which we shall consider in a moment. The explanation for the inferior performance of Group Two will be brought out more fully when we come to discuss the structure of the groups' vocabulary in Section 4.4.1.2. It is enough to point out here that all the <u>linear</u> dimensions, which could be described by specialised words like <u>long</u>, <u>short</u>, <u>high</u>, <u>tall</u>, etc., were represented more simply by Group One using an <u>areal</u> judgement that involved words like <u>big</u> and <u>small</u>. Group Two, on the other hand, used a more specialised vocabulary appropriate to linear dimension, but did not, in the cases of failure to grade, show evidence of knowledge of which word matched which plane. Their more specialised vocabulary in fact confused them, as they tried to consider more than one planar extension of an object representing a concept, when actually the drawings in the arrays for linear dimensions never varied in more than one plane. We shall return to this point in the next section and in the discussion of results.

If we now turn to the reasons why Group Two did better on the Persons page than Group One, it is immediately noticeable that grading on this page was extended to an array of seven examples of the concept HEIGHT as applied to people. It seemed that failure to grade here was related to the size of the array, which induced performance errors. But whereas the failures in the other groups were mainly due to one instance being omitted, repeated or misplaced, in the Group One failures, subjects mainly graded the seven instances into dyads and triads, displaying a more primitive schema. Other researchers working in similar fields have noted this phenomenon: this kind of failure has been referred to by Donaldson, for example (Donaldson, 1963) in her research on "matching problems", as <u>executive error</u>. Among the causes of this sort of error are such factors as memory span and concentration. When processing capacity was overstrained, seemingly it induced loss of hold on the larger array represented by the Persons page. It was very noticeable not only that Group Two did better on the sorting task but also that the wide variety of dimension words used on other pages was here sharply reduced in favour of those which were appropriate, although there were some instances of <u>fat</u> and <u>thin</u> occurring alongside <u>tall</u> and <u>short</u>.

4.4.1.1.b. <u>Perceptual Effects</u>

As has already been stated, only two orders in the sorting tasks were accepted as evidence of the ability to grade non-verbally: (i) the order <u>M</u> (Diminutive to Extended, or Deviant to Normal, depending on the concept illustrated); and (ii) the order <u>U</u> (the reverse, namely Extended to Diminutive, or Normal to Deviant). It was expected that ordering would be affected in the direction of end-linked instances of a concept, i.e. in favour of the left-most drawing if this happened to be either the Diminutive or the Extended member of the triad. For instance, if the most diminutive instance happened to be on the left, this might determine that most people would mention the left-most term

TABLE 4.4.1.1.B.

Choice of M and U orderings, and type favoured by "leftmostness" of the first term. Raw frequencies in groups and sub-groups are followed by rounded relative percentages in brackets.

Page of questionnaire	Type of ordering favoured: M	Type of ordering favoured: U	Chosen Ordering — GROUPS: GP1 (N=33) M	GP1 (N=33) U	GP2 (N=26) M	GP2 (N=26) U	GP3 (N=23) M	GP3 (N=23) U	GP6 (N=19) M	GP6 (N=19) U
Rectangles	x		20 * (61)	9 (27)	11 (42)	7 (27)	13 (57)	8 (35)	13 * (68)	5 (26)
Buildings		x	11 (33)	18 (55)	9 (35)	8 (31)	11 (48)	8 (35)	12 (63)	6 (32)
Persons	x		12 (36)	14 (42)	17 * (43)	6 (23)	15 * (65)	6 (26)	12 (63)	5 (26)
			SUBGROUPS: GP1A (N=16)		GP2A (N=13)		GP3A (N=12)			
Big Bees	-	-	8 (50)	4 (25)	7 (54)	3 (23)	8 (67)	3 (25)		
Small Bees	x		8 (50)	5 (31)	7 (54)	5 (38)	9 * (75)	2 (17)		
Bottles	x		5 (31)	2 (13)	2 (15)	8 (62)	4 (33)	7 (58)		
			SUBGROUPS: GP1B (N=17)		GP2B (N=13)		GP3B (N=11)		GP6 (N=19)	
Big Trees	-	-	6 (35)	8 (47)	3 (23)	4 (31)	5 (45)	5 (45)	13 * (68)	5 (26)
Small Trees		x	5 (29)	8 (47)	3 (23)	5 (38)	5 (45)	5 (45)	10 (53)	8 (42)
Faces	-	-	5 (29)	5 (29)	0	4 (31)	2 (18)	4 (36)	0 **	16 (84)

* Difference significant: $p<.05$ } One-tailed, Binomial Test for $N<25$, or
**Difference highly significant: $p<.001$ } one-tailed x^2 for $N>25$. d.f. = 1

first when giving the order of difference, and so offer the grading order of type M.

It looked at first as if a certain type of ordering was favoured if the first term of the series of three was left-most. Table 4.4.1.1.B. shows the frequencies, in groups and sub-groups, choosing M and U orderings when these would have been favoured by "leftmostness" of the first term in that ordering. However, it was noted that significant differences only occurred in choice of ordering when it was M which was favoured. Choices of U ordering when it should have been favoured departed at no point from chance level.

This difference became far more noticeable when the numbers in the three child groups were combined: where an M ordering was favoured by leftmostness, on all the physical dimensions it was chosen with a degree of frequency that departed significantly from chance level. Where U ordering was so favoured, it did not occur significantly frequently. For the ratios of M : U ordering on the pages Rectangles, Persons and Small Bees, the figures are respectively as follows:-

M	U	
44	24	$X^2 = 5.882$ two-tailed $p<.02$, d.f. = 1
44	26	$X^2 = 4.629$ two-tailed $p<.05$, d.f. = 1
24	12	$X^2 = 4$ two-tailed $p<.05$, d.f. = 1

This suggests, interestingly, that it was the Diminutive end in the physical dimensions which somehow dominated in the non-verbal grading of the concepts. Further support for this hypothesis can be found in the fact that on the Big Bees page, given to subgroups A, the choice of order M again departed significantly from chance, the ratio of M : U being 23 : 10 ($X^2 = 5.121$, two-tailed, $p < .05$, d.f. = 1). This was the only other page where the difference in frequencies of the two orders was statistically significant. But in this case, neither M nor U ordering appeared to be favoured by "leftmostness". However, the page was re-examined and it was found that M was favoured by "rightmostness". This suggested that the definition, and interpretation, of end-linking should be broadened, so as to include a consideration of the rightmost instance on those pages where no particular ordering was favoured by the leftmost instance.

Testing this hypothesis for goodness-of-fit against the data, it was found that choice of order M was accurately predicted eleven times out of twelve for the three groups of children across the physical dimensions ($p = .003$, Binomial Test, one-tailed). On the other hand, U order was predicted accurately on only five occasions out of a possible nine, which was not significant. For the more abstract CONFORMITY concepts represented by the Bottles and Faces pages, not surprisingly, end-linking was not found to have a significant effect on ordering.

It is not surprising that the orderings were differently determined for the CONFORMITY concept, since in a sense one end of the gamut for grading is the norm, whereas for the physical dimensions the norm is non-extremal. Accordingly, the children in this study tended to grade the concept by starting from the norm, i.e. the least deviant instance. The U ordering is thus favoured. The ratio M : U for the three child groups is 18 : 30 when the A and B subgroups are combined ($X^2 = 3$, not significant). If Group One is excluded, the M : U ratio becomes 8 : 23 ($X^2 = 7.258$, $p<.01$ two-tailed h, d.f. = 1), and parallels the grading behaviour of the adult group.

Nothing has so far been said of the adult group, but a perusal of Table 4.4.1.1.B. reveals that M was always the dominant ordering on the physical dimensions, irrespective of end-linking. But when the adults graded the CONFORMITY dimension, without exception they did so by starting with the normal and proceeding towards the deviant.

4.4.1.1.c. Order of Sort vs. Order of Description

It will be recalled from the beginning of Section 4.4.1.1. that subjects were asked to order the three drawings twice at the top of a page: once for non-verbal grading of the concept, and then again for verbal description. In what follows, a distinction will be made between systematic and non-systematic behaviour in the switch from grading order to description order.

Systematic behaviour is that where a subject either maintained the same order (M or U) or merely reversed it when listing the three drawings before starting the description task. Non-systematic behaviour is where one of the other orders of sorting occurred either for the initial or for the second listing or for both. Systematic behaviour could be reasonably expected to increase with age. Table 4.4.1.1.C. presents the group data.

There were some statistically significant differences in the behaviour of the various groups, mainly caused by the apparently eccentric behaviour of Group Two, which was systematic on those physical dimension concepts which have been called areal, but often not systematic on the linear dimensions, where the concept to be graded and described varied in only one plane.

We can see that the adult group was quite systematic (one person

TABLE 4.4.1.1.C.

Systematicity of Concept Ordering between Sorting and Description. Frequency by Groups and Subgroups. (S = Systematic; N.S. = Not Systematic)

Page	Group 1 (N=33)		Group 2 (N=26)		Group 3 (N=23)		Group 6 (N=19)	
	S.	N.S.	S.	N.S.	S.	N.S.	S.	N.S.
Rectangles*	15	18	7	19	14	9	18	1
Buildings**	23	10	10	16	16	7	18	1
Persons	21	12	17	9	17	6	17	2

Subgroups:

	1A (N=16)		2A (N=13)		3A (N=12)			
Big Bees	9	7	7	6	9	3		
Small Bees	11	5	9	4	10	2		
Bottles	6	10	6	7	8	4		

Sub-groups:

	1B (N=17)		2B (N=13)		3B (N=11)		6 (N=19)	
Big Trees‡	10	7	4	9	9	2	17	2
Small Trees	12	5	5	8	7	4	18	1
Faces‡‡	7	10	3	10	4	7	16	3

* $X^2 = 21.729$ ($p<.001$; d.f. = 3; two-tailed h)
GP2 and GP3 significantly differ: $X^2 = 4.44$ ($p<.05$)

** $X^2 = 16.184$ ($p<.01$; d.f. = 3; two-tailed h)
excluding GP6, $X^2 = 7.179$ ($p<.05$, d.f. = 2, two-tailed h)

‡ GP2 and GP3 significantly differ: Fisher's exact test $p<.025$.

‡‡ $X^2 = 14.012$ ($p<.01$; d.f. = 3; two-tailed h)

being totally non-systematic), and Group Three was dominantly systematic on all except the Faces page; Group Two was systematic less often, on only three out of nine pages; Group One was highly systematic on six pages out of the nine, failing on the Rectangles and the two pages representing the concept CONFORMITY. These three pages were the ones where the concepts could not readily be converted to areal ones for simplification. As was mentioned earlier, when we come to consider the language data we shall see that there was a notable difference in the vocabulary used by Groups One and Two to describe what they saw.

Lumsden and Poteat (1968) have already noted the salience of the vertical dimension in five and six-year-olds. Putting it rather over-simply, what seems to have happened in this present study is that Group One was more systematic on those physical dimensions which could be called big or small, and often lacked more specialised terms for the vertical extensions although these were perceptually dominant. Group Two, on the other hand, had the specialised terms but were not sure which extension to apply them to, and so tried to class concepts as if they co-varied on more than one dimension, even when extension varied on one dimension only. This is a rather fascinating example of language influencing thought. It is not the only one, either, as will later be seen. Children in Group Two, it appears, were attending separately to the factored-out dimensions of the objects in the drawings, where these allowed, and assessing the vertical and horizontal proportions, whereas Group One were, in the main, using a more intuitive, global schema of judgement.

4.4.1.1.d. Changes in Preferred Ordering between Sorting and Description

The results presented in this section are felt to constitute an important contribution to the debate on the interaction between linguistic and cognitive development.

During the analysis of results which formed the basis of Table 4.4.1.1.B, it was found that a sizable number of children, but no adults, changed the ordering of the concept triads at the top of the pages when they came to actually describe the three drawings. This was not surprising in itself, as the instructions given during the elicitation had left it open whether the subjects should use the same order for initial sorting according to the concept and for description. What was surprising, however, was that the change of mind was far more heavily biased in one direction than in the other. Firstly, more subjects changed from a systematic ordering (M or U) to some other ordering, than changed in the reverse direction. Secondly, the change was much more often away from M (i.e. where the Diminutive would be in place of first-mention) than away from U (where the Excessive would be mentioned first).

For each page of the questionnaire, the three child groups were first treated separately, and the above observations held consistently across groups, although the relative numbers in each group were too small to be statistically significant. The three groups were then combined, and the significance of the changes on each page of the questionnaire was statistically assessed using the McNemar test, incorporating Yates' correction for continuity. The results of the group analysis are presented in Table 4.4.1.1.D (i), and the analysis of data from pages completed by subgroups is presented in Table 4.4.1.1.D (ii). The data from the two pages relating to the CONFORMITY concept are presented separately afterwards, in Table 4.4.1.1.D (iii).

The important features of the results are:

Firstly, as child subjects moved to "verbal ordering", i.e. when they began the description task, there were far more changes from systematic ordering to unsystematic listing than there were from unsystematic ordering to systematic listing of the three examples presented at the head

TABLE 4.4.1.1.D. (i)

Direction of change in preferred orderings between non-verbal grading and verbal grading in Groups 1, 2 and 3 together (N = 82). McNemar Test for the Significance of Changes (incorporating Yates' correction).*

Page		From: Type of First Ordering (non-verbal	N	To: Type of Second Ordering (verbal)	N	X^2	p with d.f. = 1: <.05	<.01	<.001
Rectangles	1.	Systematic	68	Not Systematic	32	13.225			x
		Not Systematic	14	Systematic	8				
	2.	M	44	Not - M	32	22.4			x
		Not - M	38	M	3				
	3.	U	24	Not - U	13	1.161	not significant		
		Not - U	58	U	18				
Buildings	1.	Systematic	65	Not Systematic	16	4.762	x		
		Not Systematic	17	Systematic	5				
	2.	M	31	Not - M	16	9.388		x	
		Not - M	51	M	2				
	3.	U	34	Not - U	10	0.696	not significant		
		Not - U	48	U	13				
Persons	1.	Systematic	70	Not Systematic	15	13.067			x
		Not Systematic	12	Systematic	0				
	2.	M	44	Not - M	14	7.563		x	
		Not - M	38	M	2				
	3.	U	26	Not - U	7	0.364	not significant		
		Not - U	56	U	4				

* two-tailed hypothesis

TABLE 4.4.1.1.D (ii)

Direction of change in preferred orderings between non-verbal grading and verbal grading in Subgroups 1A, 2A and 3A together (N = 41) and Subgroups 1B, 2B and 3B together (N = 41). McNemar Test, incorporating Yates' correction. Two-tailed hypothesis.

Page		From Type of first ordering (non-verbal)	N	To Type of second ordering (verbal)	N	X^2	p with d.f. = 1 $<.05$	$<.01$	$<.001$
Big Bees	1.	Systematic	33	Not Systematic	8	6.125	x		
		Non Systematic	8	Systematic	0				
	2.	M	23	Not - M	10	5.818	x		
		Not - M	18	M	1				
	3.	U	10	Not - U	2	0.571	not significant		
		Not - U	31	U	3				
Small Bees	1.	Systematic	36	Not Systematic	6	1.125	not significant		
		Not Systematic	5	Systematic	2				
	2.	M	24	Not - M	8	0.75	not significant		
		Not - M	17	M	4				
	3.	U	12	Not - U	5	0.1	not significant		
		Not -U	29	U	5				
Big Trees	1.	Systematic	31	Not Systematic	8	2.5	not significant		
		Not Systematic	10	Systematic	2				
	2.	M	14	Not - M	6	1.125	not significant		
		Not - M	27	M	2				
	3.	U	17	Not - U	5	0.125	not significant		
		Not - U	24	U	3				

TABLE 4.4.1.1.D (ii) (cont'd)

Page		From Type of first ordering (non-verbal)	N	To Type of second ordering (verbal)	N	X^2	p with d.f. = 1 $<.05$	$<.01$	$<.001$
Small Trees	1.	Systematic	32	Not Systematic	7	1.778	not significant		
		Not Systematic	9	Systematic	2				
	2.	M	13	Not - M	1	3.2	not significant		
		Not - M	28	M	4				
	3.	U	18	Not -U	8	6.125		x	
		Not -U	23	U	0				

TABLE 4.4.1.1.D (iii)

Direction of change in preferred orderings between non-verbal and verbal grading for the CONFORMITY concepts. Subgroups 1A, 2A and 3A, followed by 1B, 2B, 3B. The final row shows the results when the subgroup results are combined. (Subgroups N = 41. Total N = 82) McNemar Test, incorporating Yates' correction for continuity. Two-tailed hypothesis.

Page		Type of first ordering (non-verbal)	N	Type of second ordering (verbal)	N	X^2	p with d.f. = 1 $<.05$	$<.01$	$<.001$
Bottles	1.	Systematic	28	Not Systematic	8	1.455		not significant	
		Not Systematic	13	Systematic	3				
	2.	M	11	Not - M	5	0.1		not significant	
		Not - M	30	M	5				
	3.	U	17	Not - U	8	1.455		not significant	
		Not - U	24	U	3				
Faces	1.	Systematic	20	Not Systematic	6	2.3		not significant	
		Not Systematic	21	Systematic	1				
	2.	M	7	Not - M	5	1.5		not significant	
		Not - M	34	M	1				
	3.	U	13	Not - U	3	0		not significant	
		Not - U	28	U	2				
Combined:	1.	Systematic	48	Not Systematic	14	4.5	x		
		Not Systematic	34	Systematic	4				
	2.	M	18	Not - M	10	0.56		not significant	
		Not - M	64	M	6				
	3.	U	30	Not - U	11	1.56		not significant	
		Not - U	52	U	5				

of each page. This was a consistent feature on <u>every</u> page of the questionnaire, although the numbers involved did not always make it statistically significantly different from chance. This behaviour is quite different from the manner of responding in the adult group, who were consistent in preserving the same order of instances between non-verbal and verbal grading. The changes in preferred ordering between sort and description suggest some support for the view that some of Piaget's findings concerning the age of development of concepts and operations in children may have been the result of his placing too strong a reliance on data of a linguistic kind, so that he was misled about the real age at which concrete operations develop. Certainly the evidence of this study is that the use of language is a factor for confusion if one wishes to adduce evidence of grading ability.

The second feature to note, is that with one exception (subgroup performances on the Small Trees page), perusal of Tables 4.4.1.1.D, (i) and (ii), shows that there are always more changes away from initial <u>M</u> ordering than away from <u>U</u>. Again this is not always statistically significant, especially where the subgroup structure reduces the total number of subjects. This dominant pattern of change away from <u>M</u> ordering cannot, moreover, be dismissed as being the result of a greater number of subjects choosing <u>M</u> in the first place, thus inevitably making more subjects available for change of mind in this category than in category <u>U</u>; the reason why this explanation fails is that even when relative percentages are considered in each category instead of raw frequencies, the difference in the amount of change is still strongly present, and even increases in some cases.

What the movement away from <u>M</u> ordering particularly suggests is that somehow an <u>M</u> ordering was difficult to handle verbally. Why was this? The only explanation that has suggested itself so far is that an

M ordering means starting with the Diminutive end of a dimension and using words like small, short and low. On the other hand, choice of a U ordering would favour mention of big, long, tall and high. As will be seen in section 4.4.1.2., when the vocabulary was analysed, precisely the latter words occurred most often, and it was only the word small from the first category that occurred as frequently, low never occurring at all.

At the risk of grossly overgeneralising, what this observation has been interpreted to mean is that many children at this stage have two schemata for grading: one, the non-verbal cognitive schema, leads them to grade "upwards", i.e. in a positive direction away from diminutive for physical dimensions; the other, linguistic schema allows them to attend only to the extended ends of physical dimensions and progressively grade towards zero. Cognitive and linguistic development seem to be dynamically opposed and to result in unstable behaviour not found in the adult subjects who also completed the questionnaire.

4.4.1.1.e. Interaction of Grading with other Variables

(i) Age

Ordering for the sorting and description at the top of each page was classified according to three sorts of behaviour: Systematic, Asystematic and Unsystematic, to see whether information had been lost by dichotomising the data. Systematic behaviour was defined as being any of the orderings which combined M and U (M+U, M+M, U+U, U+M) for sorting and description. Asystematic behaviour was choice of initial M or U which then changed to L, R, H, P or O for description. All other combinations were called Unsystematic.

Generally what was found was that this more delicate analysis merely emphasised the eccentricity of the children in the 9 ; 01 - 10 ; 00 age group (i.e. more or less Group Two), which resulted in higher frequencies of asystematic and unsystematic behaviour than for either of the other groups. On the Rectangles page, the analysis gave the following:

Age	N	Unsystematic	Asystematic	Systematic
8;01 - 9;01	33	4	14	15
9;02 - 10;01	27	8	12	7
10;02 - 11;02	22	2	6	14
18;0+	19	1	0	18

$X^2 = 8.28$, not quite significant, with d.f. = 4 for children
$X^2 = 25.25$, $p<.001$, with d.f. = 6, when adults are included.
(two-tailed h)

A similar pattern of choice-behaviour could be found on the page containing drawings of Buildings: again the intermediate age-group was eccentric.

Age	N	Unsystematic	Asystematic	Systematic
8;01 - 9;01	33	4	6	23
9;02 - 10;01	27	9	8	10
10;02 - 11;02	22	4	2	16
18;0+	19	1	0	18

$X^2 = 9.995$, $p<.05$ with d.f. = 4 for children) two-tailed h
$X^2 = 18.92$, $p<.01$ with d.f. = 6 with adults included)

On other pages the same behaviour is repeated, but the frequencies are not significantly different from chance level because of the reduction in Total N caused by sub-group structure. The only place where all groups seem to be equally good at sorting and maintaining chosen orders is the Persons page, and it is arguable that grading the size of people is the most familiar - because the most indulged-in - of all grading activities among children of the age represented by this sample. This suggests that grading ability is not acquired as a once-and-for-all schema, but rather that its rate of development will to some extent vary, depending on the familiarity of the entities graded.

As can be seen from Table 4.4.1.1.E (i), age was correlated significantly, though only slightly with grading ability in the sample population. (The four age-groups, and the three types of sorting from Systematic to Unsystematic, were treated as ordinal data here.) Only the three main pages of the questionnaire are presented, as the numbers were too low in sub-groups. The Faces and Bottles pages were combined for CONFORMITY.

TABLE 4.4.1.1.E (i)

Kendall Correlation Coefficients. Age by systematicity of grading. Statistical significance is given in brackets after each Tau coefficient. N = 101.

VARIABLES:	Rectangles	Buildings	Persons	(CONFORMITY)
Age	.2663 (.001)	.1351 (.023)	.1675 (.007)	.2664 (.001)

It can be seen that the correlation with age is highest for the two concepts which, most psycholinguists would agree, represent the greatest difficulty. However, as will be noted when Table 4.4.1.1.F is consulted, the correlation coefficients are lower between age and grading ability than between grading behaviours shown from one page of the questionnaire to the next.

(ii) Intelligence?

For Groups Two and Three, where some primitive data on intelligence were available, the correlation with grading ability was again calculated. The Kendall Correlation Coefficients are to be found in Table 4.4.1.1.E (ii) (Kendall's Tau was used).

TABLE 4.4.1.1.E (ii)

Kendall Correlation Coefficients. Intelligence ranking by systematicity of grading. Statistical significance is included in brackets.

Group	N	VARIABLES	Rectangles	Buildings	Persons	CONFORMITY
2	26	Teacher's Ranking	.0725 (.302)	.1082 (.219)	-0.0229 (.435)	.2748 (.024)
3	23	IQ Ranking	-0.1254 (.201)	-0.2104 (.08)	.2829 (.029)	-0.0123 (.467)
		VARIABLES	Big Bees	Small Bees	Small Trees	Small Trees
2A	13	Teacher's Ranking	.5816 (.003)	.2543 (.113)		
3A	12	IQ Ranking	.1083 (.312)	.5093 (.011)		
2B	13	Teacher's Ranking			.4188 (.023)	.4315 (.020)
3B	11	IQ Ranking			.2810 (.114)	.0733 (.377)

It is not possible to say that there is a connection between intelligence and grading ability, because of the quality of the data on intelligence, which makes inter-group comparisons suspect anyway. The highest significant correlations are found in the subgroups of Group Two, and as this group was the most unstable as far as systematicity of grading went, this might indicate that the ability to grade was at least partially a matter of intelligence. More than this cannot be ventured.

(iii) Sex

The girls generally seemed to be better at grading on the physical dimensions, but the boys were more systematic on CONFORMITY. Statistically significant differences on individual pages of the questionnaire emerged in Groups Two and Three on the CONFORMITY dimension, and in Group Three the boys were also significantly better than the girls on systematicity for the Rectangles page. The exact frequencies are given in Table 4.4.1.1.E (iii). Significance of the results was calculated using either X^2 or the Fisher exact probability test, whichever was suitable for the number of subjects involved.

Following this analysis, groups were assessed, on the sex variable, for overall grading behaviour on the physical dimensions as a whole, and it was found that there was a significant sex difference for consistency of sorting in Group One. This was significant at the five per cent level ($X^2 = 4.899$, d.f. = 1). Here, surprisingly, it was the girls who were more consistently systematic in grading. The contingency table for Group One is as follows:-

	M	F
consistent	7	14
not consistent	8	4

N = 33
(Fisher's exact p = .021, two-tailed h.)

This is an interesting discovery, since there was also found to be a stability of patterning in choice among the girls in this group, something not found elsewhere. A detailed breakdown of patterns of choice is given in Table 4.4.1.1.E (iv), following. Group Two is again noticeable for its low frequency of consistency compared with other groups.

TABLE 4.4.1.1.E (iii)

Contingency tables showing grading ability by sex on individual pages of the questionnaire in Groups 2 and 3. (Significance is for a two-tailed hypothesis.)

GROUP OR SUBGROUP:	2B		3		3A		3B		3A + 3B	
N:	13		23		12		11		23	
Page/Concept	Faces		Rectangles		Bottles		Faces		CONFORMITY	
Sex:	M	F	M	F	M	F	M	F	M	F
Systematic	3	0	9	5	6	2	4	0	10	2
Not Systematic	2	8	2	7	0	4	1	6	1	10
X^2			5.753*						15.83	
Fisher's exact test	X				X		X			
$p<.05$	X		X		X		X			
$p<.001$									X	

* this chi-square is not significant using Fisher's exact probability test, which Siegel (1956, p.110) recommends for cases where expected frequency is less than five for any cell.

TABLE 4.4.1.1.E (iv)

Consistency in successful (non-verbal) grading in the questionnaire. Patterns of choice for Description Order are included separately where these duplicated Grading Order. (Pages representing CONFORMITY excluded)

	GROUP:	1		2		3		6	
	SEX:	m	f	m	f	m	f	m	f
Type of Grading	N =	15	18	11	15	11	12	3	16
always M + ...		1	3	1	-	3	4	-	1
M + M		1	1	-	1	-	2	3	5
always U + ...		-	3	-	-	-	-	-	-
U + U		-	-	-	-	2	-	-	3
combined M + M U + U		1	3	1	1	1	-	-	4
combined M + ... U + ...		4	4	3	5	3	4	-	1
Total successful:		7	14	5	7	7	10	3	14

Compared with consistency in ordering for non-verbal grading, as shown above, there was very little incidence of consistency in ordering for description. The data for this are given in the frequencies of Table 4.4.1.E (v), following.

From the table below, it can be seen that there were six boys and four girls who consistently chose the same ordering in the first part of the description tasks, either by always starting at the Diminutive instance for the physical dimensions, or by starting with the Excessive. The subjects who were consistent in this way make up only about one-eighth of the child sample, which is a very small proportion indeed (the adults, for example, had more than 50% frequency for consistency). Nevertheless, it is perhaps worth noting that among these very consistent graders, the boys preferred U ordering and the girls M ordering, a

TABLE 4.4.1.1.E (v)

Consistency in Ordering for Description.

GROUP:	1		2		3		6	
SEX:	male	female	male	female	male	female	male	female
Type of Grading:								
... + M	1	1	-	1	-	2	3	5
... + U	2	-	-	-	3	-	-	3
combined {...+ M / ...+ U}	1	4	1	1	4	1	-	5
not consistent	11	13	10	13	4	9	-	3
Total N:	15	18	11	15	11	12	3	16

difference which is significant (Fisher's exact probability test gives $p \leq .025$).

This might be related to a later observation, namely that more girls than boys used intermediary terms like middle-sized in these groups. This in turn suggests that the girls may try to solve the problem of grading in an essentially different way from that used by the boys.

4.4.1.1.f. Correlation of Dimensions

The grading behaviour (non-verbal followed by verbal ordering) of each subject on the pages of the questionnaire was correlated with his behaviour on every other page. To do this, the combinations of choices for non-verbal followed by verbal ordering were treated as ordinal-scaled data. Totally systematic behaviour was given a score of 3, asystematic behaviour was scored as 2, and non-systematic behaviour scored as 1, these various kinds of behaviour being defined in the way that has already been described in 4.4.1.1.e. Subjects were then ranked on grading behaviour for pairs of concepts, and Kendall's Tau was used to provide correlation coefficients. (It would have been desirable to calculate a Contingency Coefficient instead of using Tau, since the Contingency Coefficient does not assume that data input is of ordinal type; but the 3 x 3 tables needed to calculate the Contingency Coefficient would have led to more than 20% of the cells of the contingency tables having expected frequencies of less than 5. This in turn would have made statistical results meaningless.)

For the three pages of the questionnaire that the children and adults all completed in common, the group results combined (N = 101) give the following three Correlation Coefficients; significance is included in brackets:

Page: (CONCEPT)	Rectangles (LENGTH)	Buildings (HEIGHT)
Buildings (HEIGHT)	.5056 (.001)	
Persons (HEIGHT)	.3190 (.001)	.4592 (.001)

The overall coefficients show that correlation, though in no case very high, was highest when sorting and grading took place on the two sets of drawings which had similar outlines (i.e. rectangular) rather than those two sets which were extended along the same dimension (HEIGHT, for Buildings and Persons). The lowest intercorrelation was that for the two sets of drawings that had neither shape nor dimension in common.

However, this is not a set of relationships which is mirrored in the results from individual groups, as can be seen from Table 4.4.1.1.F.

It is particularly noticeable that in Group One there is virtually no correlation between grading in the physical dimensions and grading in CONFORMITY, which could be called more abstract. There is certainly no stability in correlation, and this suggests inconsistency of judgement

TABLE 4.4.1.1.F

Correlation Coefficients, by groups, of grading behaviour on different concepts represented in the questionnaire. Significance is included in brackets.

Group	N	(CONCEPT) Page:	(LENGTH) Rectangles	(HEIGHT) Buildings	(HEIGHT) Persons
1	33	(HEIGHT) Buildings	.2398 (.025)		
2	26		.500 (.001)		
3	23		.4554 (.001)		
6	19		1.000 (<.0001)		
1	33	(HEIGHT) Persons	.3272 (.0038)	.6974 (<.0001)	
2	26		-0.0154 (.456)	.3687 (.017)	
3	23		.4513 (.001)	.3168 (.017)	
6	19		.6872 (<.00003)	.6872 (<.00003)	
1	33	(CONFORMITY) Faces Bottles	.0708 (.281)	.2475 (.022)	.1102 (.1841)
2	26		.3595 (.005)	.4588 (.001)	.3668 (.004)
3	23		.3187 (.017)	.2117 (.079)	.5019 (.001)
6	19		.5443 (.0006)	.5443 (.0006)	.3218 (.0271)

TABLE 4.4.1.1.F (Cont'd)

Subgroup	N	(CONCEPT) Page:	(SIZE) Big Bees	(SIZE) Small Bees
1A	16	(SIZE) Small Bees	.3400 (.033)	
2A	13		.4484 (.016)	
3A	12		.3647 (.049)	
1A	16	(CONFORMITY) Bottles	.2224 (.115)	-0.046 (.401)
2A	13		.4573 (.015)	.7409 (.001)
3A	12		.8475 (.001)	.2951 (.091)

Subgroup	N	(CONCEPT) Page:	(HEIGHT) Big Trees	(HEIGHT) Small Trees
1B	17	(HEIGHT) Small Trees	.134 (.226)	
2B	13		.5505 (.004)	
3B	11		.7005 (.001)	
6	19		.7171 (.001)	
1B	17	(CONFORMITY) Faces	.0463 (.398)	-0.1555 (.192)
2B	13		.5230 (.006)	.4966 (.009)
3B	11		.4466 (.028)	.5244 (.012)
6	19		.3416 (.021)	.5443 (.001)

in this group, both as a whole and in its subgroups.

Group Two was also unstable in its grading behaviour, as was mentioned in 4.4.1.1.a., and the slight negative correlation between HEIGHT (Persons) and LENGTH (Rectangles), though this is not statistically significant, suggests an instability which was fairly general through the group, when the dimensional judgement changed from vertical to horizontal and the type of array changed also.

It can be seen that there is, generally, an improvement in correlation as one moves from the young children in Group One to the adults in Group Six, and this suggests greater consistency in behaviour with increasing age. Only in one case, though (LENGTH and HEIGHT, Rectangles and Buildings), does the correlation for the adults reach unity.

Correlations of above 0.5 are found in Group One on the HEIGHT dimension (Buildings and Persons); in Group Two on LENGTH by HEIGHT (Rectangles and Buildings), in Subgroup 2B on HEIGHT by HEIGHT (Big and Small Trees) as well as CONFORMITY by HEIGHT (Faces and Big Trees); and in Subgroup 2A, CONFORMITY by SIZE (Bottles and Small Bees) - which is the highest correlation overall in Group Two. In Group Three, CONFORMITY by HEIGHT (Persons) is above 0.5 correlation, as are CONFORMITY by SIZE in 3A (Bottles and Big Bees), HEIGHT by CONFORMITY in 3B (Small Trees and Faces) and HEIGHT by HEIGHT (Big and Small Trees).

It is rather surprising that unity is never achieved for correlation of the "Big" and "Small" versions of the same concept on pages completed by the subgroups. What is noticeable, however, is that whereas correlation is about the same for all three child subgroups on the SIZE dimension (Bees), correlation gradually improves with age for grading in the HEIGHT dimension (Trees), suggesting greater consistency in more specialised dimensional distinctions, by about the age of ten-and-a-half.

4.4.1.2. Description Task

Analysis: On the basis of experiences in the pilot-scheme, a classification of language data had been established which, though somewhat complex, was flexible enough to encompass all the data and to permit meaningful generalisations to be made about the differences in the four groups' language-behaviour.

Although all the data were analysed, only those which concern gradable adjectives will be presented here. Gradable nouns, noun phrases and verbs have been excluded from presentation of results.

On semantic (and to some extent formal) grounds, adjectives used in the questionnaire were allocated to one of four main classes: (i) Comparative, (ii) Superlative, (iii) Absolute and (iv) Intermediary. Because it was very often the case that subjects used more than one adjective to complete a sentence-blank, it was also found necessary to have three subcategories of Absolute: I Single; II Pairs; and III Multiples, depending on how many adjectives were used. In considering the data, only the adjective head was considered for classification; adverb modification, necessarily, was ignored so as not to make the analysis impossibly complex.

Secondly, in the categories Superlative, Absolute and Intermediary, adjectives were classed according to whether they seemed to have been used in a logically appropriate or logically inappropriate way to describe a particular instance of a concept considered as one of an array of seven. By this device it would be possible to pick out those subjects whose language-behaviour suggested a more primitive (triadic) schema for grading.

Thirdly, the adjectives were typed, according to the kind of conceptual information predicated, in terms of how specific they were. For the physical dimensions, there were four distinctions made: Global (G);

Specific Relevant (SR) and Specific Other (SO); a fourth type was labelled Alternative (A). These type-allocations varied according to the dimension, so that, for example, where the concept represented was HEIGHT for buildings, the following adjective predications would illustrate the different types:

big, small, gigantic, huge:	Global (G)
tall, high, low:	Specific Relevant (SR)
wide, thin, slim, short, long:	Specific Other (SO)
nice, square, boring:	Alternative (A)

It will be noted that if the concept stayed the same, but the referent objects changed from buildings to persons, then high and low would change places with short in the typology. The category of Intermediary adjectives was typed similarly, but only dichotomously according to whether the conceptual information was Relevant (R) - a type which conflated the distinctions previously mentioned as G and SR in the Absolute category - or whether it was Other (O). Examples of R adjectives here were words like average, medium high, and middle-sized in the case of the HEIGHT dimension; and O adjectives were words like medium-long, average length, normal, etc., which were felt to deviate from conceptual relevance.

For the two pages illustrating the CONFORMITY concept, a different typology of adjectives was devised. Here there were seven headings under which adjectives mainly fell: Normative (N), Aesthetic (AE), Shape (SH), Orientational (L), Affective (AF), Extensive (E) and Other Physical (OP). Examples of these seven types are as follows:-

Normative:	normal, proper, imperfect, abnormal, odd, peculiar, good
Aesthetic:	beautiful, nice, ugly, awful, nasty
Shape:	squashed, straight, round, oval, twisted, jagged, bent
Orientational:	lopsided, leaning, upright, wonky, squint, slanted
Affective:	frightening, menacing, happy, sleepy, sad

Extensive: long, wide, narrow, thin

Other Physical: bony, glass, plastic, hairy, bald, one-eyed, smooth

It was not possible to distinguish other types of adjective, apart from these seven, without losing generality. The classification as it stands appears rather _ad hoc_ and arbitrary, but it did attempt to reveal the kinds of perceptual attitude that might underlie certain choices of adjective. It was felt that the first two types of adjective (N and AE) best expressed judgements based on the CONFORMITY concept, whereas the last two types (_E_ and _OP_) were the most removed from doing so. In fact, some adjectives of the last type could not really be termed gradable (e.g. one-eyed), although in the answers given by some children they appeared to be organised gradably.

The only problem that occurred with classifying the language data, in the way outlined above, was that when Absolute adjectives occurred in twos or threes in a sentence it was difficult to allocate such a group to the logically _Appropriate_ or _Inappropriate_ class. It was decided to class these groups as Appropriate if all the adjectives in a group were individually so, and if one of them were Inappropriate, to designate the whole group as such. It was always found that it was the _S_ type rather than the _G_ type adjectives which were inappropriately used in the physical dimensions.

Initially, the polarity of the gradable adjectives was not taken into account; it was only after the results of the analysis of the sorting and ordering tasks (4.4.1.1.) had suggested that there could be a significant difference in preference for "positive" as against "negative" polarity in the adjectives used, that subjects' choices of adjective were examined in this light. Polarity will be dealt with in the next section, therefore (4.4.1.3.).

4.4.1.2.a. Overview of Results

The page-by-page frequencies of adjective types by class and category are given in Tables 4.4.1.2.AI to AVI. As these tables are rather extensive, they have been confined to the Appendix (See Appendix 3), and in the corresponding tables of relative percentages, presented below, only the categories, subcategories, and classes of appropriacy are shown. The rows marked as a or b denote Appropriate and Inappropriate respectively. The total percentages in each class of adjectives are given separately for each of the four groups of subjects and for the two types of structures used in completing the sentence blanks, whether predicative (c) or attributive (a). At the bottom of each column the total percentage of answers is given: this is rarely 100%, since there were quite a few instances where subjects left the sentence-blanks as they were, apart from giving answers which were illegible, uninterpretable, or unusable. Failures to complete the second sentence-blank of each pair, particularly, account for what is sometimes a sharp discrepancy between totals for Predicative and for Attributive usage, especially among the youngest children in the sample.

(The tabulation of percentages is arguably not an ideal method of presenting the results here, since it obscures the true strength of individual contributions within each set of data. In other words, if a particular adjective category occurs with a frequency of 20% on a page of the questionnaire, there is no means of showing whether this is the result of 20% of the sample population each using the category once, or 4% of the sample each using it five times. For the purposes of a macro-analysis, however, this disadvantage may be ignored, since it is outweighed by the advantage of allowing broad trends to be visible when each group is treated as a speech-community in miniature. The sub-structure of the various frequencies will be illustrated by means of mode frequencies for each adjective type on each page of the questionnaire, and later by the micro-analysis of individual usage of the main adjective types.)

Not surprisingly, the category of Absolute adjectives was numerically always the largest, since it had a potential of occurrence of 100% on each page of the questionnaire. As had been seen in the pilot scheme, Comparative adjective forms were potentially the next most frequent, since they could be used for n - 1 instances of a concept and so could theoretically occur almost as often as Absolute, although the structure of the second sentence-blank accompanying each picture on the questionnaire was expected to discourage such a general use of Comparative adjectives, by excluding the "focus of comparison" (Flores d'Arcais, 1970). Only extremal instances of a concept (and therefore two out of fourteen sentence blanks) on each page should, logically, have attracted Superlative adjective choices, and similarly only one or two central instances of a concept should attract Intermediary category adjectives.

Let us now look at the percentages in Tables 4.4.1.2.A (i) through (vi) in greater detail, to examine the interactions of the different categories, and how the sub-structure of these might reflect changes brought about in children's thinking as they mature.

(i) Comparative Category

The highest frequency of occurrence is found almost entirely in Group One and Group Six. Group Three fluctuated considerably between low (1.5%) and high (12.5%) frequencies, largely as a result of change of dimension, as will be shown later. Group Two had, by comparison, remarkably low frequencies in the Comparative category across all concepts.

When the array of seven instances was not broken up, i.e. on the Persons page, the highest frequency of Comparative form is found in all

TABLE 4.4.1.2.A (i)

Frequency of Adjective Category and Usage. Relative Percentages within each group. (Rounded to 1 d.p.)

Page: Rectangles. Concept: LENGTH

Group and N:		GP1 (33)		GP2 (26)		GP3 (23)		GP6 (19)	
Type of Predication:		c	a	c	a	c	a	c	a
Total Frequency: F = 100%		231	231	182	182	161	161	133	133
Category and Usage									
i. Comparative		4.8	1.3	1.6	0.5	3.1	1.2	20.3	5.3
ii. Superlative	a.	3.5	-	1.1	-	0.6	0.6	3.0	0.8
	b.	7.4	0.4	2.7	-	1.2	-	9.0	0.8
iii. Absolute									
I Single	a.	34.6	42.4	29.7	41.8	54.7	51.0	30.8	37.6
	b.	7.4	13.0	7.7	14.3	12.4	26.7	6.0	18.0
II Pairs	a.	10.8	3.9	9.9	6.0	1.9	0.6	3.0	1.5
	b.	13.4	6.9	26.4	23.0	8.7	2.5	8.3	13.5
III Multiples	a.	0.4	0.4	1.1	-	-	-	0.8	0.8
	b.	1.3	0.4	2.2	-	0.6	-	3.0	0.8
iv. Intermediary	a.	3.9	4.3	2.2	3.3	1.2	3.1	5.3	7.5
	b.	6.5	3.5	2.2	2.7	1.9	5.0	3.0	3.8
Total %		94.0	76.5	86.8	91.6	86.3	90.7	92.5	90.4

TABLE 4.4.1.2.A (ii)

Frequency of Adjective Category and Usage. Relative Percentages (rounded to 1 d.p.) within each group.

Page: Buildings   Concept: HEIGHT

Group and N:		GP1 (33)		GP2 (26)		GP3 (23)		GP6 (19)	
Type of predication:		c	a	c	a	c	a	c	a
Total frequency: F = 100%		231	231	182	182	161	161	133	133
Category and Usage									
i. Comparative		1.7	0.4	1.1	0.5	5.0	2.5	9.0	4.5
ii. Superlative	a.	4.3	0.4	1.1	-	-	-	3.0	-
	b.	6.1	-	1.6	-	0.6	-	3.0	-
iii. Absolute									
I Single	a.	48.5	51.1	45.1	49.5	67.7	47.2	51.9	67.7
	b.	4.8	15.2	4.9	18.1	5.0	29.2	0.8	3.8
II Pairs	a.	3.9	3.0	5.5	3.3	1.2	3.7	6.0	3.8
	b.	18.6	3.0	18.1	8.8	7.5	3.1	5.3	2.3
III Multiples	a.	-	-	2.2	-	-	-	0.8	-
	b.	0.9	0.4	5.5	-	-	-	-	-
iv. Intermediary	a.	-	-	0.5	1.1	-	1.2	2.3	2.3
	b.	8.2	5.2	3.3	2.2	6.8	2.5	3.8	4.5
Total %		97.0	78.7	88.9	83.5	93.8	89.4	85.9	93.4

TABLE 4.4.1.2.A. (iii)

Frequency of Adjective Category and Usage. Relative Percentages (rounded to 1 d.p.) within each group.

Page: Persons   Concept: HEIGHT

Group and N:		GP1 (32)		GP2 (25)		GP3 (23)		GP6 (19)	
Type of predication:		c	a	c	a	c	a	c	a
Total frequency: F = 100%		224	224	175	175	161	161	133	133
Category and Usage									
i. Comparative		14.3	5.8	4.0	1.7	12.4	1.9	14.3	0.8
ii. Superlative	a.	9.4	1.3	1.1	-	2.5	-	3.0	-
	b.	0.4	-	-	-	-	-	-	-
iii. Absolute									
I Single	a.	48.2	40.2	48.6	65.7	67.7	65.8	60.2	87.2
	b.	3.6	12.5	2.3	8.6	1.9	20.5	-	-
II Pairs	a.	4.0	4.5	12.0	1.7	0.6	-	-	-
	b.	3.1	0.4	9.7	8.6	-	-	-	-
III Multiples	a.	-	-	1.7	-	-	-	-	-
	b.	0.9	-	1.7	-	-	-	-	-
iv. Intermediary	a.	1.3	0.9	0.6	-	0.6	-	3.8	7.5
	b.	5.4	4.0	4.6	6.3	4.3	5.0	-	1.5
Total %		90.6	69.6	86.3	92.6	90.0	93.2	81.3	97.0

TABLE 4.4.1.2.A (iv)

Frequency of Adjective Category and Usage. Relative percentages (rounded to 1 d.p.) within each group.

Page: Big Bees. Concept: SIZE

Group and N:		GP1A (16)		GP2A (12)		GP3A (12)	
Type of predication:		c	a	c	a	c	a
Total frequency: F = 100%		112	112	84	84	84	84
Category and Usage:							
i. Comparative		5.4	-	3.6	1.2	9.5	-
ii. Superlative	a.	2.7	-	4.8	-	2.4	-
	b.	4.5	-	2.4	-	-	-
iii. Absolute							
I Single	a.	47.3	52.7	33.3	44.0	65.3	63.1
	b.	3.6	12.5	2.4	4.8	4.8	2.4
II Pairs	a.	11.6	4.5	17.9	14.3	1.2	2.4
	b.	6.3	0.9	9.5	9.5	-	2.4
III Multiples	a.	-	0.9	3.6	-	-	-
	b.	0.9	0.9	2.4	-	-	-
iv. Intermediary	a.	2.7	1.8	2.4	2.4	2.4	6.0
	b.	9.8	7.1	2.4	2.4	8.3	3.6
Total %		94.8	81.3	84.7	78.6	94.1	79.9

Page: Small Bees

F = 100%		96	96	84	84	72	72
i. Comparative		4.2	1.0	8.3	-	5.6	1.4
ii. Superlative	a.	8.3	-	2.4	-	2.8	-
	b.	10.4	-	-	-	1.4	-
iii. Absolute							
I Single	a.	43.7	50.0	39.3	54.8	77.8	76.4
	b.	4.2	12.5	3.6	6.0	2.8	8.3
II Pairs	a.	10.4	6.2	15.5	9.5	-	-
	b.	6.2	1.0	7.1	-	-	-
III Multiples	a.	-	-	2.4	-	-	-
	b.	-	1.0	3.6	-	-	-
iv. Intermediary	a.	-	-	2.4	3.6	2.8	2.8
	b.	12.5	8.3	3.6	3.6	2.8	2.8
Total %		99.9	80	88.2	77.5	96	91.7

TABLE 4.4.1.2.A (v)

Frequency of Adjective Category and Usage. Relative Percentages (rounded to 1 d.p.) within each group.

Page: Big Trees. Concept: HEIGHT

Group and N:		GP1B (17)		GP2B (12)		GP3B (11)		GP6 (19)	
Type of predication:		c	a	c	a	c	a	c	a
Total frequency: F = 100%		119	119	84	84	77	77	133	133
Category and Usage:									
i. Comparative		4.2	1.7	3.6	2.4	7.8	3.9	14.3	6.8
ii. Superlative	a.	6.7	1.7	3.6	1.2	1.3	-	6.8	0.8
	b.	6.7	0.8	2.4	-	3.9	-	3.0	-
iii. Absolute									
I Single	a.	43.7	52.1	44.0	60.7	70.1	77.9	58.6	74.4
	b.	4.2	6.7	2.4	6.0	2.6	5.2	-	-
II Pairs	a.	12.6	0.8	16.7	8.3	1.3	-	0.8	1.5
	b.	2.5	3.4	9.5	13.1	1.3	-	3.8	0.8
III Multiples	a.	-	-	3.6	-	-	-	-	-
	b.	2.5	-	2.4	2.4	-	-	0.8	-
iv. Intermediary	a.	2.5	1.7	4.8	1.2	2.6	-	3.8	4.5
	b.	9.2	1.7	2.4	-	2.6	2.6	4.5	6.0
Total %		94.8	70.6	95.4	95.3	93.5	89.6	96.4	94.8

Page: Small Trees.		(16)		(13)		(11)		(19)	
F = 100%		96	96	78	78	66	66	114	114
i. Comparative		1.0	3.1	1.3	-	1.5	4.5	10.5	5.3
ii. Superlative	a.	7.3	2.1	-	-	1.5	-	4.4	0.9
	b.	5.2	1.0	-	-	3.0	-	2.6	0.9
iii. Absolute									
I Single	a.	45.8	55.2	52.6	69.2	62.1	68.2	57.9	71.9
	b.	11.5	9.4	5.1	9.0	4.5	7.6	2.6	1.8
II Pairs	a.	9.4	8.3	21.8	7.7	4.5	1.5	1.8	1.8
	b.	2.1	-	5.1	2.6	-	1.5	0.9	0.9
III Multiples	a.	-	-	3.8	-	-	-	-	-
	b.	-	-	1.3	-	-	-	-	-
iv. Intermediary	a.	-	-	1.3	-	6.9	3.0	8.8	9.6
	b.	12.5	5.2	6.4	6.4	3.0	4.5	5.3	5.3
Total %		94.8	84.3	98.7	94.9	86.2	90.8	94.8	98.4

TABLE 4.4.1.2.A (vi)

Frequency of Adjective Category and Usage. Relative Percentages (rounded to 1 d.p.) within each sub-group.

Page: Bottles. Concept: CONFORMITY

Group and N:		GP1A (16)		GP2A (13)		GP3A (12)	
Type of predication:		c	a	c	a	c	a
Total Frequency: F = 100%		96	96	78	78	72	72
Category and Usage:							
i. Comparative		0		1.3	0	2.8	0
ii. Superlative	a.	2.1	-	-	-	-	-
	b.	1.0	-	-	-	-	-
iii. Absolute							
I Single	a.	58.3	60.4	50.0	52.6	59.7	56.9
	b.	18.8	13.5	12.8	16.7	26.4	25.0
II Pairs	a.	15.6	6.3	19.2	14.1	1.4	-
	b.	1.0	-	5.1	2.6	2.8	2.8
III Multiples	a.	-	-	-	-	-	-
	b.	-	-	5.1	-	-	-
Total %		96.8	80.2	92.2	86.0	93.1	84.7

Page: Faces

Group and N:		GP1B (17)		GB2B (13)		GP3B (11)		GP6 (19)	
Total Frequency: F = 100%		119	119	91	91	77	77	133	133
i. Comparative		0	0	0	0	3.9	2.6	0.8	0
ii. Superlative	a.	2.5	-	-	-	1.3	-	-	-
	b.	-	-	-	-	-	-	-	-
iii. Absolute									
I Single	a.	74.8	68.1	78.0	84.6	90.9	89.6	79.7	83.5
	b.	-	0.8	-	-	2.6	2.6	4.5	4.5
II Pairs	a.	9.2	4.2	9.9	4.4	-	-	8.3	4.5
	b.	0.8	0.8	-	-	1.3	1.3	-	0.8
III Multiples	a.	2.5	-	4.4	-	-	1.3	1.5	-
	b.	-	-	6.6	-	-	-	-	-
Total %		89.8	73.9	98.9	89.0	100.0	97.4	94.8	93.3

three child groups, where it served to extend the store of adjectives available. As already mentioned, the use of the Comparative is also attractive for other reasons, since it can offer access to a low-level organising strategy for a large array, by the simple verbal "chaining" of each new instance to the one mentioned immediately before.

Two main positions seemed to attract Comparative forms on each page of the questionnaire: these were (i) the middle instance of the three presented at the top of each page (with the exception of the Persons) and (ii) the middle instance or instances of the remainder of the array presented lower down the page. For the adult data, only the first-mentioned of these was attractive, apparently, as elsewhere on the pages comparative forms occurred randomly and in no large numbers. The occurrence of the comparative in these positions suggested advanced grading behaviour, since in the younger group it was precisely these positions that were frequently occupied by Intermediary terms, which were classed as logically Inapplicable. Between a half and one-third of all Comparative forms occurred in the environment of the picture representing the intermediate instance in the initial triad at the top of the page.

One final observation to make here is that the details given for the Comparative in the breakdown tables of frequencies in Appendix 3 show Global (G) type adjectives consistently predominating over S type throughout the child data, whereas among those adults using Comparative forms, S adjectives predominate in the concept areas LENGTH (Rectangles) and HEIGHT (Buildings) but not HEIGHT (Persons). There were two apparent reasons for the dominance of G type adjectives on the Persons page: the first was that the two most extended instances in the array were, for those adults who correctly used the information given by the norm-figure at the top of the page, not merely tall but relatively gigantic, and adjectives like the latter were typed as Global. A second reason, also supported by reference to the data, is that because of the peculiar role played by the human body in the learning of dimensional concepts and the accompanying adjectives, there is a certain amount of linguistic fossilisation that leads certainly to the preservation of small to refer to less extended instances, instead of the use of short, and also (though to a lesser extent) to the preservation of big for the more extended instances of HEIGHT in people. Both small and big were typed as Global in the analysis of the data.

(ii) Superlative Category

The three main points to note here are (i) the gradual decrease in frequency of occurrence of this form through the three age-levels represented in the child data; (ii) the predominance of Inappropriate over Appropriate logical application in the first two groups, particularly in Group One; (iii) the dominance in this category, yet again, of adjectives of Global type in all three child samples.

Particularly in Group One, classic symptoms of a less developed grading ability were found in the occurrence of more than two Superlative forms per array, when, for example, more than one instance in a concept set was described as biggest. This sort of behaviour frequently co-occurred with choice of two non-adjacent instances, in the array of seven, to be described by means of Intermediary type adjectives. It is also worth noting that those children who logically misapplied Superlative and Intermediary categories of adjective in this way were not those who failed to carry out the sorting and ordering tasks at the head of each page. Successful sorting by concept followed by ordering for verbal description was no predictor of whether children could organise all seven instances verbally into a single graded series. In fact it tended to be the case that subjects who failed to perform the sorting task were those who used Absolute category adjectives and Comparatives. The reasons for this are discussed at the end of the chapter.

The adults' behaviour was different. One adult consistently failed to grade the arrays verbally into sevens, and so was alone responsible for the percentages that appear in the b category of Superlatives for each page after the first. Apart from her, five others in the group appeared to have misunderstood the instructions and to have used a "three-four" system of grading for the first page (Rectangles) but to have subsequently corrected their behaviour and graded the other arrays as sevens. At first it appeared that those who used the Superlative form were perhaps verbally less developed, since Global type adjectives were more frequent than expected; but this was not the case, since closer examination of the data revealed that the users of G type Superlatives also used S-type, but there was in each dimension a strong distributional preference for the S-type adjective to be used in conjunction with the most extended instance and the G-type to be used for the least extended. This is a distinction which held constant across Comparative and Superlative and Absolute categories, and it will be described in more detail in the section on Polarity (4.4.1.3.)

(iii) Intermediary Category

A difficulty which had not been foreseen, and which clouds the quality of results for this category of adjective, was that of determining in some cases whether an adjective should be classed as of the Appropriate or Inappropriate logical variety. It was simple enough in the data from Group One, where two non-adjacent instances in the array were frequently described by means of an Intermediary, and one of these was always the intermediate instance of the triad at the top of the page; but in the other groups the same instance was also termed medium or middle-sized, without there being any Superlatives used to show that the instance so designated was only such in the initial triad. What frequently occurred was that the intermediate instance of the triad at the top of the page was described using an Intermediary category of adjective, and then all the other instances on the page were described using Absolute category adjectives without any obvious and visible logical inconsistencies: those instances which were more extended were described using adjectives of positive polarity, and those which were less extended were described by negative polarity items. Seen from an adult point of view (i.e. mine), there was nothing inconsistent, logically, and the only peculiarity was that the Intermediary adjective was located off-centre in the array as a whole. A similar sort of response was found in the adult data. From a logical point of view, if there is no external norm available for size judgements related to the real world, there is no reason, apart from symmetry, why the Intermediary adjective should occur at the precise middle of the graded array (i.e. for the fourth instance where the array consists of seven). Nevertheless, this does place a question mark over the validity of results arrived at by using the consistent criterion that an Intermediary adjective occurring with the central instance of the gradable triad at the top of the page should be designated Inapplicable unless it occurs in the environment of others making up a "broad middle" in the array seen as a whole.

Having said this, we may now guardedly note that Group One always had more Intermediary adjectives used in logically <u>Inapplicable</u> fashion than <u>Applicable</u>. Frequencies in the other groups fluctuated between the two classes. Where there was an objective measure of the logic of grading, i.e. on the HEIGHT dimension for Persons, all three child groups had far larger frequencies of Inapplicable than of Applicable Intermediary adjectives, whereas the adult group presented the reverse of this. There was a strong tendency for both the (young) children and the (full-grown) adults to designate person <u>B</u> in the array of Persons as being average or medium. A majority in each group then went on to designate person D as gigantic or colossal, whereas for the children, logically, this figure could not have been more than tall if the figure of "Norma(n)" was used as a yardstick. This use of Intermediary adjectives has interesting psychological implications which will be discussed at the end of the chapter.

(iv) Absolute Category

I. Single

Because it was more difficult to use contextual clues from their visual environment in the pages of the questionnaire, adjectives in this category were the most difficult to evaluate adequately. Only in the most obviously deviant cases, i.e. where for example a subject designated one instance as big and a more extended instance of a concept as small, were adjectives consigned to the Inappropriate logical category. Otherwise, a broad tolerance was shown, so as to accommodate subjects who had large "category widths". There were several of these: for them, one instance in an array was, say, medium, and the instances on one side of it in the gradient were small, and on the other side tall or long.

It is worth noting, in considering the Absolute category in the frequency tables in Appendix 3, how rarely Global (G) adjectives were found to be Inappropriate in logical application. It is mainly SO or SR (Specialised Other or Specialised Relevant) which occur in the physical dimensions, and SH (Shape) type adjectives in the CONFORMITY concepts; at least, this is true for subcategory I.

Global adjectives are consistently the most numerous type in the a. row (for Appropriate usage) for each I Single subcategory in the frequency tables for the physical dimensions. For the LENGTH concept, SR type adjectives were also quite numerous, and actually predominated in the adult data. The highest relative percentages are shared by

Groups Three and Six. In Group Six, SR type adjectives were quite numerous, though fewer than G, on the HEIGHT dimension for Buildings and Persons; and on this latter page, Group Three also produced relatively many SR adjectives (tall and short). The SO adjectives were occasionally accepted as logically Appropriate where peculiarities in the arrays were noticed by the subjects and commented on. So, for example, some did not accept the fifth rectangle on page one for grading on LENGTH, but on WIDTH instead, and described it as narrow, because what was the constant secondary extension (one centimetre) of the array of Rectangles (and thus their WIDTH) became the primary extension (and thus the LENGTH) of this particular rectangle when its shortness in the array was inherently unacceptable and caused cognitive conflict. A similar phenomenon was found for the fifth Building in the array for HEIGHT, where it was one millimetre narrower than the others. The first design feature was intentional, but the second was not. Similarly on the Persons page there was one figure, person C, which had not been reduced in the proper proportion and so appeared relatively thin compared with the others. Apart from these exceptional cases, the SO adjectives dominated the b. row for logically Inapplicable usage in the first three pages (Rectangles, Buildings, Persons) listed in the tables. Peculiarly enough the highest relative percentage is found in Group Three.

For the Trees and Bees pages, Global type adjectives are dominant in both Appropriate and Inappropriate usage - although the second category has extremely low associated frequencies, it must be noted.

On the two pages representing the concept area of CONFORMITY, the largest relative percentages are found on the Bottles page in Group One, and on the Faces page in Group Three, for the class of logically Applicable. It is worth noting that the percentage frequencies on the last page jump to relatively very high figures: 68% to 90%, depending on the group;

this indicates that it was easier to elicit relevant data on the Faces page, probably due to the familiarity of the entities in the drawings representing CONFORMITY.

Of the various types of adjective used, N occurred with respectable frequency on both pages, although it was not the most frequent type in each group. The AE type of adjective occurred on the Faces page, but was not one of the three most popular types listed for Bottles. Taking Complementary and Attributive functions separately, the listing of the three most frequent adjective types across the groups is:

		Complementary	Attributive
Bottles			
	Group 1A:	E, L, N	E, AE, N
	Group 2A:	N, L, E	E, SH, N/AE
	Group 3A:	L, E, N	E, N, SH
Faces			
	Group 1B:	O, AE, AF	O, AE, AF
	Group 2B:	N, AE, O	AE, N, AF
	Group 3B:	SH/O, N, AE	AE, O,E
	Group 6:	N, SH, O	N, SH, O

There do not seem to be any clear-cut differences between the groups, but only between the two pages in the types of adjective they most frequently elicited. The first page seems to have elicited responses mainly in the form of the more "concrete" type of adjectives, and the second seems to have suggested adjectives of a more "abstract" type. The common presence of O type in the second-page frequencies, however, shows that even here the picture-set was not of an entirely successful design.

Absolute Category:

Pairs (II) and Multiples (III)

Going on now to consider subcategories II and III of the Absolute adjectives, we note that the largest percentage frequencies in the tables occur mainly in Group Two, with some overspill on both sides, both for logically Appropriate and logically Inappropriate usage. Subcategory III tended to be absent in data from Groups Three and Six, except on LENGTH (Rectangles) and HEIGHT (Buildings). This suggests, generally, that the age-range covered by the three child groups is one during which a strong development in vocabulary takes place, peaking (for the concepts considered in this study) at about the age of Group Two, but with some further time elapsing before full control over the meaning of the various adjectives is established. Group Two seemed generally to be unsure and unstable in their use of dimensional adjectives, and the use of two or three in each sentence-blank where one would have sufficed is an indication of this uncertainty over meaning.

Taking logically Applicable usage first, we can see that the combinations to occur constantly with the highest frequency in Groups One and Two all involve G in combination with other types: G + G and G + SR for LENGTH (e.g. big huge/tiny little; big long/wee short); G + SO for HEIGHT (Buildings and Trees); and G + G for HEIGHT (Persons), G + G and G + SO for SIZE (Bees). Where pairs of adjectives occur at all in the data from Groups Three and Six, the highest frequencies are for SR + SO in LENGTH (Rectangles), and both SR + SO and G + SO in HEIGHT (Buildings), showing a relatively greater specificity than Groups One and Two in choice of adjective type.

The logically Inapplicable combinations of row b. in the relevant section of the tables for each concept all involve SO adjectives as the most frequent. In the LENGTH dimension, SO combines with SR most frequently in all groups, suggesting a richness of specialised vocabulary not found consistently for the other dimensions, but vocabulary which, on the other hand, could not be applied with complete logicality. For HEIGHT (Buildings) the most frequent Inapplicable type-combination is G + SO, followed by SR + SO in all groups, and also by SO + SO in Group One, showing that there were subjects here who used specialised dimensional adjectives without knowing how to apply them appropriately.

On the other pages (Persons, Trees, Bees), only the percentage frequencies for Groups One and Two need be considered. For HEIGHT (Persons), G + G combinations are most frequent in row a., with some G + SR and G + SO beginning to show in Group Two. On the other two pages, the Applicable class contains mainly G + SO combinations, although there is some difference between the two versions of the Bees page with G + G assuming importance on the "Small" version in place of G + SO on the "Big", thus indicating that order of presentation of the pictures in an array did have an effect.

In the Inapplicable class for the above pages we find G + SO combinations (e.g. big fat, small thin) in the HEIGHT dimension most frequently for both Persons and Trees, and in Group One also the occurrence of SR + SO (tall skinny) for Trees. The two groups again differ in type-combinations for SIZE (Bees), Group One having G + SO, and Group Two SR + SO exemplified by pairs like fat tall.

For the two pages representing CONFORMITY, we cannot fail to note the paucity of Inappropriate scores. However, there is no particular combination of adjective types making up the percentage frequencies in the Appropriate section. Neither of the two types N or AE in combination occurs here in large number. It is perhaps worth noting, though, that if doubling and trebling of adjectives indicates uncertainty over the meaning of the individual items, then the much lower percentages for Pairs and Multiples on the Faces page again confirms that subjects had less difficulty describing here than on the page containing Bottles.

4.4.1.2.b. Summary

A number of threads must be drawn together here, before continuing. There seem to be both qualitative and quantitative differences between the various groups represented in the data. The main points are the following:

Group One is characterised by relatively frequent use of the Superlative form in grading, together with Intermediary adjectives. The Superlative adjectives are mainly of Global type, and this is the only group where the mean frequency of Superlative exceeds 2 (26 occurrences among 11 subjects). Global adjectives are the dominant type, either alone or in combination with Specialised adjectives, for the physical dimensions. More than half the group appeared incapable of grading a divided array of up to seven instances of a concept; when it was divided they treated it for verbal description like two separate arrays.

Group Two is characterised by relative "verbosity", as shown by the high frequencies for Absolute adjectives and the virtual disappearance of Comparative adjectives for all dimensions studied. The low frequencies for Superlative made for difficulty in gauging the success with which instances of concepts were linked to meaning in verbal grading of arrays. The off-centre location of Intermediary adjectives - again a relatively infrequent category - did suggest that arrays were often treated as they had been in Group One, namely by "three-four" or "three-three" division, the difference being that the symptoms were now linguistically covert. The high frequency with which specialised adjectives were used in a logically odd or deviant way suggested that for many of the children in this group the words lacked complete semantic content.

Group Three had some features from both Groups One and Two, suggesting that: (a) the process of semantic development in this aspect of language use is rather slow; or (b) linguistic fossilisation may set in at an early stage in some areas of vocabulary; or (c) there were design faults in the questionnaire which prevented developmental patterns in the growth of vocabulary from revealing themselves. (Certainly, the fact that two of the adults in Group Six revealed many of the features found among the children sampled suggests support for both the second and third points). Apart from features in common with the other Groups, Group Three seemed to show signs of having mastered some aspects of the semantic content of the adjectives used, as instanced by the reduction in use of pairs of adjectives, compared with Group Two, and the relative increase in Appropriate as opposed to Inappropriate usage of the adjectives in some dimensions.

4.4.1.3 Verbal Organisation

4.4.1.3.a. Grading

For the three pages on which all groups are directly comparable, namely LENGTH (Rectangles) and HEIGHT (Buildings and Persons), the following table shows the percentage in each group who were obviously unable to grade the arrays verbally, those for whom there is some doubt, and those who apparently succeeded. The criteria used in deciding success were those described in the previous section. Failures are in the first column, marked x, and doubtful cases appear under ? in the second.

		X	?	Success
Rectangles	GP1:	48%	43%	9%
	GP2:	27%	42%	31%
	GP3:	17%	61%	22%
	GP6:	42%	11%	47%
Buildings:	GP1:	27%	36%	37%
	GP2:	12%	15%	73%
	GP3:	4%	56%	40%
	GP6:	21%	-	79%
Persons:	GP1:	19%	-	81%
	GP2:	8%	-	92%
	GP3:	9%	-	91%
	GP6:	5%	-	95%

LENGTH seemed to be the concept area where the lowest number of subjects were obviously successful, and HEIGHT (Persons) seemed to present the least difficulty. However, when two other factors are taken into account the appearance can be seen to be deceptive. The two factors are the choice of language, and the use of a norm on the third page. Language will be considered in the next sections, but here the point will be made that in the HEIGHT dimension for Persons, most children failed to use the information given implicitly by the figure of Norma(n) at the top of the page. Of the sixteen subjects in Group One who used Intermediary terms at all, for example, three described Person G as medium or middle-sized, and only three properly described Person D as such. The others chose Person B (See Appendix 2 for the relative sizes). The percentages in each group displaying such behaviour are quite similar. If the figures on the Persons page are listed in graded order of HEIGHT, with the tallest on the left, the percentage of subjects in each group and the positioning of their Intermediary adjectives is seen from the following table, predicative and attributive distinctions being here collapsed :

Persons:	E	D	B	G	C	F	A	Total %
GP1 %:	-	13	38	9	-	-	-	47
GP2 %:	-	4	40	16	8	-	-	44
GP3 %:	-	4	43	17	4	-	-	57
GP6 %:	-	-	53	5	-	-	-	53

The Total Percentage is less than the total of individual columns because some subjects (2, 4 and 1 in Groups One, Two and Three respectively) chose more than one instance for description by use of an Intermediary adjective. Only one subject in each of the child groups used Intermediary for D to the exclusion of all the other figures in the array, indicating that a totally symbolic mode of thought was the exception rather than the rule.

4.4.1.3.b. Polarity - and Adjective Types

The group frequencies for different types of adjective were examined with reference to the various instances on each page of the questionnaire.

This was in order to ascertain whether the mode frequency for any type of adjective occurred in a typical position in an array, and whether that position was the same for all groups. If it were, this would indicate a certain amount of inter-speaker agreement as to how parts of each dimension should be described, and this in turn could be interpreted as some sort of support for the "object-related norms" of Leech (Leech, 1974, pp. 108-110). The mode scores for Global and Specialised Relevant types of adjective on the three pages of the questionnaire completed by all subjects (Rectangles, Buildings and Persons) are presented in Table 4.4.1.3.B. below. The underlined scores are those for attributive function, and the non-underlined scores are those for predicative function, in each group. The concept instances have been listed in graded order for each page.

No figures are presented for the mode scores on the other pages: the Trees pages showed similar results in both cases, but as the Bees pages represented the undifferentiated concept of SIZE, only half the effect was observed, namely the occurrence of G mode scores at the less extended end of the ordered arrays; SR adjectives were few, and were supplanted by G type, but these were not so frequent at the extended as at the diminutive ends of the arrays.

What we have in all these cases, then, is a remarkable difference in adjective type used for the two extremes of the dimensions, both for HEIGHT and LENGTH (but to a lesser extend also for SIZE) concepts. Specialised adjectives with positive polarity appear in fair number at the extended end of the arrays of drawings, but their high frequency here is not matched by an equivalent frequency of Specialised adjectives with negative polarity at the diminutive ends. Instead it is Global adjectives with negative polarity that occur, and in some cases in larger frequencies. This suggests an interesting asymmetry in vocabulary development which

TABLE 4.4.1.3.B.

Situation of Mode Scores for Specialised (SR) and Global (G) adjective types on three main pages of the questionnaire. Absolute Category only.

Page: Rectangles Concept: LENGTH

		Longest --->						---> Shortest
Adjective:	GROUP	4	M	2	5	X	D	3
SR	1	13		7				
	2	10/6		6				
	3		14/9	9				
	6	6/6						
G	1							15/11
	2						8/12	
	3						12/8	
	6						6	5/6

Page: Buildings Concept: HEIGHT

		Tallest/Highest --->						---> Lowest
Adjective	GROUP	4	A	S	O	2	3	5
SR	1		10/8					
	2		10/9					
	3		14/5					
	6	11 (10)	12					
G	1						17	19
	2						10/9	
	3						16/11	
	6						8/9	8/9

Page: Persons Concept: HEIGHT

		Tallest --->						---> Shortest
Adjective:	GROUP	E	D	B	G	C	F	A
SR	1	3/2		3/2				
	2	5/7						
	3	6	12/6					
	6		7/9					
G	1						18	18/16
	2						14/15	
	3						16/14	16/14
	6						14/16	14/16

will be pursued in greater detail in the micro-analysis of section 4.4.2., where it will be shown that the above-mentioned phenomena have other correlates that lead to a hypothesis as to the stages in development of vocabulary for these concept areas (LENGTH and HEIGHT). The asymmetry noted above also relates in a clear way to the results of a second experiment, described in Chapter 5, designed to examine the development in comprehension of the Global adjectives big and small.

4.4.1.3.c. Polarity: Effects of Order of Presentation

The double versions of the Trees (HEIGHT) and Bees (SIZE) were used to determine how stable verbal grading was in the presence of reversed order of presentation of concept arrays. To do this, the "Small" version of each page-pair was imposed on the "Big" version for comparison of intra-subject judgements. The concept array was re-ordered properly in each case, and the odd seventh instance on each of the "Big" versions, which had no matching picture on the "Small" version, was ignored. Polarity was the only feature examined, and the comparison between the Big and Small versions of the pages was made, and noted according to whether the polarity of the adjectives had been conserved (C), reversed (R), or neutralised (NE). (The Predicative structure—blank was examined in each case, except where only an Attributive usage had occurred.) The totals were then calculated for each sub-group, and are presented in Table 4.4.1.3.C., which shows that for both pages reversals of polarity in description occurred most often near the centre of the arrays, and that the judgements given for the extremities were the most stable. The spread of instability can be seen to be largest in Group One, where it even took in the diminutive end of each array of drawings, but whereas in the older groups the span of instability is not so broad, it is more intense, as marked by an increasing proportion reversing or neutralising polarity near the centre; although the adults are seen to

TABLE 4.4.1.3.C.

Frequencies in each subgroup for conservation (C), reversal (R) and neutralisation (NE) of polarity when order of presentation for concept is reversed.

Page: Bees

Concept: SIZE

		Order: Largest			→							Smallest									
Sub-Group	No. of Ss.	1 F			2 C			3 M			4 L			(5)	6 O			7 A			
		C	R	NE	C	R	NE	C	R	NE	C	R	NE		C	R	NE	C	R	NE	
1A	15		-	-		1	5		5	2		-	3			2	5		1	-	
2A	12		-	-		3	2		4	4		-	3			1	4		-	-	
3A	11		-	-		-	2		7	2		3	4			-	3		-	-	
Total	38																				
Totals C:		38			25			14			25				23			37			
R:			-			4			16			3				3			1		
NE:				-			9			8			10				12			-	

Page: Trees

Concept: HEIGHT

		Order: Highest			→							Lowest									
Sub-Group	No. of Ss.	1 L			2 A			3 C			4 S			(5)	6 Y			7 P			
		C	R	NE	C	R	NE	C	R	NE	C	R	NE		C	R	NE	C	R	NE	
1B	16		-	-		6	2		4	4		6	1			12	-		1	-	
2B	13		-	1		3	2		3	1		6	2			2	4		-	2	
3B	10		-	1		5	2		3	2		5	2			4	1		-	1	
6	19		-	2		2	5		2	4		2	5			3	2		-	3	
Total	58																				
Totals C:		53			31			35			29				30			51			
R:			-			16			12			19				21			1		
NE:				4			11			11			10				7			6	

be much more consistent in their grading-polarity, suggesting that they mostly graded the array as a whole, whereas those who changed polarity graded each array as two separate parts, showing a less symbolic mode of thought.

4.4.1.3.d. Sex differences in Verbal Grading

There were noticeable sex differences observed for all three child groups in two aspects of vocabulary: the first concerns the use of SR (Specialised Relevant) type adjectives, and the second concerns the use of Intermediary category in verbal grading.

In the first case, an apparent developmental difference was noticed in disposition to choose one polarity or both polarities for representation by means of Absolute adjectives of the SR type. This difference can unfortunately only be illustrated by reference to the LENGTH concept, since the others present problems of dichotomisation which will be made clear in the micro-analysis section on vocabulary choice. (4.4.2.3)

Generally, the males in all groups appeared to be ahead of the females in the development of polarity in SR adjectives - in this case long and short - in active vocabulary. Over half of the males who used these adjectives used both, whereas only a quarter of the females did so. The following contingency table gives the frequencies in each group and the totals:

	MALE			FEMALE		
	GP1	GP2	GP3	GP1	GP2	GP3
long only	7	4	5	15	8	9
	Total: 16			Total: 32		
long-short	6	6	6	3	7	2
	Total: 18			Total: 12		
N =	13	10	11	18	15	11

($X^2 = 4.3096$, d.f. = 1, $p<.05$)

Only in one individual group is the sex difference significant: Group One, where Fisher's exact probability test gives $p \leq .05$.

As a compensation, the females used Intermediary adjectives much more frequently than the males, so that there is a perceptible difference between the sexes on choice vs. non-choice of Intermediary, as well as for the distinction of logically Applicable vs. Inapplicable usage. The first dichotomy is significant: $\chi^2 = 4.746$, d.f. = 1, $p < .05$. The frequencies in the second can be seen in the following table for the LENGTH dimension:

	MALE GP1	MALE GP2	MALE GP3	FEMALE GP1	FEMALE GP2	FEMALE GP3	
No Intermediary	5	10	8	5	7	4	
	Total: 23			Total: 16			
Intermediary:	5	1	0	9	5	5	Applicable
	Total: 6			Total: 19			
	5	0	3	4	3	3	Inapplicable
	Total: 8			Total: 10			
N =	15	11	11	18	15	12	

($\chi^2 = 7.528$, d.f. = 2, $p < .05$)

Similar biases are observed in the HEIGHT dimension for Buildings and People pages, but are not statistically significant.

4.4.1.3.e. Non-verbal Seriation and Verbal Grading

In Group One, where there had been enough failures on the sorting tasks to make the comparison worthwhile, males and females were compared to see whether choice of an SR-type adjective was related to success in non-verbal grading, success being here defined as choice of MU, MM, UM, or UU orderings in the sorting task. Of the 13 males who had used SR-type adjectives in describing LENGTH, only four had these orderings on the sorting task, and twelve of the eighteen females had them. Again there seemed to be a strong sex difference, but it is in fact not statistically significant ($X^2 = 2.59$).

However, it had been noted, during the analysis of the data, that many children seemed to be using the adjective long in a rather odd way in their comparisons: they used it not only on the LENGTH dimension but also on the HEIGHT dimensions, and when they did use it for the array of Rectangles it was quite often used apparently to refer to the dimension one would normally call WIDTH.

Looking only at those who used both long and short to describe the Rectangles array, it was observed that there was an apparent relationship between accurate (i.e. logically Applicable) employment of these adjectives for the horizontal extension, and the choice of MM ordering in the sorting task. Because of the small frequencies involved, all three groups were taken together; the contingency table is as follows:-

		dimensionality:	
		horizontal	non-horizontal
Sort Order:	MM	6	1
	any other	2	21

N = 30

(Fisher's exact $p < .005$)

The results here were not found elsewhere, but the reasons for this will perhaps presently become clear. We might note, however, that if the subjects using long and short with the proper dimensional orientation are the furthest along in the developmental process for use of these adjectives, then they were highly disposed to start grading at the diminutive rather than the extended end of the scale of LENGTH in this particular case, a disposition which, as shown in section 4.4.1.1.d, runs against the general trend, which is to grade from the extended end of the array. This might indicate the influence of one aspect of language development on cognition. Let us now move on to cover aspects of vocabulary development in more detail.

4.4.2. Micro-Level

In this section we shall be concerned with individual subjects' use of particular adjectives, where there are again found to be regularities which do not, however, show up clearly in frequency data of the form used until now. The frequency data are nevertheless necessary, since they could be used in combination with the results from this second type of analysis in order to produce an index of "availability strength" of particular adjective types, and even particular adjectives, in the different age-levels represented in the sample groups. For what follows, only the three pages of the questionnaire completed by everyone in the sample have been used. Similar phenomena to those about to be discussed were observed on other pages of the questionnaire, but these were not rigorously analysed. They will be referred to, where relevant, in what follows. The pages to be examined below are those which represented the concepts LENGTH and HEIGHT, and contained pictures of Rectangles, Buildings and Persons.

4.4.2.1. Intermediary Adjectives

On these three pages of the questionnaire, a difference was noted not only in the proportion of each group disposed to use Intermediary adjectives, but also in the adjectives preferred by each group. The preferred adjectives and the relative percentages are given below in Table 4.4.2.1.A. The percentage of users of Intermediary in each group is given on the right.

TABLE 4.4.2.1.A.

Page (Concept)	Group	Adjectives: medium	Middle/ inbetween	middle-size(d)	median	normal	(other)	%N
Rectangles (LENGTH)	1	33	18	46				70
	2	31		4		8	4	35
	3	39		9	9	9	4	48
	6	42	5	21			16	68
Buildings (HEIGHT)	1	24	6	39				58
	2	19				8	8	31
	3	35	9	4	17			61
	6	37		21		11	5	63
Persons (HEIGHT)	1	22	3	22		6		47
	2	32		4		8	4	44
	3	39		9	13	9	9	57
	6	21				37	11	53

It can be seen that there is some overlapping of percentages, since the right-hand side score is usually less than the row total. In Group One the overlap was between middle/inbetween and middle-size(d) and then between middle-size(d) and medium. Apart from one case in Group Three (where two people used middle) the adjectives (?) middle and inbetween do not occur outside Group One, and this suggests that they are among the first Intermediary terms to be learned and then discarded in favour of others. Middle-size(d) also has high currency in Group One, but not in the other child-groups. Its relative popularity in the adult group is in need of explanation, perhaps in the way of pointing out that there may be some instances of linguistic fossilisation here; the disadvantage of this explanation, however, is that it is not adequate to cover the absence of middle-sized from the Persons page, where it would surely be most expected to occur. In fact, of the four adults who used the adjective to describe Buildings (HEIGHT), two used normal and two used no Intermediary on the Persons page. A different grouping, again four adults (one from the first grouping) who used the adjective for Rectangles (LENGTH) chose normal and average and one chose nothing (The person appearing in both groupings used normal) for the Persons page. This pattern, of the adjective middle-sized being used by a number of people, but not consistently, is different from the verbal behaviour of the child subjects, who were found in Group One to use it consistently through the questionnaire if they used it uniquely on the first page.

There is a link, furthermore, between use of middle, middle-size(d) and inbetween with failure to grade the arrays as sevens in those cases where they were presented in the form of an initial triad and then the other instances. The adjectives all occurred in connection with the middle of the initial triad when it was properly ordered, and this is an observation which was true for both adults and children. Now, whereas there was no norm for judgement of "true" size on the Rectangles and Buildings pages, there was one on the Persons page. On the first two pages, the adults who graded the arrays graded them in the main as sevens, and those adults who used middle-sized in the way just described ended up with a set of adjectives appropriately ranged around what I have described as an "off-centre location" (4.4.1.2.a., 4.4.1.2.b) for the Intermediary. Many of the children in Group One who used the three adjectives discussed so far, but particularly middle-sized, did not end with a neatly arrayed set of adjectives, but with two arrays for each page, and sometimes even two middles! (An interesting note here is that the presence of an even number of further instances of the array discouraged the use of a second Intermediary to some extent, but where one did occur, inbetween was the preferred adjective in Group One).

What this seems to indicate is that middle-sized is developmentally

TABLE 4.4.2.1.B.

Types of Superlative used in Group 1, with associated Intermediary adjective, showing number of subjects using each (Group N = 33).

Page	Superlative Type used	N:	Adjectives and N of users middle/ in between	middle-size(d)	medium	None
Rectangles	Global	8	1	4	3	2
	SR	1	1	1	-	-
	G and SR	3	-	3	-	-
	Total	12	2	8	3	2
Buildings	Global	6	1	4	2	1
	SR	2	-	-	1	1
	G and SR	3	1	2	1	1
	Total	11	2	6	4	3
Persons	Global	11	1	3	3	7
	SR	1	-	-	-	1
	G and SR	3	-	1	1	1
	Total	15	1	4	4	9
GRAND TOTAL:			5	18	11	14

Total N = 20

rather early to appear, and provides the link between a primitive locational schema marked by middle and inbetween, and a more abstract one marked by words like medium, which are capable of being used where an array of more than three gradable instances of a concept is seriated, and also capable of broader application within the arrayed set, creating the possibility of a "broad middle" and also one which might be off-centre. The other evidence for the status of middle-sized consists in its connection with the use of Superlative category adjectives. In Group One, the majority of the users of Superlative were also users of middle-size(d). Table 4.4.2.1.B. shows this. A different group of Superlative users caused the large score appearing under None on the Persons page. They were using the Superlative as one of the grading methods for seven instances instead of the usual three. (This does reduce the strength of the argument somewhat, but throughout the data there are overlaps of this kind, as linguistic development is a continuum rather than a set of discrete stages, although for analysis one may wish to treat the data as if they did break into discrete stages.)

There is no such strong connection between Intermediary terms (particularly middle-sized) and Superlative, elsewhere in the data, and this raises the question of whether use of the Superlative is itself the mark of an early stage of cognitive development, which disappears almost totally while Absolute adjectives develop and take over many of the functions of the Superlative, and then reappears later in a more integrated verbal schema for grading. We shall examine possible evidence for this hypothesis in the next section.

4.4.2.2. Types of Adjective for Superlative and Comparative

In order to find out whether use of the Superlative characterised an early stage of language development, the adjectives used in the Superlative and Comparative categories were examined for type and polarity.

For the sake of inter-group comparison, the number of subjects using each type of adjective is given in Tables 4.4.2.2. below as a percentage. For each page, the Global adjectives were the same ones, and were as follows: polar positive adjectives were bigger (GC+) and biggest/largest (GS+); and polar negative adjectives were tichier/weer/tinier/smaller (GC-) and tichiest/weest/tiniest/smallest (GS-). Then for each dimension the specialised adjectives varied. Positive polarity items for the concepts were as follows: longer (SC+) and longest (SS+) for LENGTH (Rectangles); and taller/(higher) (SC+) and tallest (SS+) for HEIGHT. In negative polarity, the specialised adjectives were as follows: shorter (SC-) and shortest (SS-) for LENGTH (Rectangles); then lower and lowest for HEIGHT (Buildings), neither of which appeared in the data; and finally shorter (SC-) and shortest (SS-) for HEIGHT (Persons), which also appeared on the Buildings page![5]

Table 4.4.2.2.A. shows the percentage of subjects in each group using the above adjectives; beneath the rows for polarity is a row showing the percentage using both polarities for a particular category, and then below that the Total percentage of subjects involved in using the category. The final two rows of each grid show, firstly the total percentage of subjects using one or both categories (Comparative and Superlative), and then the percentage of subjects using any type of adjective in these categories. This allows one to see, as one compares percentages from one row with the totals of those in the row above, what degree of type-and-category overlap there is.

Except in the adult group, there are generally about twice as many subjects using Global as using Specialised Superlative forms: with the adults, Specialised adjectives are more common, showing their relatively greater language development. We may also note that Global adjectives generally occur at about twice the rate that Specialised adjectives do,

TABLE 4.4.2.2.A.

Percentages of each group involved in using Global (G) and Specialised (S_1) types of adjective in Comparative and Superlative categories (C and S), showing distribution over positive (+) and negative (-) polarity.

1. LENGTH (Rectangles) 2. HEIGHT (Buildings) 3. HEIGHT (Persons)

Group 1

	1. LENGTH (Rectangles)				2. HEIGHT (Buildings)				3. HEIGHT (Persons)			
	GC	GS	S_1C	S_1S	GC	GS	S_1C	S_1S	GC	GS	S_1C	S_1S
+	12	24	3	12	-	18	3	15	28	38	-	13
-	6	27	3	-	9	24	-	-	19	22	3	3
Both	-	18	-	-	-	15	-	-	6	15	-	3
Total	18	33	6	12	9	27	3	15	42	45	3	13
C + S	36%		15%		30%		15%		58%		13%	
G + S_1 (N=)	42%				36%				60%			

Group 2

	1. LENGTH (Rectangles)				2. HEIGHT (Buildings)				3. HEIGHT (Persons)			
	GC	GS	S_1C	S_1S	GC	GS	S_1C	S_1S	GC	GS	S_1C	S_1S
+	4	-	4	15	-	4	4	-	8	4	-	4
-	11	15	-	4	4	11	-	-	4	4	4	-
Both	4	-	-	-	-	4	-	-	-	4	-	-
Total	11	15	4	19	4	11	4	-	12	4	4	4
C + S	23%		23%		15%		4%		16%		8%	
G + S_1 (N=)	38%				19%				20%			

Group 3

	1. LENGTH (Rectangles)				2. HEIGHT (Buildings)				3. HEIGHT (Persons)			
	GC	GS	S_1C	S_1S	GC	GS	S_1C	S_1S	GC	GS	S_1C	S_1S
+	4	4	4	-	4	-	4	-	30	4	9	4
-	-	9	9	-	17	4	-	-	17	13	-	-
Both	-	-	-	-	4	-	-	-	4	-	-	-
Total	4	13	13	-	22	4	4	-	43	17	9	4
C + S	13%		13%		26%		4%		47%		13%	
G + S_1 (N=)	17%				30%				52%			

Group 6

	1. LENGTH (Rectangles)				2. HEIGHT (Buildings)				3. HEIGHT (Persons)			
	GC	GS	S_1C	S_1S	GC	GS	S_1C	S_1S	GC	GS	S_1C	S_1S
+	26	21	26	21	11	-	32	26	26	5	11	11
-	21	16	5	5	21	-	-	-	26	-	11	5
Both	5	11	-	5	-	-	-	-	11	-	5	5
Total	42	26	32	21	32	-	32	26	42	5	16	11
C + S	53%		68%		32%		47%		42%		21%	
G + S_1 (N=)	84%				63%				53%			

except for LENGTH in Groups Two and Three, which suggests that perhaps this is the age where long (and short) really become well defined; there is support for this suggestion in the way the Absolute forms of Global and Specialised adjectives are related, as will be seen in the next section.

A comparison of the relative percentages at the foot of each grid in Table 4.4.2.2.A. shows that there is a fair amount of overlap of type-and-category in Groups One and Six, and relatively little in Groups Two and Three, demonstrating that different people used the two types and categories of adjective in these latter groups. There is a large amount of overlapping, both of category and type, in Group One's use of adjectives, but in the adult group this double overlap appears appreciable only for the LENGTH concept. However, if the data that provided Table 4.4.2.2.A are re-organised in such a way that the category-and-type of adjective combinations appear in an interaction matrix showing the percentages of subjects in Groups One and Six who used more than one polarity, category, and/or type of adjective, we can see that the differences are rather more peculiar. Table 4.4.2.2.B. presents such an interaction matrix. The boxed diagonal contains the percentages of subjects associated with use of a particular adjective located on the left-hand side. The row and column where the boxed percentage is situated show the combinations that occurred with other adjectives, again as percentages matched with those of the diagonal. For each quadrant, a percentage of overlap was calculated by representing the overlaps or interactions that did occur among adjectives as a percentage of the total possible number that could have occurred given the scores on the diagonal. These quadrant percentages give: in the A quadrant, the within-Global category overlap; in the B quadrant, the Global by Specialised category overlap; and in the D quadrant, the within-Specialised category overlap. These percentages show no overlap as zero, and total overlap, with the same persons using every category in a quadrant, as 100. On the right of each matrix, the Interaction index shows which category-types were combined most often with others. The percentage is calculated by summing the column and row scores for each adjective and dividing the sum by the potential total of combinations, given the other scores on the diagonal.[6]

It can be seen that the Interaction Index gives quite high overlap percentages in some cases for Group One, particularly for GS+ and GS- (biggest and smallest - plus synonyms), which have the highest scores on the diagonal, too. Among the Specialised adjectives, it is SS+ (i.e. longest and tallest respectively) that is found most often and combines with G type adjectives in all three concepts. The comparative bigger is frequent only for the second HEIGHT concept, but had relatively low interaction with other adjectives, and then mainly of G type; which reflects properly the fact that this form was used by different subjects from those using the others.

For the adults in Group Six, the Interaction Index is generally lower all round than in Group One, showing the relative independence of each form used, and no form consistently dominant in preference. In LENGTH, everyone who used GS+ (biggest) also used GC+ (bigger), which, along with smallest, were the most-overlapping adjectives, smallest interacting also with positive-polarity S adjectives longer and longest. For the HEIGHT dimensions, it is GC- (smaller) which interacts most with S-type adjectives of positive polarity (taller and tallest). The last significant fact to note is that shortest (SS-) interacts in the second dimension of HEIGHT totally within-S but not at all outside, and judging by two other grids where it appears seems to be a totally within-S phenomenon; i.e. it does not co-occur with smaller , for example.

In comparing the four groups of subjects, and particularly the extremes as represented by Groups One and Six, we see that there appears

TABLE 4.4.2.2.B.

Interaction index of Global (G) and Specialised (S) types of adjective with positive (+) and negative (-) polarity in Comparative (C) and Superlative (S) categories for the concepts of LENGTH and HEIGHT.

Group One 100% = N = 33.

LENGTH (Rectangles)

%	GC+	GC-	GS+	GS-	SC+	SC-	SS+	SS-	Interaction Index %
GC+	12								25
GC-	-	6		50%			41%		40
GS+	3	6	24						55
GS-	6	-	18	27					60
SC+	-	3	-	3	3		33%		50
SC-	-	3	3	-	-	3			33
SS+	3	-	3	9	3	-	12		38
SS-	-	-	-	-	-	-	-	0	-

HEIGHT (Buildings)

%	GC+	GC-	GS+	GS-	SC+	SC-	SS+	SS-	Interaction Index %
GC+	0			67%			31%		
GC-	-	9							30
GS+	-	3	18						60
GS-	-	6	15	24					60
SC+	-	-	-	-	3		100%		25
SC-	-	-	-	-	-	0			-
SS+	-	-	9	6	3	-	15		43
SS-	-	-	-	-	-	-	-	0	-

HEIGHT (Persons)

%	GC+	GC-	GS+	GS-	SC+	SC-	SS+	SS-	Interaction Index %
GC+	28			49%			23%		39
GC-	6	19							30
GS+	19	13	38						58
GS-	6	3	16	22					41
SC+	-	-	-	-	0		100%		-
SC-	-	-	-	-	-	3			33
SS+	3	-	3	9	-	3	13		36
SS-	-	-	-	-	-	3	3	3	33

TABLE 4.4.2.2.B (cont'd)

Group Six 100% = N = 19

LENGTH (Rectangles)

%	GC+	GC-	GS+	GS-	SC+	SC-	SS+	SS-	Interaction Index %
GC+	26			47%				18%	37
GC-	5	21							24
GS+	16	5	16						42
GS-	11	5	11	21					39
SC+	5	11	-	5	26			57%	28
SC-	-	-	-	-	-	5			29
SS+	5	-	-	11	11	5	21		34
SS-	-	-	-	-	-	5	5	5	29

HEIGHT (Buildings)

%	GC+	GC-	GS+	GS-	SC+	SC-	SS+	SS-	Interaction Index %
GC+	11			0%				33%	15
GC-	-	21							30
GS+	-	-	0						-
GS-	-	-	-	0					-
SC+	5	11	-	-	32			42%	47
SC-	-	-	-	-	-	0			-
SS+	-	5	-	-	11	-	26		28
SS-	-	-	-	-	-	-	-	0	-

HEIGHT (Persons)

%	GC+	GC-	GS+	GS-	SC+	SC-	SS+	SS-	Interaction Index %
GC+	26			44%				10%	23
GC-	11	26							30
GS+	5	-	5						17
GS-	-	-	-	0					
SC+	-	-	-	-	11			63%	28
SC-	-	5	-	-	5	11			37
SS+	-	5	-	-	5	5	11		37
SS-	-	-	-	-	5	5	5	5	50

to be a gradual reduction with age in the frequency of the category Global Superlative (biggest) for all three dimensional concepts (although its reappearance in Group Six for the LENGTH concept has to be explained; see 4.4.1.2.a (ii) in this connection). It is especially clear from Table 4.4.2.2.A. that its initial dominance in Group One is not repeated elsewhere, as in the older groups it gives way to comparatives and then to S-type adjectives. There is thus both a category-shift and a type-shift evident in the table.

4.4.2.3. Types of Absolute Adjective

4.4.2.3.1. Long, short, tall and company

Mention has already been made (4.4.1.2.a., 4.4.1.3.b., 4.4.1.3.e) of an observation which has strong implications, namely that (if the data are not freakishly awry) long and tall[7] appear at one point in development to be used in undifferentiated fashion for some kinds of referent.

Table 4.4.2.3.1.A. displays the percentages of subjects in each of the sample groups who used the above adjectives, short and low, and big, small and synonyms, on the three main pages of the questionnaire for LENGTH and HEIGHT. If it is reasonable to assume that the difference in age between groups also represents a developmental difference - gross though it may be - in the use of language, then the following statements derived from the data presented in the table make some kind of sense:

(a) Over 90% of the children in all three groups used long in connection with LENGTH. However, simultaneously there were some people using tall for the same concept (including adults).

(b) Though tall is known by the majority, even in the youngest group, it does not appear so frequently in association with HEIGHT as long does for LENGTH: it might be less familiar.

(c) Short is used less often in connection with LENGTH than in

TABLE 4.4.2.3.1.A.

Percentages of each group involved in using Global (G) and Specialised Relevant (SR) or Specialised Other (SO) types of adjective in Absolute category, showing distribution over positive (+) and negative (-) polarity separately and in combination.

1. LENGTH (Rectangles)

SR = long-short
SO = tall/high-low (short?)

2. HEIGHT (Buildings)

SR = tall/high-low
SO = long-short

3. HEIGHT (Persons)

SR = tall-short
SO = long

Group 1

	1. G	1. SR	1. SO	2. G	2. SR	2. SO	3. G	3. SR	3. SO
+	79	94	27	58	76	48	63	22	6
-	100	27	(12?)	100	--	48	94	19	-
Both	79	27	(12?)	58	--	21	63	3	-
*Total N =	100	94	27	100	76	76	94	38	6

Group 2

	1. G	1. SR	1. SO	2. G	2. SR	2. SO	3. G	3. SR	3. SO
+	50	96	42	38	88	54	64	60	16
-	85	54	(19?)	88	--	46	100	20	--
Both	46	50	(19?)	35	--	27	64	16	--
*Total N =	88	100	42	92	88	73	100	64	16

Group 3

	1. G	1. SR	1. SO	2. G	2. SR	2. SO	3. G	3. SR	3. SO
+	65	96	35	39	87	17	65	74	--
-	83	39	4	100	--	39	96	13	--
Both	52	35	4	39	--	13	61	13	--
*Total N =	96	100	35	100	87	43	100	74	--

Group 6

	1. G	1. SR	1. SO	2. G	2. SR	2. SO	3. G	3. SR	3. SO
+	26	84	42	32	89	--	68	53	--
-	74	37	--	89	21	32	94	32	--
Both	26	37	--	32	21	--	63	21	--
*Total N =	74	84	42	89	89	32	100	63	--

*Total N signifies the percentage of each group accounted for by the use of a particular type of adjective.

connection with HEIGHT, and even stands instead of _low_ in the children's descriptions of _Buildings_. For the concept LENGTH, its frequency appears to increase (and peak) at the age represented in Group Two.

(d) _Long_ is (mistakenly) associated with HEIGHT in the first two groups more often than _tall_ is with LENGTH, whereas in the third child group, and also amongst the adults, the reverse tendency can be seen.

(e) Associated with (d), _long_ is extended by some members of Groups One and Two even to HEIGHT for _Persons_.

(f) The use of Global adjectives (_big-small_ and synonyms) appears to gradually decrease with age, but noticeably only at the _positive polar_ end of the scale, thus creating asymmetric matching of adjective types in opposition.[8] Two kinds of grading were found involving Specialised adjectives: the first opposed positive and negative polarity, but the second opposed a positive Specialised with a negative Global adjective - usually _small_ - rather than vice-versa.

(g) Despite the fact that the _Persons_ page was completed last-but-one on the questionnaire, there are lower percentages of subjects using _tall-short_ on this aspect of HEIGHT than there are on the _Buildings_ page. But this may be connected with the fact that there were alternatives such as _gigantic_ and _dwarfish_ available to describe the Persons, and these were classed as Global types of adjective.

(h) In the HEIGHT data, _low_ does not occur as a polar opposite of _tall/high_ until Group Six, so one may conclude that it is the last Specialised adjective of this set to be actively mastered. Its appearance once elsewhere, in Group Three, where it was used for LENGTH instead of HEIGHT, suggests that it is beginning to be activated around the age of eleven.

Clearly, these disparate facts suggest a developmental sequence of sorts, and the pattern of development can be seen even more clearly when the adjective combinations used by each subject are taken into account. In Table 4.4.2.3.1.B., the data for LENGTH (Rectangles) and HEIGHT (Buildings) are presented to show these combinations. A fairly clear pattern emerges, particularly if the adjective combinations for the HEIGHT dimension are banded in the way suggested by the brackets and scores at or below 5% are masked[9], as has been done in Table 4.4.2.3.1.C. following.

It is noticeable that for LENGTH, short and tall occur neither singly nor in paired combination, although they combine in a number of ways with long and high, and there is only one single case where long is not used at all (in the combination of short + tall + high, once in Group Three). On the other hand, in the dimension of HEIGHT, short and long are used singly and in paired combination by some subjects, showing that where a specialised dimensional term is lacking it is in the vertical rather than the horizontal plane: in these cases the term used to describe extension in the horizontal plane does double duty in the vertical, too.

Whereas the combined column totals for long and long + short are more or less constant across the child groups, the distribution is not, since there is a strong shift in Group Two into pairing long with short. Reading across the table, we find that for the same adjectives on the HEIGHT dimension the scores in Groups One and Two are about equally high in combinations with tall. However, the specific combination short + tall is used by a third of Group One, and a strong individual match is found in the LENGTH columns containing long + (short) + tall. What this seems to indicate is that tall is not at first properly understood, but is attached to long on the basis of their being both opposed by short, which is an obvious candidate for "go-between". This arrival of tall, however, destabilises the semantic system, and gives rise to a confusion of vertical with horizontal extension until the problem is solved, presumably

TABLE 4.4.2.3.1.B.

Contingency table of percentage frequencies for Specialised Relevant (SR) type adjective distribution in the groups sampled, for the concepts HEIGHT (Buildings) by LENGTH (Rectangles). Figures are rounded percentages. ∅ denotes Global adjectives used instead of Specialised.

Group 1

LENGTH

	Adjectives	Long	Long + short	Long + short + high	Long + high	Long + short + tall	Long + tall	Short + tall + high	∅	Total Percentage
	∅	3	-	-	-	-	3	-	3	9
	Short	-	-	-	-	-	-	-	-	-
	Long	12	-	-	-	-	-	-	-	12
	Long + Short	-	3	-	-	-	-	-	-	3
HEIGHT	Long + short + tall	6	3	-	-	6	3	-	-	18
	Long + tall	12	3	-	-	-	-	-	-	15
	short + tall	9	3	-	-	9	6	-	3	30
	Tall	12	-	-	-	-	-	-	-	12
	Tall + high									-
	High									-
	Tall + high + short									-
	Tall + low + short									-
	Tall + high + low + short									-
	Tall + low									-
	Total % :	54	12	-	-	15	12	-	6	99%

TABLE 4.4.2.3.1.B. (cont'd)

Group 2

LENGTH

HEIGHT

Adjectives	Long	Long + short	Long + short + high	Long + high	Long + short + tall	Long + tall	Short + tall + high	ø	Total Percentage
ø	4	-	-	-	-	-	-	-	4
Short	-	-	-	-	-	-	--	-	-
Long	4	-	-	-	-	-	-	-	4
Long + short	-	4	-	-	-	-	-	-	4
Long + short + tall	-	8	-	-	12	4	-	-	24
Long + tall	8	4	-	-	4	8	-	-	24
Short + tall	-	12	-	-	-	-	-	-	12
Tall	8	-	-	-	-	8	-	-	16
Tall + high	-	4	-	-	-	4	-	-	8
High	-	-	-	-	-	-	-	-	-
Tall + high + short	-	4	-	-	-	-	-	-	4
Tall + low + short									-
Tall + high + low + short									-
Tall + low									-
Total %:	24	36	-	-	16	24	-	-	100%

TABLE 4.4.2.3.1.B. (cont'd)

Group 3

LENGTH

HEIGHT

Adjectives	Long	Long + short	Long + short + high	Long + high	Long + short + tall	Long + tall	Short + tall + high	∅	Total Percentage
∅	-	-	-	-	-	-	-	-	
Short	-	-	-	-	-	-	-	-	
Long	-	4	-	-	-	-	-	-	4
Long + short	4	4	-	-	-	-	-	-	8
Long - short + tall	-	-	-	-	4	-	-	-	4
Long + tall	-	-	-	-	-	-	-	-	-
Short + tall	-	4	-	-	4	4	-	-	12
Tall	28	8	-	-	-	8	-	-	44
Tall + high	4	-	-	-	-	-	-	-	4
High	-	-	-	-	-	4	-	-	4
Tall + high + short	4	4	-	-	-	8	4	-	20
Tall + low + short									-
Tall + high + low + short									-
Tall + low									-
Total %	40	24	-	-	8	24	4	-	100%

TABLE 4.4.2.3.1.B. (cont'd)

Group 6.

LENGTH

	Adjectives	Long	Long + short	Long + short + high	Long + high	Long + short + tall	Long + tall	Short + tall + high	ø	Total Percentage
	ø	-	5	-	-	-	-	-	5	10
	Short	-	-	-	5	-	-	-	-	5
	Long	-	-	-	-	-	-	-	-	-
	Long + Short									-
HEIGHT	Long + short + tall									-
	Long + tall									-
	Short + tall	-	5	-	-	5	5	-	-	15
	Tall	20	5	-	-	-	-	-	10	35
	Tall + high	5	5	5	-	-	-	-	5	20
	High	-	-	-	-	-	-	-	-	-
	Tall + high + short	-	-	-	-	-	-	-	-	-
	Tall + low + short	-	-	-	-	-	5	-	-	5
	Tall + high + low + short	-	-	-	-	5	-	-	-	5
	Tall + low	-	-	-	5	-	-	-	-	5
	Total %	25	20	5	10	10	10	-	20	100%

TABLE 4.4.2.3.1.C.

Simplified presentation of locations of percentage group frequencies for choice of Specialised Relevant (SR) adjectives. Where frequencies exceed 5%, the group number (1, 2, 3 or 6) is entered in a particular cell, and is coded for size of percentage as described in the key at the foot of the page. The slash separating adjectives represents a choice of one or both from a pair.

LENGTH

HEIGHT

Adjectives	Long	Long + short	Long + short + high	Long + high	Long + short + tall	Long + tall	Short + tall + high	∅
∅								
Long	$\underline{1}$							
Short								
Long + (short/tall)	$\underline{1}$* 2	1 $\underline{2}$*			1 $\underline{2}$*	$\underline{2}$		
Short + tall	1	$\underline{2}$			1			
Tall/high	$\underline{1}$ 2 3X* 6x*	3 6				$\underline{2}$ $\underline{3}$		$\underline{6}$
Tall + short + (high/low)						3		
Tall + low								

Key: n = 6-10%
$\underline{n}$ = 11-20%
nx = 21-30%
nX = 31-40%

* = mode percentage for a group.

by successful differentiation.

Reading the row totals in the table, we find that use of tall and/or high, without short, increases in frequency with each succeeding age-group, and passes 50% by the age represented in Group Three. High makes its first appearance at Group Two level, and is used in combination with tall, suggesting that it might go through a similar process of differentiation to the latter, but without the problem of spatial orientation. Finally, low seems to develop in the active vocabulary, but in none of the data does it oppose high alone: it either appears together with short or it opposes tall alone.

Beyond these observations, one cannot fail to note that the top row and right-hand column of Table 4.4.2.3.1.B. show that with the exception of Group Three there were subjects in all groups who used no Specialised adjectives whatsoever, restricting themselves rather to the use of Global type. In two cases (one in Group One, one in Group Six) this was so for both dimensions. It is disconcerting to note that 25% of the adult group (i.e. five subjects) are spaced around this edge of the table: this suggests the presence of linguistic reticence, to say the least. It might not be insignificant that they were all female subjects. However, there is quite an amount of scatter, indicating the lack of any uniform preferences for particular adjective combinations across dimensions.

From the simplified percentage representation of group frequencies in Table 4.4.2.3.1.C., which includes any choice of combination made by two or more subjects in a group, two basic developmental tendencies (taking gross age differences as the developmental yardstick) can be seen: reduction in diversity of combinations of adjectives, and increase in frequency of choice of the restricted combinations. From Group One to Group Six the diversity factor is reduced 7 : 7 : 4 : 3, and the increase in amount of intra-group agreement on particular combinations of adjectives, as instanced by the mode score for each group, goes: 18% : 16% : 32% : 25%. There is also a gradual displacement of mode scores from one cell to another on the HEIGHT dimension, as the meanings of the various adjectives undergo development.

4.4.2.3.2. Other adjectives

Reference back to Table 4.4.2.3.1.A. in the last section shows the adults apparently inferior to the children on Specialised adjectives for LENGTH in two respects: firstly, fewer adults used long than did children; and secondly, the adults using tall/high for LENGTH were as numerous as, or more numerous than, the children. How can this be explained? We shall leave the main bones for the Discussion section following, but it seems important to note here that the misused adjectives were used by the adults only for the fifth Rectangle on the page[10], whereas the children generally misapplied the adjectives elsewhere on the page, too.

The second point concerns other dimensional adjectives which were elicited "unexpectedly" in large numbers from all four groups. Amongst these was the adjective pair wide-narrow, which made a triple in association with broad. There were three adults who expressed LENGTH difference by exclusive use of these adjectives. For them the more extended dimension of the rectangles, orientated as it was from left-to-right, meant WIDTH rather than LENGTH, so that WIDTH became a primary rather than a secondary dimensional specification. Such a phenomenon is lacking in the child data, where wide and narrow were used together with long, short (and tall!) and numerous other adjectives in the manner of verbal buckshot.

The percentage frequencies of subjects using these secondary adjectives in each Group, for the concepts LENGTH and HEIGHT (Buildings) are presented in Table 4.4.2.3.2. below. The adjectives have been clustered as far as possible on a notional basis, so that the second row of the table for each group can show where adjectives of opposing polarity were used by the same subjects. The third row gives the total percentage of the group using combinations from that particular set of adjectives.

The table shows quite clearly that wide was used by the adults only in association with the LENGTH concept, and not at all for HEIGHT, whereas the children used it for both concepts. Narrow was used in both dimensions, though the frequency of adult choice halved as they changed dimensions, from LENGTH to HEIGHT.

In the cluster of adjectives centring on the thick-thin-fat opposition, which is normally associated with three-dimensional objects - one might even say animate objects, if thick is omitted - we see that thin is the dominant adjective in both dimensions, though frequency decreases for HEIGHT. While the data were being cast in this table, it was noted that fat appeared to be exclusively dependent for its occurrence in Groups Two and Three on the prior presence in the array of thin or a synonym (skinny, slim). Thin, on the other hand, always occurred in the environment of long or tall in a pair of sentence blanks, a fact which, as I shall attempt to show in the Discussion section following, suggests a partial structure and a developmental sequence that takes in these words.

The other adjectives listed in Table 4.4.2.3.2. were noted firstly because of their frequency in more than one group and secondly because of their relatedness to adjectives more normally used to describe physical dimensions.

For rectangular referents (Buildings and Rectangles), square seems to function in the same way as small or short or low in the gradability system. Straight was used in place of long or tall, while flat was used for the most diminutive instance on the Buildings page, suggesting an

TABLE 4.4.2.3.2.

Percentage of each group using Other Specialised (SO) types of adjective in the Absolute Category, showing distribution over positive and negative polarity where relevant.

1. LENGTH. (Rectangles)

	broad (+)	narrow (-)	wide (+)	thick (+)	thin (-)	fat (+)	stout/plump (+)*	skinny/slim (-)**	square	straight	vertical	horizontal
Group 1:	3	12	27	3	30	33	-	12	12	6	-	-
+/-	3	3				18	6					
Total N:		36%				51%			12 %	6%		
Group 2:	4	23	42	-	65	23	19	8	12	12	4	8
=/-	4	8				16	12	8				4
Total N:		56%				77%			12%	12%		8%
Group 3:	9	13	22	4	65	26	13	17	34	4	9	9
+/-	4	-		4		17	4	13				18
Total N:		39%				79%			34%	4%		18%
Group 6:	11	47	37	-	58	-	-	-	11		5	5
+/-	11	32										5
Total N:		63%				58%			11%			5%

* Also includes: chubby, tubby

** Also includes: slender, sleek

TABLE 4.4.2.3.2. (cont'd)

2. HEIGHT (Buildings).

	broad (+)	narrow (-)	wide (+)	thick (+)	thin (-)	fat (+)	stout/plump (+)*	skinny/slim (-)**	square	straight	vertical	horizontal	flat
Group 1:	3	9	15	-	45	33	-	15	24	-	-	-	6
+/-	3	-			24	9							
Total N:	24%			57%					24%				6%
Group 2:	8	15	27	-	46	35	12	12	35	12	4	-	8
+/-	4	4			19	8	4						
Total N:	39%			69%					35%	12%	4%		8%
Group 3:	13	9	13	9	43	34	13	17	39	17	9	4	12
+/-	4	-		9	20	-	8				4		
Total N:	30%			69%					39%	17%	9%		12%
Group 6:	-	21	-	-	21	-	-	-	27	-	-	-	-
+/-													
Total N:	21%			21%					27%				

* Also includes chubby, tubby and stubby

** Also: slender, sleek

affinity with low.

Significantly the adjective pair vertical-horizontal did not occur before Group Two, and this is where the process of differentiation of tall from long seemed to be under way.

This peculiar confusion between adjectives normally associated with shape or texture or orientation and those which appropriately describe dimensions of physical size has a small number of bizarre consequences, as evidenced by the following examples from the data: (It's) long-shaped; (It's) equal-lined; small at each end; all sized; medium-shaped; which show that for some of the children in this age-band, size and shape may well be inextricably intertwined, at least when judging some categories of object.

Some children - it is unfortunately impossible to say how many exactly - seemed, to judge from the vocabulary which they assembled in individual sentence blanks of the questionnaire, to be using what one can only characterize as "inherent" verbal grading, where each instance in an array was described in isolation as if it were unique. This was particularly so for the rectangular entities (Rectangles and Buildings), where the two dimensions of each instance seemed to be compared and the proportional relation used to provide an adjective, so that for example the most diminutive (i.e. the shortest) Rectangle could be described as tall or high when it quite clearly would not be if a "relative" type of grading was used. That sort of behaviour led to semantic inconsistency when the array is viewed as a whole. There is a link here to the dominance of Shape and Orientation adjectives observed (4.4.1.2.a) in the questionnaire pages relating to the CONFORMITY concept, since the two phenomena could be aspects of the same perceptual process.

4.5. Discussion.

The results of the present study offer a number of insights into the relationships between perception, cognition and language, as well as suggesting some hitherto unsuspected developments in the vocabulary of children between the ages of 8;01 and 11;02 years.

To begin with the very general aspects of the link between perception and cognitive processing: the fact that quite a few children in each group did not succeed in ordering the sets of drawings at the top of each page of the questionnaire (4.4.1.1.a.) is an indication that in some cases the ability to organise and structure entities gradably may be very slow in developing. One might argue that the repeated failure of two women in the same tasks indicates rather that there may have been a lack of clarity in the instructions given to the subjects performing the ordering tasks, but this need not be so, since there are well-documented examples of adults failing on experimental logical tasks of which they were thought to be capable, and it is by no means certain that every adult achieves an optimal level of cognitive skill (see, for example, Henle, 1962; and the conclusions reached in Shayer, Küchemann and Wylam, 1976.). In fact in this case the two women also show up in the experiment described in Chapter 5, where they are also remarkable for relatively 'primitive' categorising behaviour that leads them into category overlap and category contiguity, which are found to be characteristics of the younger children's groups.

What these subjects failed to do is to manipulate the triadic arrays symbolically; since the pictures could not be picked up and moved about or arranged in order physically, it was necessary to build up some internal representation of what the order should be, and then list the identifying letters of the picture-sets accordingly. However, the failure need not have been one of representation, since subjects may have just failed to perceive a difference between the pictures, and thus did not venture beyond the act of classification to that of grading. But in view of the instructions given to subjects, this last explanation seems unlikely, and the failure probably was one of symbolic ordering, similar to though not identical with the kinds of failure that had been observed in the pilot scheme (where intuitive was followed by operational serialisation). This behaviour is characteristic of a pre-symbolic, i.e. predominantly iconic mode of thinking, as defined by Bruner (1968), and if we generalise from the present data, it appears to decline in salience after the age of approximately 10;02 years - at least for the majority of subjects - and this accords well with Bruner's suggestion of a range of from six to twelve years of age for the duration of the transition from iconic to symbolic (or representational)-dominated patterns of cognitive organisation. Furthermore, the finding that there were proportionately more subjects failing to sort in Group 2 than in Group 1, although Group 2 used fewer Global and more Specialised adjectives - and were thus linguistically more advanced - is also similar to findings reported elsewhere, in Bruner and Kenney (1966), who found "confounded usage" to be correlated with poor performance on reproduction of a transposed 3x3 matrix (see section 2.3.3.). The language factor was quite general for children between five and seven years of age.

However, the present results might be thought to differ in the indication of dependence. In his discussion of the Bruner and Kenney (1966) findings, Bruner takes the view that language is the determining factor in cognitive performance : "...improvement in language should aid this type of problem solving" (Bruner, 1964:389). But in the present study the results lead to the conclusion that in the grading task cognition is the determinant of language, since while the majority of failures to grade are linked primarily to confounded usage and secondarily to global usage, there are also many subjects whose usage was confounded (in the sense that they used Specialised adjectives for positive pole and Global adjectives for negative pole judgements) who were nevertheless able to grade the pictures appropriately for non-verbal sorting and/or verbal description. It may be objected that this is an artefact of the analysis, since short was not accepted as a relevant antonym of tall and high when buildings and trees were described, and nor were narrow and wide an acceptable pairing in describing Rectangles; perhaps if these were treated as acceptable, then the frequency of confounded usage would be decreased and the results would be similar to those of Bruner and Kenney (1966). This objection is not valid, since there are some subjects who did not use these antonyms either, and whose "confounded usage" did not prevent them from grading. Such a result is compatible with the conclusion reached by other researchers (Sinclair-de-Zwart, 1967; Bryant, 1974; Ehri, 1976) that language lags behind cognitive development, although it may be useful in helping the child to focus on the nature of the cognitive problems he has to solve (Riley and Trabasso, 1974; Schlesinger, 1974).

A second reason for interpreting the present results as showing that cognitive development leads language development is the change in ordering preference found among the children but not among the adults between the non-verbal grading task and the verbal decription of the top three pictures on the relevant pages of the questionnaire. The adults, it will be remembered, generally ordered the pictures in both tasks for the physical dimensions by starting with the most diminutive (i.e. the physically least extended) instance, and ordering towards the most extended instance of a dimensional concept, whereas some children generally used such an ordering only for the non-verbal grading task, and then reversed it or became unsystematic when they performed the verbal description (4.4.1.1.b - 4.4.1.1.d.)

Clearly there may be several possible explanations for this type of behaviour among the children, and we shall examine some of them in a moment, but whatever explanation is accepted it does not alter the fact that some children who could grade non-verbally did not display this skill so often when language became an additional variable in the task content.

The important thing to note here is that in this type of task the majority of both children and adults show a non-linguistic size preference for the diminutive end of physical dimensional gradients, and this result conflicts with the predictions of the Semantic Feature Hypothesis (E. Clark, 1973a;1973b), which suggests that there is a non-linguistic preference for the more extended ends of physical dimensions (see section 2.5.2.)

If non-linguistic size preference changes with age, then it is quite possible that the present results, coming as they do from an older sample of children than those in previous studies, reported in section 2.5.2., reflect yet another period of fluctuation in dimensional preference. Note that the hypothesis that the form of the instructions for the children's activity (Give me ... versus Show me ...) also determined the differences in previous results cannot be supported in the present case since children were not asked to handle the objects graded, but merely to look at them and list them.

It is tempting to consider that non-linguistic preference for the diminutive end of a physical dimension is the definitive style of cognitive organisation, since this is what was found generally in the adult group. However, this conclusion cannot be unequivocally supported in the present case, owing to the heavy preponderance of females in the adult sample, and further research will be needed, with a more balanced sample of adults, before a firm pronouncement can be made on this question. In view of other evidence in this study and in Chapter 5, it is quite possible that women's behaviour differs from men's in this type of grading task, and possibly their gradability system generally may differ at a number of points. It may be quite important, for example, that among the very few children who were consistent on both non-verbal and verbal grading (4.4.1.1.e.), boys preferred the extended ends and girls preferred the diminutive ends of physical dimensions for both sorting and description, the girls' behaviour matching that of the women in the adult group. As we shall see in the results of the study described in Chapter 5, the performance of the oldest group of boys there outstripped not only that of girls the same age, but also occasionally that of the women subjects as regards the advanced development of antonymic [11] structure in category relations for <u>big</u> and <u>small.</u> Add to this the fact that boys were certainly superior to girls in the development of dual polarity (4.4.1.3.d.), and that this result is weakly reflected in the adult data, where all the males (N=3) but less than half the females used specialised relevant dimensional adjectives with both polarities, and then the hypothesis that women differ from men in some aspects of gradability is by no means as outlandish as at first might appear. This hypothesis is certainly supported by anecdotal evidence from other sources, such as Key (1975;33ff. and 75) and R.Lakoff(1975; 8ff.), and there is some physiological evidence that women's perceptual processing differs from men's (Kimura 1973).

To return now to possible explanations for the discrepancy between non-linguistic and linguistic grading order found among children in this study there are at least three factors that deserve to be considered.

The first is that in the non-verbal grading task there is certainly a perceptual processing strategy at work which has little to do with language and which is not - as far as can be determined - used by the adults; cognitive organisation proceeds by way of "end-linking" (4.4.1.1.b.) whereby an array of three pictures is scanned from the outside edges inwards, and whatever extremal instance is found to be the diminutive or the extended one is used for first-mention in the grading order. Such a strategy for processing visual input has been reported elsewhere for children of four and five years old (Riley and Trabasso 1974; also cf. Wales and Campbell 1970;379-380 who discussed something similar), and in the present study accounted for the majority judgements in sixteen out of twenty-one sets of group data ($p=.013$ by Binomial Test, one-tail), although as reported in 4.4.1.1.b. it had a much stronger influence when the diminutive instance was end-linked (11 out of 12 cases) than when the most extended instance was.

A second factor to consider is limit on processing capacity; this would explain loss of initial (non-verbal) systematicity as being caused by some children's inability to hold a mental representation of the three ordered pictures while they perform the description task. Two facts argue against this interpretation; pressure on processing capacity should have affected both types of systematic ordering equally, but it actually much more often had an adverse effect on the ordering that placed the diminutive rather than the extended instance first; and secondly the experimental instructions relieved the pressure on processing capacity by ensuring that children wrote down the grading order of the pictures before they took on the description task and so they would have had the identifying letters of the pictures in order in front of them on the page. Thus the processing capacity explanation fails.

We come then to a third possible factor, namely that of language, which was already implicated in this phenomenon (4.1.1.d.) without any causative relationship being imputed. It is attractive to view the results as support for the Semantic Feature Hypothesis; the predominant direction of change is away from the ordering where diminutive would be in place of first mention, whereas orderings where the excessive instance would be in the place of first mention tend to be maintained, and more specialised-type adjectives are found of positive polarity than of negative polarity in the language data from the children. But non-verbal grading and description, at least as far as can be determined, are not linked at all in the results. Firstly, the number of children changing order of pictures was rarely the majority of the sample, so that we cannot claim this behaviour as general; and secondly there are not only children who systematically maintained their non-verbal grading order when they placed the most diminutive picture first but also some who maintained the order when the diminutive was placed last in the initial triad, Even among the children who did change the order of the array triad between non-verbal and verbal grading, some changed against the trend and altered an ordering where the excessive end of a dimensional array was presented first. Nor is there any correlation between use of both polar specialised adjectives for a dimension and one particular type of ordering for either verbal or non-verbal description.

However, this is not to say that there is no explanation for the change in ordering for the non-verbal and verbal ordering tasks. It is just that the explanation may be rather more complex than a simple language-to-cognition relation. What the results strongly suggest is a lack of cognitive integration between perceptual and linguistic structure among those subjects who changed orderings between tasks. For almost all the adults, the non-verbal ordering and the ordering for description of the three pictures they saw at the top of the page were essentially the same task whereas for a large minority of the children they were not. One may hypothesise that there was less skill shown by these children in the cross-modal matching between visual and linguistic representations in cognitive structure. This hypothesis is far better supported by the language data, since the majority of subjects who showed knowledge of both positive and negative-polarity specialised adjectives that were dimensionally relevant were no more likely to be systematic in non-verbal and/or verbal grading than those subjects who used specialised adjectives only of positive polarity combined with global adjectives of negative polarity. In fact there are proportionately slightly more of the latter who turn out to be systematic, whichever criteria are used, and even if performance over the three questionnaire pages that all subjects did is composited.

The only signifant result in this area of language was that reported for Group 1 (4.4.1.3.e.), and this did not concern polarity directly, but rather the logical appropriacy of a specialised (positive polar) dimensional adjective. For Group 1, knowledge of negative polarity specialised adjectives is negatively correlated with another aspect of cognitive development, namely antonymic structure (see the end of 5.3.5.2.2.) , and in Groups 2 and 3 there is neither positive nor negative correlation between this linguistic knowledge and antonymic structure.

Where there do seem to be relationships between cognition and language, as measured on this questionnaire, is in the loose association of adjective forms and categories with different kinds of organisational behaviour; most of the children who used Global Superlatives together with Intermediary adjectives failed to treat the arrays of pictures as single arrays, but broke them up into two parts. And most of the subjects who failed on the grading tasks used Global Comparatives and Specialised Absolute adjectives. Again, it seems a likely hypothesis that cognitive development is the determining factor here, rather than language. The two groups of children differ in the size of the array they are prepared to consider as an array, the first group limiting itself to three or four pictures but successfully grading, and the second group showing some disposition to take in an array of six or seven pictures and treat it as a structural unit for descriptive purposes although they generally fail to grade just the triadic sub-part of it alone, possibly as a result of trying to describe the pictures on more than one dimension at a time.

It seems reasonable to assume that in both these instances children are using "framework clues" rather than some more abstract generally applicable logical principle for grading and describing, since both groups of children appear to have relative rather than absolute codes for processing visual information (Cf. Bryant, 1974;Kuenne,1946). The users of Superlative plus Intermediary adjectives seemed to find difficulty in dealing with a large number of perceptual values, but could code three (or four, if they knew a word that could extend the "middle end" of a triad; such a word is inbetween) by using Daddy - Mummy - Baby or biggest - middle - smallest. They were obviously coding a relationship among the sizes, but did not appear to have an internally stored yardstick against which they were measuring what they saw. The Comparative and Absolute adjective users were in the same position, although their perceptual focus, and possibly their processing strategy, was slightly different, so that they were not seen to be limited to processing split arrays of pictures; this is not to say that they were not limited in this way, but rather that their behaviour was covert. The evidence from how the children described the drawings on the "Persons" page of the questionnaire is particularly illuminating when seen in this connection, since the younger children - and some women - failed to grade the large array, and the children who could grade were unable to make use of the norm represented by the special figure of Norma(n) at the top of the page. The size relations which these children are able to handle are broad ones, such as <u>bigger</u> and <u>smaller</u> which can be easily coded from one occasion to the next, and according to Bryant children about this age are also able to code the size ratio between visual stimuli and their background - in our case the pictures on the pages on which they were drawn; "the size of the background is always greater than the size of the stimuli, however different the stimulus pairs are from each other. The change in the relations between stimuli and background (...) is a ratio change" (Bryant, 1974; 35).

Another piece of evidence that children were frequently using framework strategies can be seen in the results of section 4.4.1.3.c. The frequent reversal of polarity on the double-version pages indicates lack of a stable representation of a norm-for-the-class against which each picture could be assessed. The effects of this lack were seen to decrease with age, but younger children appeared to be also less able to process large arrays for verbal description, their tendency being to take whatever was presented in the first three pictures and use it as a standard for assessing the rest of the array. The adult results, which are proportionately much lower on changes of polarity, indicate the possibility that they were making use of an absolute code, i.e. they had some inner representation which they were using as a basis for grading.

The results presented in the micro-level analysis (4.4.2.1.ff.) cast further light on the issue of relative versus absolute coding. The early occurrence of <u>middle</u>,<u>middle-size</u> and <u>inbetween</u> is significant. These are transparently relational terms with a strong locational meaning and two are used elsewhere in the language not as adjectives but as locational expressions. Such terms as medium, average, normal (and median, the unforeseen result of a maths lesson about measures of central tendency, given to Group 3 the day before the elicitation !), on the other hand, are more opaque. Besides this, however, medium, average and normal are relatively context-free terms, whereas middle, middle-size and inbetween are not. The first three are scientific or quasi-scientific terms that in everyday speech rely for their meaning on some notion of statistical calculabilty, independent of an individual situation. The second three terms are situationally bound and derive their meaning from the contingencies of the moment; they represent relative coding items, whereas medium, etc. represent a means of absolute coding. Adults use both codes as the situation demands, since, given the need to refer to the second of three objects ranged for size (for example), the normal response is to call it middle-size; this is sufficient to pick the object out and isolate it within that situation. But if one wanted to recognise the object again on a future occasion it would be more helpful to recall, perhaps, the relation that it bore to the norm-for-the-class, and code this as medium or whatever.

We could describe the principle determining the application of middle or inbetween as the logic of small sets; the principle for medium and average, etc. to be applied is that of classes or universal sets. Seen from this point of view superlative and comparative forms of adjective are peculiarly ambivalent, since they can operate on the basis of either type of logic. In any small set - and the triad seems to be a favourite configuration here - superlative adjectives can be applied in conjunction with middle-sized, etc. to describe the outside extremities of the ordered array, but their function is not altered when arrays become large, as they serve the same purpose of marking the two extremities of the range. Two polar opposite superlatives can accommodate an infinite number of non-extremes between them. Comparative forms are also applicable within both small sets and universal sets, since they associate pairs of members in an ordinal relation. The conditions for their use may be much more contingent on individual situations, however, so that they could be said to be characteristic more of a relative than an absolute cognitive code. The data presented in Table 4.4.2.2.A., moreover, implying an age-related category shift (Global to Specialised) and type shift (Superlative-dominant to Comparative-dominant) in compared forms of adjective, suggests Donaldson and Wales' (1970;264) hypothesis that the order of development for forms of gradable adjectives is absolutes -> superlatives -> comparatives, may be in need of refinement. What we have is a body of results implying an ordering global superlative -> global comparative -> global absolute -> specialised adjectives (all forms). The problem is that of a norm-for-the-class. Children can use superlatives and comparatives without recourse to this notion, but the complete sense of an absolute adjective depends upon it. This is not to say that children cannot function at all with absolute gradables; because they quite clearly manage in a number of situations to do so. But whereas we can see that superlatives can, together with comparatives, derive their later function in universal sets from their essentially similar function in small sets, the absolute adjective is not well placed in this respect. Its main function, as so many linguists have pointed out, rests on the notion of a class-norm, so that its major domain is normally that of a universal set, and it is only secondarily used within small sets, quite often duplicating the function of superlatives in triads, or of comparatives in dyads. Adults quite often use absolute adjectives in this way. Assuming three objects in an array, let us say books, one can couch a request for the largest by saying either <u>Could you give me the biggest book?</u>

or Could you give me the big book? Similarly, if there are only two books in the field of vision, then the request could contain either form, or a comparative, without causing ambiguity or misunderstanding. Where large sets are at issue, however, asking for the biggest and asking for a big book will not always secure the same one; It is only the extra implication of uniqueness carried by the definite article in the big book which allows the selection of the same one to proceed unproblematically. There seems to be an interesting interaction with deixis going on here, but there is not space to go into this; it is perhaps enough to say that whereas the main domain of superlative and comparative forms of gradable adjective is that of small sets, the domain of absolute adjectives is primarily universal sets or large sets.

That children of the age studied do not have more than a logic of small sets at their disposal is indicated by the tendency to process arrays of pictures by splitting them. It will also be demonstrated by means of the Chapter 5 data that there is a further step in logical organisation which is necessary before it will be possible to use gradable antonyms to describe large sets, and this is the coding of norms.

A different slant on the question of relative coding is provided by the results on vocabulary type, in sections 4.4.2.3.1. and 4.4.2.3.2. There seems to be a large minority of children in Groups One and Two who do not understand what long and tall mean. For them long was always accompanied by thin, as was tall, when judging the dimensional differences on the main pages of the questionnaire. This was noted to be particularly deviant when the Rectangle or the Building with the smallest overall area was designated as tall and thin or long and thin. What this very strongly suggests is that children who wrote these combinations were processing an individual picture without any reference whatsoever to the other pictures of the array, and they were doing this without knowing what either word of the pair referred to precisely. This was referred to as "inherent" grading, but obviously it is also compatible with a relative perceptual code, since the children who do this seem to be responding to the ratio relation between the primary and secondary axis of extent in the drawings. It could equally well be said that what the children are coding is a shape configuration rather than a size, in which long/tall and thin is not separable into two predications about different dimensions; it is a wholistic notion. Wherever thin goes fat apparently follows: things are either tall and thin or small and fat.

We must also note the role of short as a mediator in the development of specialised size adjectives. It is surprising that so few previous researchers have noted its double function in opposing both tall and long. The results displayed in section 4.4.2.3.1. imply a development from big - little initially to long followed by short and then tall, with intervening stages of confusion. As long emerges, it seems very likely that big becomes more restricted to the vertical orientation. But as big is initially used for largeness in any dimension, long may be first extended to describe a particular type of shape in any orientation too. Short will be defined by reference to long, and it is interesting to speculate that it will encode the same type of shape perception as long does, since if one thinks of the objects that are often described as short objects (i.e. pencils, rulers, sticks, people) their overall outline is still such as to present one axis which is relatively more extended than a second axis orthogonal to it. This is essentially what distinguishes short from little or small, in many cases, the latter being applied to diminutive objects which need not have one saliently extended axis. It seems very likely, to judge from the data, that _short_ will be quite a difficult concept to acquire, since in many real-life situations some _long_ things will contrast with objects of rather nondescript dimensional extent that are more suitably labelled as _small_ than _short_. This is what explains the high frequency of _small_ as an antonym for long(and tall) in this study. Pushed too far, reduction of extent along one axis removes a suitable context for _short_, and things are judged as _small_ instead. This suggests - heresy! - that _short_ is not the same sort of antonym as, say _narrow_ is, but that it is rather part of a triadic arrangement, between _long_ and _small_ or _little_. It also bears the same relation to _tall_, which appears the last of the three specialised adjectives, since the need for it is relatively restricted, being confined to describing long (shaped) objects in vertical orientation, for which the adjective _big_ already exists.

High is the last word of this set to emerge, and is used as a synonym or variant of _tall_. Its status is really problematic, since it must seem to the child that it has no obviously separate function as far as describing objects is concerned. But why should it emerge after _tall_? On the basis of the number of judgements associated with shape, I would speculate from the data that _tall_ can be accommodated to the existing shape schema for _long_: Only verticality has to be isolated and incorporated as an extra perceptual factor. For _high_, this is more difficult, since it tends not to be used with nominals referring to the same object shape as _tall_, although there is some overlap. (e.g. _High tower_, _tall tower_, _?high pole_, _tall pole_, _tall spire_, _tall man_, but not *_high man_ and not *_tall roof_).

This leads to an observation of note, namely that _high_ has two uses, one of which is perhaps more prevalent than it is in the case of _tall_. It refers to either filled or empty space, in the sense that what is sometimes described by _high_ may not be objects of great extent (as in high cathedral), but rather objects situated at a great distance from the ground (hence the ambiguity of high window:compare it with tall window). Tall can also be used in reference to empty space, too, of course, as in measure phrases:He is six feet tall means that the space that person occupies can be gauged as six feet in extent.Without the measure-phrase, tall (and short) refers to a physical presence - suggested as being of a particular shape.

There seems to be a preference to deal with real, solid objects when children learn size adjectives and their meanings. There is no mystery about this; since adults are rarely in a position to explain very precisely what size adjectives actually refer to, the child has to infer this for himself, and a good place to begin constructing the meaning of size adjectives would seem to be with the most "ostensive" ones that appear to describe properties of solid, visible objects. We can see this principle strongly at work in the data presented in Table 4.4.2.3.2., which displays the inter-group frequencies of several of the secondary adjectives found in questionnaire replies. Fat and thin are much the most common, and it is obvious that experience of describing other human beings - solid objects par excellence!- is quite an important source of vocabulary. "Abstract" dimensional adjectives like thick, and broad, hardly appeared at all in the data, and wide-narrow can be explained by reference to the fact that they were used to refer to a primary rather than a secondary dimension.

A last point to note is that just like short, the two adjectives thin and narrow each mediate a pair of dimensional terms of positive polarity. According to the frequency criterion, therefore, they will be learned earlier, whereas according to the complexity criterion, since they participate in more contrasts they may be more complex and therefore more difficult to learn. It seems likely from the data, however, that _fat_ and _thin_ are learned together with, and at first inseparably from, _short/small_ and _tall/long_, and although _fat_ seems fairly restricted in adult usage, to animate objects, it does not appear to have this restriction in children's usage. It thus appears that _thin_ is available for contrast with _thick_ without any semantic changes being necessary, while _fat_ will have to become contextually more restricted as the vocabulary develops. This is a different interpretation from what would be offered by the Semantic Feature Hypothesis, since their _thin_ would have to "add an extra feature" (+concrete) before it became relatable to _thick_.

CHAPTER 5

CODING OF BIG AND SMALL: POLARITY, NEGATION AND CATEGORY WIDTH

5.1. The Problem

It seems reasonable to conclude from the evidence of the preceding chapter that the development of gradable adjectives in child language results from a complex process of semantic differentiation rather than from the simple accretion of semantic features suggested by the various hypotheses put forward by E. Clark (1973a; 1973b).

Clark's Semantic Features Hypothesis promotes a view of meaning according to which a number of semantic elements (or concepts) are "acquired" by the child in a once-and-for-all manner as its linguistic development proceeds. Such a hypothesis is incapable of accounting for "U-shaped curves" (Strauss and Stein, 1978) in language development of the sort examined in section 4.4.2.3. One of the main reasons for this is that, stemming as it does from semantic componential analysis, the hypothesis relies exclusively on a theory of intensional meaning, and fails to consider extensional meaning of gradable adjectives.[1]

Yet a consideration of extensional meaning is important to a study of gradability in context, and essential if we are adequately to explain some of the phenomena that have already been revealed. One aspect of the development of meaning in the field of size adjectives, for example, is that quite apart from the fact that _big_ and _small_ must inevitably become more restricted in their range of usage as other adjectives (e.g. _tall_, _short_, _wide_, _narrow_) invade their erstwhile domains, the nature of the meaning-relation itself between the two adjectives may change, if as indicated in the last chapter small maintains itself in preference to short as the Specialised adjectives tall and long become differentiated from big.[2]

We already know from other evidence (Maratsos, 1973; Lumsden and Poteat, 1968) that big (and bigger) appears to fluctuate in meaning as children's language - and presumably their cognitive ability - develops, with the result that at about age five or six they restrict its meaning to vertically extended objects, judging as big or bigger, objects which are taller than others having a surface area up to four times as large. In the Maratsos (1973) study, younger children between three and five years of age, perhaps surprisingly, appeared to respond correctly to instructions containing big. Maratsos concludes that preschool children may come increasingly to associate big with one particular dimension (i.e. the vertical) as they grow older, but that "In later development it will become necessary for the child to restrict severely the contexts in which "big" is defined by tallness" (Maratsos, 1973 : 751-752).

A second consequence of ignoring the importance of the extensional meaning of gradable adjectives is that there is no adequate characterisation of complementarity and antonymy, the logical difference between which was discussed in 2.2.2.4.1. Much of the recent data on gradable adjectives in child language has come not from studies of speech production, but from experiments on comprehension.[3] In these typically the experimenter uses a forced-choice paradigm, where the child subject is faced with two, occasionally with three or four objects or pictorial representations and is told to choose one; he is given an instruction containing a gradable adjective, such as Show me the big one, or Give me the long one/tall one/short one, etc. Such a paradigm does not usually allow a child to choose more than one exemplar of the property denoted by the gradable adjective in the instruction, and this, apart from fostering the spirit of binarism inherent in componential analytic techniques, also yields occasionally bizarre results (see Kavanaugh, 1976, for a critique).

If we try to characterise the difference between complementarity and antonymy in extensional terms, we see that complementarity is a simpler logical scheme. This can be illustrated by considering the adjectives big and small.

If big and small are treated as complementaries and are used to categorise a set of objects, the members of the big category will be identical to those in the category not small. Similarly, the categories small and not big will contain identical members. Moreover, the categories small and big will exhaust the set without remainder, as will the categories not small and not big together. In each pair of opposed categories, no object will appear more than once. This situation can be represented as in Fig. 1:

big	=	not small
not big		small

Figure 1: complementary categorisation

The fact that the two boxes represent the same set of entities is symbolised by the identity sign =. Dividing the entities into dichotomous categories yields the same result whether a positive or a negative pair of terms is used: this is represented by the dotted line being in the same location in each box. Redundantly, we may now characterise the complementarity of big and small by means of the following six conditions:

(i) big and not big are contiguous categories and together exhaustive.
(ii) small and not small are contiguous categories and together exhaustive.
(iii) big and small are contiguous categories and together exhaustive.

(iv) *not big* and *not small* are contiguous categories and together exhaustive.

(v) *big* and *not small* are isomorphic (i.e. identical) categories and not exhaustive.

(vi) *small* and *not big* are isomorphic (i.e. identical) categories and not exhaustive.

However, *big* and *small* are coded not as complementaries but as antonyms in adult speech, and in the logical scheme for antonyms only the first two of the above conditions apply. Conditions (iii) - (vi) are radically altered. The problem is, of course, that categories *big* and *small* will not under normal circumstances exhaust a set of entities, since there will always be an intermediate category (a "norm") which belongs to neither, and is representable by the intersection of their negations: *both not big and not small*. We can represent this type of categorisation as in Fig. 2. Note the displacement of the dotted line:

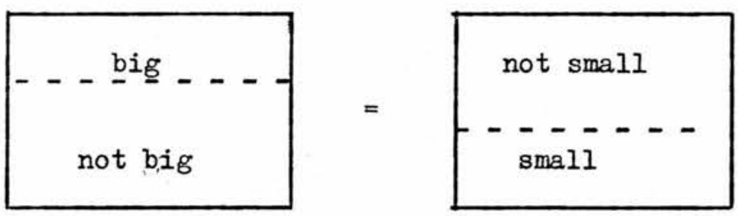


Figure 2: antonymic categorisation

What might be termed "ideal" (i.e. purely logical) antonymic categorisation is then the conjunction of the following six conditions for any class of entities:

(i) *big* and *not big* are contiguous categories and together exhaustive.

(ii) *small* and *not small* are contiguous categories and together exhaustive.

(iii) *big* and *small* are non-contiguous, separate categories and non-exhaustive.

(The term "gapped" is convenient shorthand for this condition).

(iv) _not big_ and _not small_ overlap (i.e. share some members) and are exhaustive.

(v) _big_ is included within _not small_, but is non-isomorphic. They are not exhaustive.

(vi) _small_ is included within _not big_, but is non-isomorphic. They are not exhaustive.

If we replace _big_ and _small_ by the terms _x_ and _y_ in the above conditions, then we have an extensional formula which characterises the necessary logical "competence" underlying the appropriate use of all pairs of gradable antonyms. The term _ideal_ is used for this, since it is clear that in a variety of "performance" situations, pragmatic variables will force the relaxation of some of the six conditions. These variables derive from three factors: the nature of the set of entities, the cultural knowledge possessed by the grader, and the contents of his memory-store.

Taking _big_ and _small_ as our exemplary adjectives, we may use the antonym categorisation scheme to divide a novel set of entities into three categories, provided the set is typical as a set in that it represents a smooth gradient of size from one (ordered) member to the next. However, it may be untypical if exemplars of the intermediate (_neither big nor small_) category are missing, and antonymic grading will then yield the same results as complementary categorisation. Now let us instead suppose as a fact that all the exemplars of the category _big_ for this particular set of entities are missing, unbeknown to us. Can antonymic grading proceed? The logical answer is yes: the set which would under other circumstances yield two categories is now made to yield three. But this is only possible provided that we have never encountered the entities before, or at least have never seen any big ones.

Now this situation rarely occurs for an adult, who usually has stored a set of facts about the world as a result of previous experience with it, and is likely to recognise at once whether or not the set of entities in a particular grading situation is typical of the object-class as a whole in point of size, for instance. In the imaginary grading situation outlined above, the adult would be more likely to divide the entities into two categories than into three, whereas someone lacking the necessary knowledge, such as a child, would be likely to arrive at three categories whether the set of entities were typical or untypical.

Now so far it has been assumed that the antonymous categories, as represented by big and small, are symmetric about the intermediate category, i.e. that they contain about the same number of members (i.e. have the same degree of extension), and this is perhaps acceptable while talking in ideal logical terms. But again in a number of actual grading situations the intermediate category may be displaced towards that for big or for small, as a matter of social or cultural convention, and it will to some extent depend on the nature of the entities categorised whether the logical scheme for antonymy will be regularly or irregularly applied. Such conventions, however they are characterised, will be learned during maturation and again consigned to memory.

We can already see that the adult has a number of advantages over the child which have very little to do with superior logic, but which help the former to achieve constancy of categorisation over time whereas the child - to put it at its extreme - has to deal with each grading situation as a totally new configuration of entities.

So far, for reasons of argument it has been assumed that children are capable of applying the ideal logic of an antonymic scheme, but a comparison of its six conditions with those for complementarity shows the latter to be notionally simpler since its logic is binary and allows conflation of categories. It seems reasonable to assume that complementarity is therefore an easier structure to control than antonymy, since the latter demands that all six conditions be processed simultaneously without conflating categories. If anything, the logic of antonyms is ternary rather than binary, and we might reasonably expect complementarity ontogenetically to precede antonymy.

This is not such an outrageous suggestion as might be thought, since there exists a certain amount of evidence that children prefer to treat adjectives like big and small as complementary opposites rather than antonyms,[4] and indeed in most situations prefer to apply a binary logic even where this is inappropriate. Donaldson, for instance, found this to be the case with children who had difficulty solving transitive inference ("3-term series") problems involving comparative relations (Donaldson, 1963 : 117 ff.), and more recently Ehri (1976 : 378 ff) has reported that in dealing with problems of verbal comparison, young children break down a graded array of objects by means of a series of dichotomous contrasts. Quite early, Piaget noted (1928) that pre-operational children reduced ordered relations to classifications, and recently he discussed Sinclair-de-Zwart's psycholinguistic data in terms of the difference between "scalar adjectives" (e.g. tall, big, short) found in the language of logical non-conservers (i.e. pre-operational children) and "vector vocabulary" (e.g. taller, shorter) found in the language of logical conservers (Piaget, 1968/1971 : 94 f.).

It is a puzzle to know why children should treat comparative relations, as expressed by bigger and smaller for instance, in terms of absolute membership of a category (big or small). The above studies apparently contradict the argument presented at the end of Chapter 3, where it was suggested that comparative adjectives are easier to use than absolutes since they demand less information-processing. But that argument assumed that antonyms are coded as such - as indeed they are in adult usage. However, if we allow the possibility that they are coded as complementaries in the cognitive structure of the child, absolute adjectives would appear preferable perhaps since they are superficially similar to other phenomena elsewhere in the child's vocabulary, as well as being structurally simpler linguistically. Taking the last point first, compare _Elephants are bigger than cows_ with _Elephants are big_; one cannot help noting that the first statement is much more obviously a relational predication than the second, as well as being syntactically more complex. The first statement is in fact structurally similar to sentences containing a simple (two-place) transitive verb, as Lyons (1966) noted (Cf. last part of 2.2.2.3.). The second statement, with a solitary antonym as predicate, is structurally much more like the _be_-predication used to assert relations of identity, class-membership or class-inclusion. Compare, for instance, _This elephant is big_ with _This elephant is Dumbo_ (Identity-relation); and _These elephants are big_ with _These elephants are animals_ (class-inclusion).

There is an unmistakable commonality between the binary logic of complementary adjectives and the logic underlying judgements of simple class-membership, which demand decisions as to whether objects have or do not have a property _z_ : _z_ versus _not-z_.

Moreover, a second strongly unifying logical principle is that of _reversibility_ (Piaget, 1962), which derives from the earliest, sensori-motor stage of intellectual development and is thus operative during the earliest stage of language development. Complementaries are reversible, but antonyms are not (see Section 2.2.2.4.1.), and there are many examples in early child language of attempts to apply the principle of reversibility in situations where it is inappropriate.[5] As Schlesinger has remarked, in a slightly different context: ". . . different functions are perceived as similar so that they can be expressed in the same linguistic form" (Schlesinger, 1974 : 146).

If we accept that it is at least conceivable that children, let us say up until about the age of ten, operate with a different type of logic for gradable antonyms from that used by adults, then it seems important to seek to discover what sort of extensional meanings they have for gradable adjectives. One way of doing this is by modifying the techniques developed in personality studies and cognitive psychology for the analysis of what are frequently termed the category widths associated with concepts (Cf. Pettigrew, 1958; Tajfel, Richardson and Everstine, 1964; Wallach and Caron, 1959). Such techniques could provide the language researcher with a very useful tool for studying the semantic aspects of linguistic knowledge, although they have as yet not been systematically applied in this area of research.

5.2. Aims

The aim of this last experiment was thus to assess whether gradable adjectives, as represented by the antonyms big and small, were coded in the same way for children as for adults, and if not, to try to obtain data on the nature of the difference in conceptual structure and possibly on how transition occurred from one mode of thinking to another. There was no prior assumption that child logic was different from adult logic in this area of language, and accordingly the materials and procedure were designed in the hope of maximally revealing whatever logical patterns and behaviour existed in the sample.

In order to be able to see whether big and small were coded as antonyms or complementaries, the adjectives were presented in the context of simple instructions to subjects to cross out certain members of a set of pictures which they judged to be big or small for the class of objects represented. The instructions also contained the negative terms not big and not small, which are the true complementaries of big and small. Thus all of the conditions i - vi of antonymy specified in Section 5.1. could be examined.

5.3. Method

5.3.1. Design

In this study, as in the previous one, age and sex were treated as independent variables, and the extension of the adjectives big and small, and their negatives not big and not small were examined as dependent variables. Extension was treated from two points of view:

(i) that of the "category width" associated with each of the four terms when these were used to describe two sets of objects; and

(ii) the logical relation of category widths for each set of objects, describable by reference to the conditions of antonymy, I - VI.

Since repeated judgements were demanded of subjects, the effects of short-term memory were counteracted by firstly changing the configuration of objects after each judgement and secondly by holding two experimental sessions at least twenty-four hours apart. The two sets of objects, represented by pictures, were judged once each for the two antonyms and their negatives.

5.3.2. Subjects

The subjects were those who took part in the questionnaire elicitation described in Chapter 4. However, because there were two separate sessions and some subjects were only able to attend one or other of them, the number in each group differs slightly. An additional sample, for this study only, was chosen to represent an age-group immediately above that of the children previously studied. These children, Groups 5 and 6, were pupils at a junior comprehensive school in Manselton, Swansea. The groups, broken down by age and sex, are as follows:

Source	Group No.	Males	Females	Total	Age Range	Mean (yrs; mths)
Aberdour	1	13	19	32	8;1 - 9;2	8;08
Aberdour	2	10	12	22	9;3 - 10;1	9;09
Aberdour	3	11	11	22	10;2 - 11;2	10;07
Manselton	4	19	13	32	11;0 - 12;7	11;10
Manselton	5	13	9	22	12;7 - 13;7	13;00
London	6	3	12	15	19;0 - 33;0	22;03
	Totals	69	76	145		

There is an age-overlap between Groups 3 and 4, but this represents one subject in each group. The data from these were not exchanged in the analysis of results. It can be seen that the groups are not exactly balanced on the variable of sex: this is particularly so for the adults, and they were thus excluded from analysis of results where sex was an independent variable.

5.3.3. Materials

Two sheets of A4 size paper, Sheet 1 and Sheet 2, each contained a set of drawings of ants and butterflies whose configuration differed between sheets. Each sheet was divided in half horizontally by a line, and contained a right-hand margin reserved for later data-processing. Above the line there was a set of eleven drawings of ants of various sizes, distributed in haphazard fashion. Body-length of these varied from 0.2 cm to 5.0 cm, but the difference in size was not steadily graded, since there was a sharp decrease in size between the fourth ant (2.7 cm) and the fifth ant (1.0 cm) of the set. Each drawing was identified by a letter of the alphabet to facilitate comparison between Sheets 1 and 2 of subjects' performance. No two ants were exactly the same size, although there were close resemblances between E and S, and between K and L (See the copies of sheets 1 and 2 in the Appendix 4A.)

The presentation of drawings of a set of butterflies, on the lower half of each sheet, was approximately the same, except that there were thirteen of these instead of eleven as for the ants. Also the difference in size was a more gently graded one, from 8.8 cm maximum wing-span to 0.5 cm minimum. Again, no two were exactly the same, although the second, third and fourth largest seemed alike (letters Q, V and X) as did the fifth and sixth (D and I) and the seventh and eighth largest (W and A). Although it was anticipated that subjects would be unlikely to allocate drawings of like proportion to different size categories, the array as a whole was designed so that such behaviour would not obscure the variables of interest: if anything it would emphasize them.

Note that each set of drawings allows either complementary or antonymic categorisation to be revealed, although the fact that there is an odd number in each set (eleven ants; thirteen butterflies) prevents numerically symmetrical complementarity while encouraging 'ideal' antonymy, perhaps. However, the important point is that categorisation allows inference to the kind of knowledge that the subjects might possess of a norm for the object-classes represented by the drawings. Ants and butterflies were chosen for the drawings because children could be expected to have seen actual exemplars of the class on a number of occasions, so that if this knowledge had been stored in the way adults store it it would be available during size judgement. Such objects as ants and butterflies also present a very irregular outline, thus naturally favouring size judgements using <u>big</u> and <u>small</u>, rather than, say, <u>long</u>.

In each set of drawings the intermediate size category was displaced, so that it would be possible to see whether a subject who was basing his judgements of size on the logical scheme for antonyms was using the 'ideal' form of the scheme or a modified form determined by the fact of a displaced middle. It was hypothesised that grading for big and small on the basis of a known norm for the object class would result in selecting 6-7 ants as big and 1-2 as small, with 2-4 assigned to the intermediate category that would show up as the intersection of not big and not small. Similarly, it was expected that 1-4 butterflies would be described as big, 6-7 described as small, and 2-6 assigned to the intermediate category.

5.3.4. Procedure

This experiment was conducted in two sessions separated by a time interval of at least a day for each group. For the groups who also participated in the questionnaire elicitation, this experiment followed the elicitation session in each case. The subjects were spaced out in a room, but did each session as a group. In each session they saw Sheet One, which they completed and which was then collected before they were given Sheet Two to complete. The time for completion of each sheet was about two minutes, although no time limit was fixed. Together with the instructions, distribution and collection of sheets, each session lasted just about ten minutes.

In Session One, the following instructions were given to subjects: "Now I am going to show you some pictures of ants and butterflies. Write your name please in the space at the top of the sheet of paper."

(Sheet One was given out)

"Now imagine that these are real size, and not magnified. Suppose you see some ants exactly this size. Look at them carefully. Look at the ants. I want you to put a cross with your pencil through all the ants that are big - through all the big ants. Do it now.

"Ready? Now look at the butterflies. Imagine they are real size. Now listen carefully. Put a cross with your pencil through all the butterflies that aren't big - through all the butterflies that are not big."

(When subjects were ready, Sheet One was collected, and Sheet Two given out).

"Now put your name on this sheet. Then look at the ants. Now imagine this is their real size. Imagine them walking on the desk in front of you. Listen carefully what to do. Put a cross through all the ants that are <u>small</u> - through all the <u>small</u> ants.

"Ready? Now for the butterflies. Imagine they are real size. Imagine they can fly. Now listen carefully. Please put a cross with your pencil through all the butterflies that <u>aren't small</u> - through all the butterflies that are <u>not small</u>."

(When subjects had finished, Sheet Two was collected, and the session ended.)

In Session Two, the first instruction was modified slightly, but otherwise the sequence was the same except that now the adjectives were reversed, so subjects had to cross out ants which were <u>not big</u> and butterflies which were <u>big</u> on Sheet One; and on Sheet Two ants that were <u>not small</u>, and butterflies that were <u>small</u>. The antonyms were presented in both attributive and predicative position in the instructions, but their negatives could only be presented in predicative position, for obvious reasons.

The adjustment to the first paragraph of instructions was as follows:

"Now I'm going to show you some pictures like the ones you saw last time. But I want you to do something different with them, so listen carefully to what I ask you to do. Otherwise you won't know how to do it. The pictures are again <u>real</u> size, and not magnified . . . ."

After the second session a list of names and ages of each group of subjects was compiled.

The sequence of instructions was organised in such a way that within sessions subjects had a pair of antonyms together or a pair of negatives for each set of objects. The reversal between positive and negative pairs occurred across sessions, not within a session. It was felt that this would maximally favour antonymy and discourage tendencies towards complementarity; it was hoped that the sequence of instructions would also discourage subjects from comparing sizes of ants with those of the butterflies.

5.3.5. Results

The results are presented in two main sections. In the first section the data on category widths are examined, and there are found to be significant effects attributable to both sex and age variables in the sample population. Later, section 5.3.5.2. examines the logical relationships between the various category widths provided by each subject, and again significant differences in the cognitive structuring of category relations are found to be related to the variables of sex and age without being totally explicable in terms of the original variations found in category widths.

5.3.5.1. Category Widths

The number of drawings crossed out in each set on Forms A and B in response to the instructions was recorded for each subject, and the category width for each age-group (sub-grouped by sex), for the coding of big, small, not small and not big in reference to the pictures of ants and butterflies was established. The frequencies of choice of various drawings for each category are displayed in Table 5.3.5.1. (i) for Form A and 5.3.5.1. (ii) for Form B. The identifying letters of the pictures in each set have been listed down the left-hand column in order of picture size, with the largest on the top in each case. Added to each Table are the X^2 results for the age variable only: there should be four degrees of freedom for the results computed from the contingencies of the

TABLE 5.3.5.1. (i)

Judgements of Category Width on Form A (pictures of ants). Frequencies are given for each category by sex and age-group in each case, and the overall group frequencies are given as rounded percentages. Observed X^2 for choice versus non-choice of a particular picture is given after Group 5 for the children's groups, and after Group 6 for the overall contingencies on the age variable. Significance is given at the foot of the Table, and is for a 2-tailed hypothesis.

Category: big.

Group:	1		2		3		4		5			6		
Group N =	32		22		22		32		22			15		
Sex:	m	f	m	f	m	f	m	f	m	f		m	f	
Picture											X^2			X^2
T S E	13	19	10	12	11	11	19	13	13	9		3	12	
	32		22		22		32		22			15		
	100%		100%		100%		100%		100%			100%		
F	9	14	10	12	11	9	16	12	13	9		3	12	
	23		22		20		28		22		$13{\cdot}63^{\theta}$	15		$16{\cdot}93^{\theta}$
	72%		100%		91%		86%		100%		d.f. 3	100%		d.f. 4
C	4	1	4	0			1	0	7	3		3	10	
	5		4				1		10		$20{\cdot}32^{\oplus}$	13		$53{\cdot}92^{\oplus}$
	16%		18%				3%		46%		d.f. 3	87%		d.f. 4
G			1	0					3	0		2	7	
			1						3			9		
			5%						14%			60%		
B												0	3	
												3		
												20%		
J K												0	1	
												1		
												7%		
L														
M														

Significance: $\theta = p < {\cdot}01$

$\oplus = p < {\cdot}001$

TABLE 5.3.5.1. (i) cont'd.

Judgements of Category Width on Form A (pictures of ants). .....

Category: small

Group:	1	2	3	4	5		6	
Group N =	32	22	22	32	22		15	
Sex:	m f	m f	m f	m f	m f		m f	
Picture						X^2		X^2
T								
S								
E	1 0 1 3%							
F	1 1 2 6%				0 1 1 5%			
C	13 18 31 97%	5 12 17 77%	11 10 21 96%	13 10 23 72%	1 9 10 46%	$23{\cdot}05^{\oplus}$ d.f.3	1 2 3 20%	$42{\cdot}51^{\oplus}$ d.f.4
G	13 18 31 97%	9 12 21 96%	11 10 21 96%	17 12 29 91%	3 9 12 55%	$27{\cdot}61^{\oplus}$ d.f.3	1 3 4 27%	$52{\cdot}71^{\oplus}$ d.f.4
B	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 12 31 97%	5 9 14 64%	$13{\cdot}61^{\oplus}$ d.f.1	1 5 6 40%	$42{\cdot}91^{\oplus}$ d.f.2
J	13 19 32 100%	10 12 22 100%	11 11 22 100%	18 13 31 97%	6 9 15 68%	$10{\cdot}41^{\theta}$ d.f.1	1 7 8 53%	$32{\cdot}36^{\oplus}$ d.f.2
K	13 19 32 100%	10 12 22 100%	11 11 22 100%	18 13 31 97%	7 9 16 73%		2 11 13 87%	
L	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	12 9 21 96%		3 11 14 93%	
M	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	12 9 21 96%		3 12 15 100%	

Significance: θ = $p < \cdot01$

$\oplus$ = $p < \cdot001$

TABLE 5.3.5.1. (i) cont'd.

Judgements of Category Width on Form A (pictures of ants). ...

Category: not small.

Group:	1	2	3	4	5		6	
Group N =	32	22	22	32	22		15	
Sex:	m f	m f	m f	m f	m f		m f	
Picture						X^2		X^2
T	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	
S	12 19 31 97%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	
E	13 18 31 97%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	
F	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	
C	3 4 7 22%	5 2 7 32%	5 2 7 32%	6 4 10 31%	10 6 16 73%	16·27θ d.f.4	2 11 13 87%	29·63⊕ d.f.5
G	1 0 1 3%		1 1 2 9%	2 0 2 6%	6 0 6 27%		2 8 10 67%	40·67⊕ d.f.2
B			1 0 1 5%		2 0 2 9%		2 3 5 33%	
J	1 0 1 3%						1 3 4 27%	
K	1 0 1 3%						1 2 3 20%	
L	1 0 1 3%						0 1 1 7%	
M								

Significance: θ = p < ·01

⊕ = p < ·001

TABLE 5.3.5.1. (i) cont'd.

Judgements of Category Widths on Form A (pictures of ants). ...

Category: not big.

Group:	1	2	3	4	5		6	
Group N =	32	22	22	32	22		15	
Sex:	m f	m f	m f	m f	m f		m f	
Pictures						X^2		X^2
T S E								
F	2 3 5 16%			1 2 3 19%				
C	13 19 32 100%	8 11 19 86%	9 11 20 91%	12 9 21 66%	2 5 7 32%	39·69⊕ d.f.4	1 4 5 33%	47·69⊕ d.f.5
G	13 19 32 100%	9 12 21 96%	9 11 20 91%	18 11 29 91%	2 9 11 50%	13·42⊕ d.f.1	1 6 7 47%	25·96⊕ d.f.2
B	13 19 32 100%	9 12 21 96%	11 11 22 100%	19 12 31 97%	8 9 17 77%		3 9 12 80%	
J	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	9 9 18 82%		3 9 12 80%	
K	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	12 9 21 96%		3 9 12 80%	
L	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 11 14 93%	
M	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	

Significance: ⊕ = p ·001

TABLE 5.3.5.1. (ii)

Judgements of Category Width on Form B (pictures of butterflies). Frequencies are given for each category by sex and age-group in each case, and the overall group frequencies are given as rounded percentages. Observed X^2 for choice versus non-choice of a particular picture is given beside Group 5 for the children's groups, and beside Group 6 for the overall contingencies on the age variable. Significance, for a 2-tailed hypothesis, is given at the foot of the page.

Category: big

Group:	1	2	3	4	5		6	
Group N =	32	22	22	32	22		15	
Sex:	m f	m f	m f	m f	m f		m f	
Picture						X^2		X^2
U	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	
Q	13 19 32 100%	10 12 22 100%	11 11 22 100%	18 13 31 97%	8 9 17 77%	8·85$^{\theta}$ d.f.1	3 7 10 67%	21·38$^{\oplus}$ d.f.2
X	13 19 32 100%	10 12 22 100%	11 11 22 100%	14 13 27 84%	6 9 15 68%	18·61$^{\oplus}$ d.f.2	2 6 8 53%	30·24$^{\oplus}$ d.f.3
V	12 19 31 97%	10 12 22 100%	11 11 22 100%	15 12 27 84%	6 9 15 68%	15·53$^{\oplus}$	3 6 9 60%	22·91$^{\oplus}$
D	10 14 24 75%	9 9 18 82%	10 7 17 77%	12 5 17 53%	2 4 6 27%	20·64$^{\oplus}$ d.f.4		41·35$^{\oplus}$ d.f.5
I	9 14 23 72%	6 8 14 64%	9 4 13 59%	9 6 15 47%	3 4 7 32%	10·13^{+} d.f.4		26·52$^{\oplus}$ d.f.5
W	2 1 3 9%	2 0 2 9%	1 0 1 5%	2 0 2 6%				
A	3 " 0	"	"					
H	2 0 2 6%	1 0 1 5%	1 0 1 5%					
R O N P								

Significance: + = p < ·05; θ = p < ·01; ⊕ = p < ·001.

TABLE 5.3.5.1. (ii) cont'd.

Judgements of Category Width on Form B (pictures of butterflies). ...

Category: small.

Group:	1	2	3	4	5		6	
Group N =	32	22	22	32	22		15	
Sex:	m f	m f	m f	m f	m f		m f	
Picture U						X^2		X^2
Q	1 0 1 3%							
X								
V	1 0 1 3%							
D	3 8 11 35%	0 5 5 23%	2 7 9 41%	2 3 5 16%		13·84θ d.f.4	1 3 4 27%	13·79* d.f.5
I	5 8 13 41%	0 5 5 23%	2 8 10 46%	2 4 6 19%	0 1 1 5%	13·78θ d.f.4	2 5 7 47%	15·72θ d.f.5
W	12 16 28 88%	5 9 14 64%	9 10 19 86%	15 10 25 78%	8 9 17 77%	1·88 d.f. 3	2 8 10 67%	3·04 d.f. 4
A	13 19 32 100%	9 12 21 96%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 10 13 87%	
H	13 19 32 100%	9 12 21 96%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 10 13 87%	
R O N P	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	

Significance: * = p < ·02

θ = p < ·01

TABLE 5.3.5.1. (ii) cont'd.

Judgements of Category Width on Form B (pictures of butterflies). ...

Category: not small.

Group:	1	2	3	4	5		6	
Group N =	32	22	22	32	22		15	
Sex:	m f	m f	m f	m f	m f	X^2	m f	X^2
Picture U	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	
Q	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 10 29 92%	10 9 19 87%		3 9 12 80%	
X	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 11 30 94%	10 9 19 87%		3 11 14 93%	
V	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 10 29 92%	10 9 19 87%		3 10 13 87%	
D	7 11 18 56%	9 6 15 68%	10 5 15 68%	11 7 18 56%	6 7 13 59%		1 5 6 40%	3·95 d.f.5
I	6 9 15 47%	8 6 14 64%	9 4 13 59%	10 6 16 50%	6 7 13 59%		1 2 3 20%	8·55 d.f.5
W	1 3 4 13%	7 2 9 41%	3 1 4 18%	2 0 2 6%	2 2 4 18%	$7{\cdot}72^{o}$ d.f.3		$11{\cdot}58^{+}$ d.f.4
A		1 0 1 5%	2 0 2 9%	1 0 1 3%	0 1 1 5%			
H			2 0 2 9%					
R O N P								

Significance: o = $p < {\cdot}10$
+ = $p < {\cdot}05$

TABLE 5.3.5.1. (ii) cont'd.

Judgements of Category Width on Form B (pictures of butterflies). ...

Category: not big.

Group:	1	2	3	4	5		6	
Group N =	32	22	22	32	22		15	
Sex:	m f	m f	m f	m f	m f		m f	
Pictures U, Q						X^2		X^2
X			1 0 1 5%				0 1 1 7%	
V	1 0 1 3%	0 1 1 5%	1 0 1 5%				0 4 4 27%	
D	1 4 5 16%	0 2 2 9%	1 1 2 9%	2 0 2 6%	0 1 1 5%	1·49 d.f. 1	2 6 8 53%	23·05⊕ d.f.2
I	2 2 4 13%	0 1 1 5%	1 0 1 5%	2 0 2 6%		0·96 d.f. 1	1 8 9 60%	38·21⊕ d.f.2
W	12 18 30 94%	6 12 18 82%	11 11 22 100%	15 11 26 81%	13 9 22 100%	0·39 d.f. 1	2 11 13 87%	0·63 d.f. 2
A	13 18 31 97%	6 12 18 82%	11 11 22 100%	16 11 27 85%	13 9 22 100%		2 11 13 87%	
H	13 19 32 100%	9 12 21 96%	11 11 22 100%	17 11 28 88%	13 9 22 100%		2 12 14 93%	
R, O, N, P	13 19 32 100%	10 12 22 100%	11 11 22 100%	19 13 32 100%	13 9 22 100%		3 12 15 100%	

Significance: ⊕ = $p < \cdot 001$

children's groups, and five degrees when the adult results are included, but it was sometimes necessary to pool results in order to avoid having more than the permitted number of cells with low expected frequencies. Where data were pooled in this way, Groups 2 and 3 were always amalgamated first (d.f.3) and then if necessary Groups 4 and 5 were pooled (d.f.2); and finally Group 1 was added to Groups 2 and 3 (d.f.1). The results from the adult group were never pooled with those of another group.

The frequency data from Tables 5.3.5.1.(i) and (ii) have been simplified into quartiles and are displayed in the histograms of Figures 5A (i), 5A (ii), and 5A (iii), the first two Figures representing the sub-group data, and the third representing only the age variable. The histograms have been turned sideways in order to have four sets of category widths together on a page and facilitate comparison. The pictures in each set are again listed in order of size, this time across the top of each histogram, with the largest always on the left. Frequency of agreement on allocating a picture to a particular category is represented in the histograms as follows:

1 = 1 - 25% agreement
2 = 26 - 50% agreement
3 = 51 - 75% agreement
4 = 76 - 100% agreement

In addition, the solid black line, in the fourth quartile of each, marks the area of 100% agreement within a sub-group or group.

The results may be previewed by observing that on all categories for Form A, and for big and small on From B, there were found to be significant differences in category width consistent with a general view of girls as proportionately broader categorisers than boys, and in some cases these differences appeared to be relatively independent of age since they became significant when the age-group structure was collapsed, but were otherwise not significantly salient in any particular group. When the age-group structure of the sample was maintained, significant

FIGURE 5.A.(i)

Development of Category Widths with age.

Form: A (Ants)

Sex: male / female

Category: big

Pictures (male):

Group	T	S	E	F	C	G	B	J	K	L	M
1	4	4	4	3	2						
2	4	4	4	4	2	1					
3	4	4	4	4							
4	4	4	4	4	1						
5	4	4	4	4	3	1					
6	(4	4	4	4	4)						

Pictures (female):

Group	T	S	E	F	C	G	B	J	K	L	M
1	4	4	4	4	1						
2	4	4	4	4							
3	4	4	4	4							
4	4	4	4	4							
5	4	4	4	4	2						
6	4	4	4	4	4	3	2	2	2		

Category: small

Male:

Group	T	S	E	F	C	G	B	J	K	L	M
1			1	1	4	4	4	4	4	4	4
2					3	4	4	4	4	4	4
3					4	4	4	4	4	4	4
4					3	4	4	4	4	4	4
5					1	1	2	2	3	4	4
6					(2	2	2	2	3	4	4)

Female:

Group	T	S	E	F	C	G	B	J	K	L	M
1				1	4	4	4	4	4	4	4
2					4	4	4	4	4	4	4
3					4	4	4	4	4	4	4
4					4	4	4	4	4	4	4
5				1	4	4	4	4	4	4	4
6					1	1	2	3	4	4	4

Category: not small

Male:

Group	T	S	E	F	C	G	B	J	K	L	M
1	4	4	4	4	1	1		1	1	1	
2	4	4	4	4	2						
3	4	4	4	4	2	1	1				
4	4	4	4	4	2	1					
5	4	4	4	4	3	2	1				
6	(4	4	4	4	3	3	3	2	2)		

Female:

Group	T	S	E	F	C	G	B	J	K	L	M
1	4	4	4	4	1						
2	4	4	4	4	1						
3	4	4	4	4	1	1					
4	4	4	4	4	2						
5	4	4	4	4	3						
6	4	4	4	4	4	2	1	1	1	1	

Category: not big

Male:

Group	T	S	E	F	C	G	B	J	K	L	M
1				1	4	4	4	4	4	4	4
2					4	4	4	4	4	4	4
3					4	4	4	4	4	4	4
4				1	3	4	4	4	4	4	4
5					1	1	3	3	4	4	4
6					(2	2	4	4	4	4	4)

Female:

Group	T	S	E	F	C	G	B	J	K	L	M
1				1	4	4	4	4	4	4	4
2					4	4	4	4	4	4	4
3					4	4	4	4	4	4	4
4				1	3	4	4	4	4	4	4
5					3	4	4	4	4	4	4
6					2	2	3	3	3	4	4

FIGURE 5.A.(ii)

Development of Category Widths with age.

Form: B (Butterflies)

Sex: male / female

Category: big

Pictures:

Male

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1	4	4	4	4	4	3	1	1	1				
2	4	4	4	4	4	3	1	1	1				
3	4	4	4	4	4	4	1	1	1				
4	4	4	3	4	3	2	1						
5	4	3	2	2	1	1							
6	(4	4	3	4)									

Female

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1	4	4	4	4	3	3	1						
2	4	4	4	4	3	3							
3	4	4	4	4	3	2							
4	4	4	4	4	2	2							
5	4	4	4	4	2	2							
6	4	3	2	2									

Category: small

Male

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1		1		1	1	2	3	4	4	4	4	4	4
2							2	4	4	4	4	4	4
3					1	1	4	4	4	4	4	4	4
4					1	1	4	4	4	4	4	4	4
5							3	4	4	4	4	4	4
6					(2	3	3	4	4	4	4	4	4)

Female

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1					2	2	4	4	4	4	4	4	4
2					2	2	3	4	4	4	4	4	4
3					3	3	4	4	4	4	4	4	4
4					1	2	4	4	4	4	4	4	4
5						1	4	4	4	4	4	4	4
6					1	2	3	4	4	4	4	4	4

Category: not small

Male

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1	4	4	4	4	3	2	1						
2	4	4	4	4	4	4	3	1					
3	4	4	4	4	4	4	2	1	1				
4	4	4	4	4	3	3	1	1					
5	4	4	4	4	2	2	1						
6	(4	4	4	4	2	2)							

Female

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1	4	4	4	4	3	2	1						
2	4	4	4	4	2	2	1						
3	4	4	4	4	2	2	1						
4	4	4	4	4	3	2							
5	4	4	4	4	4	4	1	1					
6	4	3	4	4	2	1							

Category: not big

Male

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1				1	1	1	4	4	4	4	4	4	4
2							3	3	4	4	4	4	4
3			1	1	1	1	4	4	4	4	4	4	4
4					1	1	4	4	4	4	4	4	4
5							4	4	4	4	4	4	4
6					(3	2	3	3	3	4	4	4	4)

Female

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1					1	1	4	4	4	4	4	4	4
2				1	1	1	4	4	4	4	4	4	4
3					1		4	4	4	4	4	4	4
4							4	4	4	4	4	4	4
5					1		4	4	4	4	4	4	4
6			1	2	2	3	4	4	4	4	4	4	4

FIGURE 5.A.

Development of Category Widths with age.

Form: A (Ants). B (Butterflies).

Category: big.

Pictures (A):

Group	T	S	E	F	C	G	B	J	K	L	M
1	4	4	4	3	1						
2	4	4	4	4	1	1					
3	4	4	4	4							
4	4	4	4	4	1						
5	4	4	4	4	2	1					
6	4	4	4	4	4	3	1	1	1		

Pictures (B):

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1	4	4	4	4	3	1	1	1	1				
2	4	4	4	4	4	3	1	1	1				
3	4	4	4	4	4	3	1	1	1				
4	4	4	4	4	3	2	1						
5	4	4	3	3	2	2							
6	4	3	3	3									

Category: small.

Group	T	S	E	F	C	G	B	J	K	L	M
1			1	1	4	4	4	4	4	4	4
2					4	4	4	4	4	4	4
3					4	4	4	4	4	4	4
4					3	4	4	4	4	4	4
5				1	2	3	3	3	3	4	4
6					1	2	2	3	4	4	4

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1		1		1	2	2	4	4	4	4	4	4	4
2					1	1	3	4	4	4	4	4	4
3					2	2	4	4	4	4	4	4	4
4					1	1	4	4	4	4	4	4	4
5						1	4	4	4	4	4	4	4
6					2	2	3	4	4	4	4	4	4

Category: not small.

Group	T	S	E	F	C	G	B	J	K	L	M
1	4	4	4	4	1	1		1	1	1	
2	4	4	4	4	2						
3	4	4	4	4	2	1	1				
4	4	4	4	4	2	1					
5	4	4	4	4	3	2	1				
6	4	4	4	4	4	3	2	2	1	1	

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1	4	4	4	4	3	2	1						
2	4	4	4	4	3	3	2	1					
3	4	4	4	4	3	3	1	1	1				
4	4	4	4	4	3	2	1	1					
5	4	4	4	4	3	3	1	1					
6	4	4	4	4	2	1							

Category: not big.

Group	T	S	E	F	C	G	B	J	K	L	M
1				1	4	4	4	4	4	4	4
2					4	4	4	4	4	4	4
3					4	4	4	4	4	4	4
4				1	3	4	4	4	4	4	4
5					2	2	4	4	4	4	4
6					2	2	4	4	4	4	4

Group	U	Q	X	V	D	I	W	A	H	R	O	N	P
1				1	1	1	4	4	4	4	4	4	4
2				1	1	1	4	4	4	4	4	4	4
3			1	1	1	1	4	4	4	4	4	4	4
4					1	1	4	4	4	4	4	4	4
5					1		4	4	4	4	4	4	4
6			1	2	3	3	4	4	4	4	4	4	4

sex differences were found only sporadically in Group 2 and Group 3 results, mainly on Form B, and more consistently in the results for Group 5, here especially in connection with Form A.

As regards the variable of age, the category width data suggest that on both Forms there is a sizable minority in Group 1 whose judgements of big and small (or not big) are relatively undifferentiated; there seems to be a gradual increase, with age, in the number and frequency of pictures judged as big on Form A, and a corresponding decrease in those judged to be so on Form B: however, Figures 5A (i) and 5A (ii) quite clearly show the boys in Groups 4 and 5 to be further ahead than the girls in this process of category width refinement, if that is what it is. It can also be seen that whereas the boys in Groups 4 and 5 show signs of reducing the extension of the category small on Form A - more than compensating for the increase of big - there are few signs of such a development in the corresponding female sub-groups. On Form B there appears to be very little difference over groups in the category widths for small (see Figure 5A (ii).), at least as far as the areas of total agreement are concerned: even the adults in Group 6 do not show an overall increase in extension, and yet this is what one might reasonably expect if there is a reduction in the extension of big, since the reverse situation occurred on Form A, with big appearing to extend with age and small to contract. Let us consider these differences in more detail.

5.3.5.1.1. Big

On Form A, picture C was the crucial one, since there was a sharp interruption at this point in the size gradient represented by the ordered set of pictures, so that while picture C appeared much smaller than the four largest pictures it was still considerably larger than a normal ant. There were significant differences in the frequencies with which picture C was chosen as <u>big</u>: increase in age was related to increase in preference (see X^2 results in Table 5.3.5.1. (i), first page.), but there also appeared to be a relatively independent effect attributable to difference in sex, with more boys than girls choosing C (the X^2 result for this variable is given in Table 5.3.5.1.A.) - again significant, although not at such a low level of probability. A second finding, which was unexpected, was that over a quarter of Group 1 rejected picture F from the category <u>big</u>, as did some subjects in Groups 3 and 4. This caused X^2 significant (see first page of Table 5.3.5.1. (i) for the results) on the variable of age, but there was no difference attributable to sex. It can be seen that there is a general increase with age in the frequency with which extension of the category width for <u>big</u> occurs: although the overall age contingencies cannot be used to calculate X^2 beyond picture C in the set of pictures, there is an individual difference between Groups 5 and 6 on choice of G which gives X^2 significant ($= 6.76$, $p<.01$, d.f.1) on the variable of age. No child judgements of category width extend over more than six pictures, whereas some of the adults have seven or nine in the category <u>big</u>.

On Form B, where there were no sharp interruptions in the size gradient represented by the pictures of butterflies, the area of fluctuation in category extension was spread over a larger number of pictures, but the same underlying tendency towards category width refinement can be seen, except that here it leads to a gradual restriction rather than an increase in category width: older subjects allocated fewer and fewer pictures to the <u>big</u> category, which reduces in extension from nine (Group 1) to six (Group 5) and even to four (Group 6) pictures. Total agreement for <u>big</u> was limited to the largest drawing, picture U - compared with three pictures on Form A. The apparent restriction of category width with age caused X^2 to be significant for pictures Q, X, V, D and I, both within the child groups' frequencies and when the data

TABLE 5.3.5.1. A.

Observed values of X^2 computed from sub-group frequencies in Tables 5.3.5.1. (i) and (ii), for choice (+) versus non-choice(-) of pictures included in a category on Forms A and B. Significance levels are given at the foot of the page.

	Category:	big		small		not small		not big	
	Sex:	m	f	m	f	m	f	m	f
Form A	N=	66	64	66	64	66	64	66	64
Picture									
C	+	16	4	43	59	29	18	44	55
	-	50	60	23	5	37	46	22	9
	X^2	6·76θ		12·50⊕		2·87		5·63*	
G	+			53	61	10	1	51	62
	-			13	3	56	65	15	2
	X^2			5·46*		6·27*		9·33θ	
B	+			58	63			60	63
	-			8	1			6	0
	X^2			4·10†				4·15†	
J	+			58	64				
	-			8	0				
	X^2			6·30*					
K	+			59	64				
	-			7	0				
	X^2			5·24†					

Form B
Picture

Q	+	60	64		
	-	6	0		
	X^2	4·21†			
X	+	54	64		
	-	12	0		
	X^2	10·74θ			
V	+	54	63		
	-	12	1		
	X^2	8·21θ			
D	+			7	22
	-			59	42
	X^2			9·26θ	
I	+			9	26
	-			57	38
	X^2			10·70θ	

Significance:

† = p <·05
* = p <·02
θ = p <·01
⊕ = p <·001

from the adults of Group 6 were included in the computation: see Table 5.3.5.1. (ii), first page. There were also more boys than girls with restricted category width, so that they chose drawings from the midst of the set less often than girls did. As can be seen from Table 5.3.5.1.A., this led to significant differences in the pattern of choice for pictures Q, X and V, but this difference is not attributable to sex alone, since it is found to be limited largely to Groups 4 and 5, suggesting that boys of this age start differentiating category width for big before girls do. As a matter of fact, the sex difference is individually significant within Group 5 for pictures Q, X and V ($p<.05$; $p<.025$; $p<.025$ respectively, Fisher Exact Probability Test, 2-tailed). We might also note that within Groups 1, 2 and 3 there seems to be an exclusively male minority with extensive category widths for big that take in pictures W, A and H (see Table 5.3.5.1. (ii).), although the frequencies here are not large enough to be significant. Picture I, which is just larger than these, is chosen significantly more often by males than females in Group 3 for inclusion in the big category ($p<.05$, Fisher Exact Probability Test, 2-tailed).

The males who had these extended category widths are not those who had over-restricted widths on Form A: in fact, the Form B result in Groups 1 and 2 came entirely from subjects who also had relatively extended widths on Form A, choosing five or six pictures of ants as big. This suggests in turn that these Group 1 and 2 subjects may just have large category widths for big, regardless of the set of objects being categorised, and if this is so then it is more appropriate to the interpretation of the Form A results, discussed above, if we treat the sex difference found in the sample as being dependent on rather than independent of age, since the Group 5 results for picture C (and G) on Form A are relatable to category differentiation, whereas the Group 1 and 2 results generally are not.

5.3.5.1.2. Small

Compared with the previous category, small is relatively undifferentiated, since it is extensive in the judgements made on both Forms, which was not expected. This category has seven pictures in it in the Form A results, and nine in the Form B results, if we view the data generally. There is an age-related tendency in the frequencies on both Forms for small to become more differentiated in extension, although this development does not appear so dramatic as it did for big, and also unexpectedly takes the form of reduction in category width in both cases rather than only on Form A.

On Form A, a relatively large number of pictures is involved in the transition from extended to restricted category width: the second page of Table 5.3.5.1. (i) shows that total agreement on what to designate as small in Groups 1, 2 and 3 covers five pictures, B, J, K, L and M, but after this age total agreement is reduced to include only the last two pictures, and disappears totally in Group 5, where one boy refused to designate any ants as small (This is not a mistake: the script shows the pencil cross as having been erased rather than never having been drawn). However, agreement re-appears for picture M among the adult group, Group 6.

The sex and age variables seem to be linked on Form A, in that category width restriction is found in Groups 4 and 5 mainly (and in Group 6), but among the children restricting the category width for small, it is boys who significantly dominate. Table 5.3.5.1. (i) for this category shows age to be significantly associated with this change for pictures C, G, B and J, and Table 5.3.5.1.A., showing X^2 on the variable of sex, also gives the pattern of choice for K as significant. The contribution from Group 5 virtually made these results, since all the girls chose pictures C, G, B, J and K as small while few of the boys did so, a difference significant in all cases by Fisher Exact Probability Test ($p<.005$; $p<.005$; $p<.005$; $p<.025$; $p<.025$ respectively). The dominance of males is related to differentiation in Group 5 but not elsewhere, since the Group 5 boys who reduced category width for small were mainly those who also differentiated big "correctly" on both Forms, whereas for example in Group 2 those boys who did not choose Picture C as small were not consistent in their differentiation of big elsewhere, and gave choices suggesting that for them big and small were coded as complementaries rather than antonyms (we shall consider this aspect of results in Section 5.3.5.2.).

The results for Form B show that there was also a reduction in category width for small associated with age and sex, but the range of significant change is limited mainly to two pictures, namely D and I. There was never in any group a majority choosing these pictures as small (although there was in a sub-group: the females in Group 3), but generally the size of the minority who chose them decreased with age, although not without fluctuations. Group 2 seemed to be rather precocious in this respect; see the second page of Table 5.3.5.1. (ii), which shows the significance of the association between this change in category width and the variable of age. Table 5.3.5.1.A. shows that approximately three times as many girls as boys chose pictures D and I as small on Form B, a difference which is again significant, and is mainly caused by the early discrepancy found in Groups 1, 2, and 3, the differences between the sexes being individually significant in Groups 2 and 3 for both pictures ($p<.05$, Fisher Exact Probability). In Groups 4 and 5 the choice of D and I is strongly reduced for both sex sub-groups, but a further instance of the same sex-related choice pattern is found for the next picture in the series, picture W, which all the girls but only just over half the boys chose in Group 5 as small (significance: $p<.05$, Fisher Exact Probability Test).

On both forms, then, there is evidence that boys are more likely to have reduced category widths for small, compared with girls of the same age, and that category width tends to become reduced as children become older.

5.3.5.1.3. Not Small

It would be natural to expect that, given the reduction in the category width of small with age, there should be a corresponding increase in category width for its negative, not small, since together the two terms should exhaust a set of objects which they are used to describe. However, such is the case only on Form A; even here, the increase in category width for not small does not match the decrease for small.

On Form A there is general agreement in all groups that the four largest ants (pictures T, S, E and F) are not small. In Groups 1 - 4, a minority also class picture C as not small, and in Group 5 this choice is made by three-quarters of the group, making X^2 significant for the age variable across the children's groups (see Table 5.3.5.1. (i), third page), and much larger when the data from the adult group are included. There also seems to be an increase between groups in the number of subjects choosing picture G as not small, but this is only significant when data from the adult group are included in the computation of X^2. Proportionately more male than female children chose C and G as not small, but this is only statistically significant for picture G: see Table 5.3.5.1.A., where X^2 for C is significant only at the 10 per cent level on a two-tailed hypothesis. The sex difference for choice of picture G is also individually significant within Group 5 ($p<.025$, Fisher Exact Probability Test), but not elsewhere.

Form B shows a much weaker type of change, whose main effects are found between the children's groups on the one hand and the adults on the other, and even this difference is only significant in one case, for picture W, which no adult chose. For the two pictures D and I, which showed significant change in category width of small, there is no difference between the children's groups in the negative category, with about half of each group choosing these pictures as not small. General agreement is found in Groups 1 - 3 that pictures U, Q, X and V belong in this category, and Group 2 has a higher proportion of extended category widths than the groups on either side. This is especially noticeable for picture W, and it is probably this group's data that make X^2 significant on the variable of age at this point (see Table 5.3.5.1. (ii), third page). There are no overall significant sex-related differences in frequency of choice on Form B, but two individually significant differences are found: proportionately more boys than girls chose picture W as not small in Group 2, and proportionately more chose picture I (next to it) as not small in Group 3 ($p<.025$, $p<.05$ respectively, Fisher Exact Probability). These two differences are in line with those found in earlier categories.

It may be that the failure of not small to complement the development of small is an artefact of the experimental procedure, since the results for these two categories are derived from data gathered on two separate days. Undoubtedly this fact does explain some of the discrepancy, but it does not seem to have unduly affected the performance of the adults, so that there are grounds for proposing that the discrepancy in category widths is at least partly due to some other factor or factors related to cognitive development. This point will be taken up again later, after the data on category relations have been presented.

5.3.5.1.4. Not Big

For this negative category, unexpected results were again achieved: instead of a category width contraction on Form A and an expansion on Form B to complement the development noted earlier for big, what was found in both cases was a contraction in width in the child data.

On Form A the range of frequencies for pictures C and G (on the other side of the "size gap" in the ordered set of pictures) shows an age-related decrease from 100% choice in Group 1 to 32% and 50% respectively in Group 5, and these frequencies are virtually duplicated in the results from the adult group, making X^2 significant in all cases. Similar age-related reductions in frequency of choice are also found for pictures B and J, but the reductions are not large enough to be significant (See the fourth page of Table 5.3.5.1. (i)). Again, it was found that proportionately more boys than girls were involved in the reduction of category width: Table 5.3.5.1.A. shows the frequencies of choice to be significant for pictures C, G and B on the variable of sex, but it was mainly the Group 5 contribution that led to this result. Most of the boys in the group failed to choose C, G and B as <u>not big</u>, but most of the girls chose the pictures, so that for G and B the group result is individually significant ($p<.005$; $p<.05$ respectively, Fisher Exact Probability Test).

On Form B the category width data show two conflicting tendencies. Firstly, the area of total agreement on what is <u>not big</u> fluctuates from group to group. All groups agree on the four smallest butterflies as <u>not big,</u> but groups 1, 3 and 5 each unanimously include other drawings in this category. All these include the next picture, H, in the set, and Groups 3 and 5 also include pictures A and W. On three further pictures, I, D, and V, however, there is a second tendency, namely for the frequencies of choice - which are in any case low - to decrease with age among the child groups, in strong contrast to the frequencies obtained from the adults, which are uniformly large, and cause X^2 for pictures D and I to be highly significant on the age variable overall (See Table 5.3.5.1. (ii), fourth page.). No general differences are found related to sex, but within Group 2 a greater proportion of girls than of boys were "broad" categorisers, choosing A and W as not big ($p < .05$, Fisher Exact Probability Test). However, comparing this result with those of the other groups for the same pictures, it might be more appropriate to describe the boys as "narrow" categorisers, since the girls' category widths are no broader than those of the other groups.

If we try to reconcile the two tendencies found in the Form B data, we might see that they are both instances of an increase in compactness for this category (or, alternatively, a reduction in diffuseness) related to increased age. There must be some explanation for this, and as we shall see in the analysis of the data on category relations, presented in the following section, Group 5 is much more "adult" in some ways than the other children's groups, and Group 1 - to a lesser extent also Groups 2 and 3 - contains two different kinds of person, one of which has very broad category widths and causes the diffuseness just noted.

One last general observation that might be made here, and connects directly with what follows, is that quite obviously there are numerous instances of category overlap in the results so far discussed; if the frequencies for big and small (or not big) for picture C on Form A are added up for each group, for example, this is clearly seen to be so, especially for Group 1. Similar totals are found, though less often, for Form B. Let us now consider this aspect of the results and investigate its implications.

5.3.5.2. Conditions of Antonymy

The findings that younger children had wider categories than older children and that girls tended to have wider categories than boys may be explained in one of two ways: either the former group in each case have cognitively organised big and small as complementaries; or there is merely very little agreement among individuals as to where the boundaries of each category are to be placed, so that although each child has an antonym scheme for big and small, this is hidden by the cumulative effect of a frequency count, which tends to suggest category contiguity or even overlap.

In order to decide which of the above explanations was more consistent with the data, each subject's performance on Sheets 1 and 2 of Forms A and B was analysed in terms of the six conditions of antonymy (see criteria I - VI, following figure 2 in Section 5.1. above).

For each Form, four Category Widths per subject had been established (for big, small, not big and not small respectively). A pair-wise matching of these Category Widths yields a set of six Category Relations, each of which may have one of three possible structures (which will be referred to as values in the tabulation of results) determined by the type of pairing. The Category Relations and their structures are given below. The underlined value in each case is relatable to one of the six conditions of antonymy, given earlier.

	Category Relation	Value	Structure
I	big - not big	a	Separate categories with gaps between them.
		b	Separate but contiguous categories.
		c	Overlapping categories, sharing at least one member.
II	small - not small	d	Separate categories with a gap between them.
		e	Separate but contiguous categories.
		f	Overlapping categories sharing at least one member.
III	big - small	g	Separate categories with a gap between them.
		h	Separate but contiguous categories.
		i	Overlapping categories sharing at least one member.
IV	not big - not small	j	Separate categories with a gap between them.
		k	Separate but contiguous categories.
		l	Overlapping categories sharing at least one member.
V	big - not small	m	The positive category is less extensive than, and is included in, the negative category.

Category Relation	Value	Structure
	n	The positive category is isomorphic with the negative.
	o	The positive category includes the negative, which is less extensive.
VI small - not big	p	The positive category is less extensive than and is included in the negative category.
	q	The positive category is isomorphic with the negative.
	r	The positive category includes the negative, which is less extensive.

For convenience in what follows, the different types of structures will be referred to thus: in each of the first four Category Relations (I - IV), the first value (a, d, g, j) will be termed gapped, the second (b, e, h, k) contiguous, and the third (c, f, i, l) overlapping; for Relations V and VI, the first value (m and p) will be called included, the second (n and q) isomorphic, and the third (o and r) reversed.

As has already been indicated, under ideal conditions a subject for whom big and small and their negatives were organised antonymically should produce a set of values in the structural sequence b-e-g-l-m-p, while a subject who had coded them as complementaries would make category judgements yielding Relations structured as b-e-h-k-n-q. However, the conditions of the experiment were such as to favour some of the Category Relations at the expense of others, since within sessions subjects were asked to make judgements based on either pairs of positive or pairs of negative adjectives. Thus in the following analysis, Category Relations I, II, V and VI are derived from data obtained on two separate days, whereas Relations III and IV are derived from a single session.

For this reason the two sets of Relation values just mentioned were rarely found entire, although many related sets were found. However, Form A seemed to produce the sequence of values suggesting complementarity. The frequencies for this and for the antonymic set of values derived from the data of Forms A and B are given below:

Group:	1		2		3		4		5		6	
Sex:	m	f	m	f	m	f	m	f	m	f	m	f
Form A:												
b e g l m p	-	2	-	-	-	1	-	-	1	-	1	1
b e h k n q	4	7	3	10	6	7	9	4	1	3	-	3
Form B:												
b e g l m p	-	-	-	1	-	-	-	-	1	-	-	1
b e h k n q	1	3	-	1	3	1	4	3	1	2	-	-
N in Group:	13	19	10	12	11	11	19	13	13	9	3	12

No subject achieved a set of antonym values on both Forms, but some subjects in Groups 1 - 4 produced two sets of complementary structures in their data: a girl in each of Groups 1 and 2, two boys in Group 3, and five subjects (three boys and two girls) in Group 4.

Apart from these two combinations of Category Relations, a further fifty-five were obtained from the data of the 145 subjects. Twenty-three combinations were found to occur on both Forms, and Form A produced fewer different combinations (32) than Form B (48)[6]. These are listed with their frequencies of distribution in Appendix 4.B.

The problem that arose with such large numbers of Category Relation Value combinations was how to reveal any underlying common features in the mass of apparently conflicting detail. Accordingly, the data were subjected to two different types of treatment. Firstly, each Category Relation was treated in isolation, and frequency counts were established for each set of three values on the two Forms, A and B. These were then analysed and the results were used to provide an outline theory of the nature of change and development in cognitive structure. This theory was then tested and refined by applying it to the sets of value combinations found for each subject's data. For convenience in what follows, the treatment of the Category Relations in isolation will be termed their paradigmatic aspects, and the analysis of the - more intricate - dynamic of their combined value structure will be termed their syntagmatic aspects (see 5.3.5.2.2.). In both aspects of Category Relations, age and sex were again found to interact and to be significantly associated with differences in the structure of Category Relations.

5.3.5.2.1. Paradigmatic Aspects of Category Relations

Table 5.3.5.2.1. presents the frequencies, by sex and age-group, of each Category Relation value in the data from Form A and Form B.

Individual sets of sub-group frequencies for a given Relation were first tested to determine the likelihood of their having occurred by chance alone. The Kolmogorov-Smirnov test was used (Siegel, 1956 : 47 - 51) with a rejection region of 5% for a two-tailed hypothesis, since this is more suitable and powerful than X^2 for small frequencies distributed over three intervals. Where a set of sub-group frequencies was extreme enough to be significant at the chosen level, this fact is indicated by an asterisk beside the identity-number of a particular sub-group in the histograms of Figures 5B (i), 5C (i), 5D (i), 5E (i), 5F (i) and 5G (i), which present the Table 5.3.5.2.1. frequencies as whole percentages of each sub-group total. Each Figure represents the two pairs of sub-group results for Forms A and B for one particular Category Relation.

Based on Figures 5B (i) - 5G (i), six further sets of histograms present the combined sub-group percentage frequencies for the antonymic values b-e-g-l-m-p in Figures 5B (ii) - 5G (ii), together with the frequencies for an age-group as a whole (calculated as a percentage of the whole group, not as a mean of the two sub-group percentages). In none of the figures has the result for male sub-group 6 been plotted, except where the percentage frequency for the whole of Group 6 was recorded.

The frequency of the antonymic values b-e-g-l-m-p in groups and sub-groups was tested for significance by computing X^2. In order to meet the requirements of the test, the two alternatives to the antonym value in each case were pooled to create either a 5 x 2 or a 6 x 2 contingency table of observed frequencies, depending on whether Group 6 was excluded or included. The results from the sex sub-group observations are presented in Table 5.3.5.2.1.A., and the results by age-group alone are presented in Table 5.3.5.2.1.B below it. In some instances data from two adjacent groups or sub-groups had to be pooled to meet the requirements of the X^2 test, and where this was done Groups 2 and 3 were first pooled (giving d.f.3), and then if necessary Groups 4 and 5 (giving d.f.2 for the children's results) were combined. Reduced degrees of freedom have been noted in brackets in the Tables. In most cases pooling of data was such that sub-group results remained comparable, but female sub-group data had to be pooled more often because of the scarcity of antonymic values in this part of the sample.

Although there are good reasons for giving Category Relations III and IV priority in the analysis of results, these will for simplicity be considered in the order previously introduced, and so we shall begin with big - not big and small - not small, the complementary relations.

(i) Category Relations I and II.

Given the fact that these two relations hold between pairs of complementary categories, one would expect contiguity to be the predominant structural value in the data, but reference to Figures 5B (i) and 5C (i) shows that contiguity was not consistently the most frequent structure. While it was dominant in Groups 1, 2 and 3, particularly among the females (age range: 8;1 - 11;2), this is far less the case in the results for Groups 4 and 5 - as well as for Group 6 females - and as the histograms of Figures 5B (i) and 5C (i) show, in six out of eight cases

TABLE 5.3.5.2.1.

Frequency of choice of different Category Relation Values as a function of Form (A or B), Sex and Age-Group.

Form: A (Ants)

Sex:		male						female					
Group:		1	2	3	4	5	6	1	2	3	4	5	6
Group N =		13	10	11	19	13	3	19	12	11	13	9	12
Category relation	value												
I	a	4	1	1	5	5	–	4	1	2	3	1	2
	b	5	6	10	11	5	2	12	11	9	8	5	7
	c	4	3	–	3	3	1	3	–	–	2	3	3
II	d	–	3	–	3	8	1	–	–	–	3	–	4
	e	9	5	6	12	5	2	15	10	10	7	3	7
	f	4	2	5	4	–	–	4	2	1	3	6	1
III	g	3	1	–	5	12	2	6	–	3	3	–	8
	h	5	8	11	14	1	–	11	12	8	10	6	4
	i	5	1	–	–	–	1	2	–	–	–	3	–
IV	j	–	2	1	1	3	–	–	–	–	2	–	–
	k	10	4	6	13	5	1	12	11	9	8	4	5
	l	3	4	4	5	5	2	7	1	2	3	5	7
V	m	6	3	5	7	6	2	9	2	4	4	3	6
	n	5	5	6	11	6	–	9	10	7	9	6	5
	o	2	2	–	1	1	1	1	–	–	–	–	1
VI	p	2	3	–	4	11	2	3	–	1	4	–	7
	q	10	6	10	15	2	1	16	11	10	6	7	5
	r	1	1	1	–	–	–	–	1	–	3	2	–

TABLE 5.3.5.2.1. (cont'd)

Frequency of choice of different Category Relation Values as a function of Form (A or B), Sex and Age-Group.

Form: B (Butterflies)

Sex:		male						female					
Group:		1	2	3	4	5	6	1	2	3	4	5	6
Group N =		13	10	11	19	13	3	19	12	11	13	9	12
Category relation	value												
I	a	4	5	1	12	10	2	4	1	6	9	4	9
	b	2	4	8	6	3	–	11	9	4	4	4	3
	c	7	1	2	1	–	1	4	2	1	–	1	–
II	d	5	3	3	7	9	2	6	3	1	7	2	8
	e	4	2	4	8	3	1	7	6	7	6	5	4
	f	4	5	4	4	1	–	6	3	3	–	2	–
III	g	1	6	2	9	11	2	4	3	1	7	5	12
	h	6	2	5	7	2	1	9	5	7	5	3	–
	i	6	2	4	3	–	–	6	4	3	1	1	–
IV	j	6	5	2	9	7	–	8	4	7	8	2	3
	k	4	1	5	8	4	2	5	4	2	5	4	4
	l	3	4	4	2	2	1	6	4	2	–	3	5
V	m	1	5	4	8	7	2	3	2	2	3	5	9
	n	4	2	5	5	6	1	11	6	8	6	3	3
	o	8	3	2	6	–	–	5	4	1	4	1	–
VI	p	3	2	3	5	5	3	3	5	1	1	1	11
	q	4	5	6	9	8	–	9	3	2	6	7	1
	r	6	3	2	5	–	–	7	4	8	6	1	–

TABLE 5.3.5.2.1.A.

Observed values of X^2 computed from the frequencies in Table 5.3.5.2.1. for presence versus absence of Category Relation Values that are criterial to the logic of antonymy. Unless otherwise specified by a number in brackets following a result, significance⁺is for four degrees of freedom (Groups 1-5) or five degrees (Groups 1-6); and a two-tailed h.

Category and value	Form A (Ants) Groups: 1 - 5 males	Form A (Ants) 1 - 5 females	Form A (Ants) 1 - 6 females	Form B (Butterflies) 1 - 5 males	Form B (Butterflies) 1 - 5 females	Form B (Butterflies) 1 - 6 females
I b	8·78°	6·04 (2)	5·35 (3)	10·42⁺	6·33	8·91
II e	3·10	11·31*(3)	10·57*(3)	2·14	2·26	3·20
III g	31·30⊕	2·92 (2)	14·26θ(3)	19·77⊕	8·53*(2)	27·11⊕(3)
IV l	0·53(2)	4·04 (2)	7·88⁺(3)	3·80 (2)	1·97 (2)	2·49 (3)
V m	1·01	2·19 (2)	3·18 (3)	3·14 (2)	1·07 (2)	15·04θ(3)
VI p	22·84⊕(2)	2·23 (2)	14·94θ(3)	1·07 (2)	2·32 (2)	28·85⊕(3)

TABLE 5.3.5.2.1.B.

Observed values of X^2 as above, but with the data from male and female sub-groups pooled, leaving Form (A or B) and Age-Group as the variables.

Category and value	Form A (Ants) Groups: 1 - 5	Form A (Ants) 1 - 6	Form B (Butterflies) 1 - 5	Form B (Butterflies) 1 - 6
I b	11·51⁺	11·52⁺	6·52	10·74°
II e	10·01⁺	10·03°	3·34	8·31
III g	16·65θ	26·11⊕	25·72⊕	41·52⊕
IV l	3·54	8·82	7·97°	9·65°
V m	5·19	6·44	11·19⁺	21·13⊕
VI p	15·19θ(3)	24·22⊕(4)	0·96(2)	34·09⊕(4)

⁺Significance is symbolised as follows:

° = p <·10   θ = p <·01

⁺ = p <·05   ⊕ = p <·001

* = p <·02

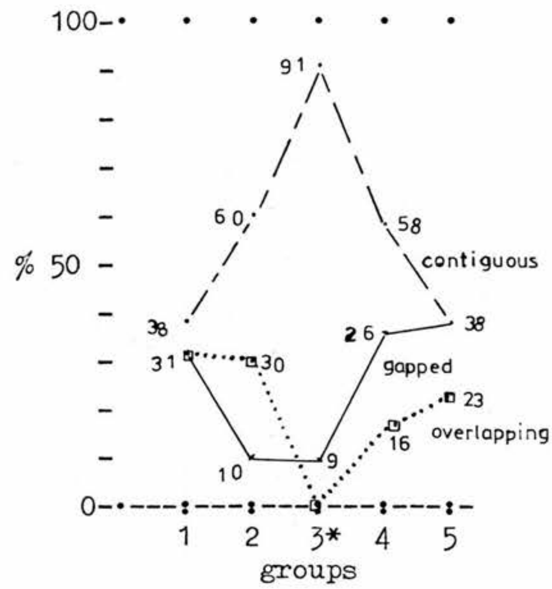
FIGURE 5 B (i).

Percentage frequency of Category Relation Values, by Form, Sex and Age. An asterisk beside the identity number of any age-group signifies the set of three values for that group had probability of occurrence of less than ·05 (Kolmogorov-Smirnov One-Sample Test).

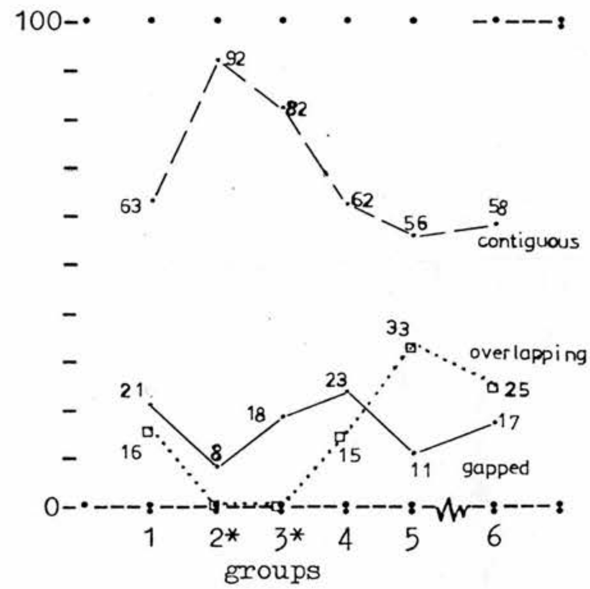
Relation I: big - not big

Form A (Ants)

males

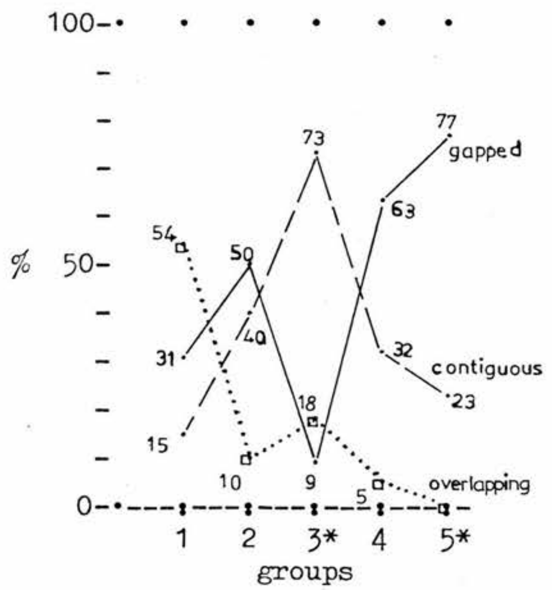


females



Form B (Butterflies)

males



females

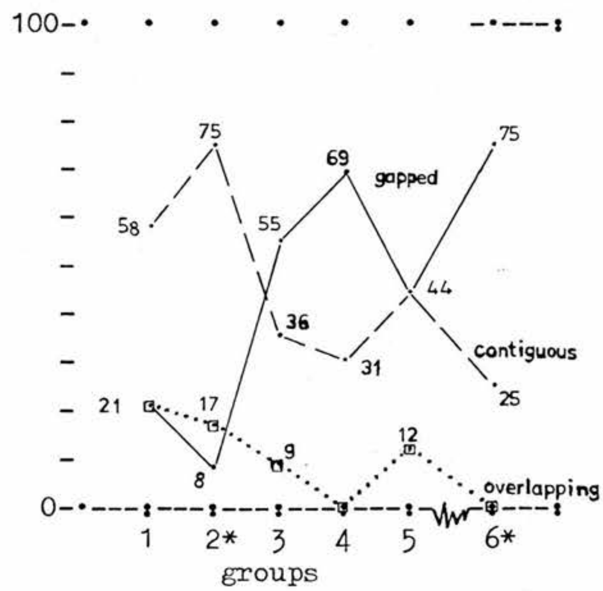
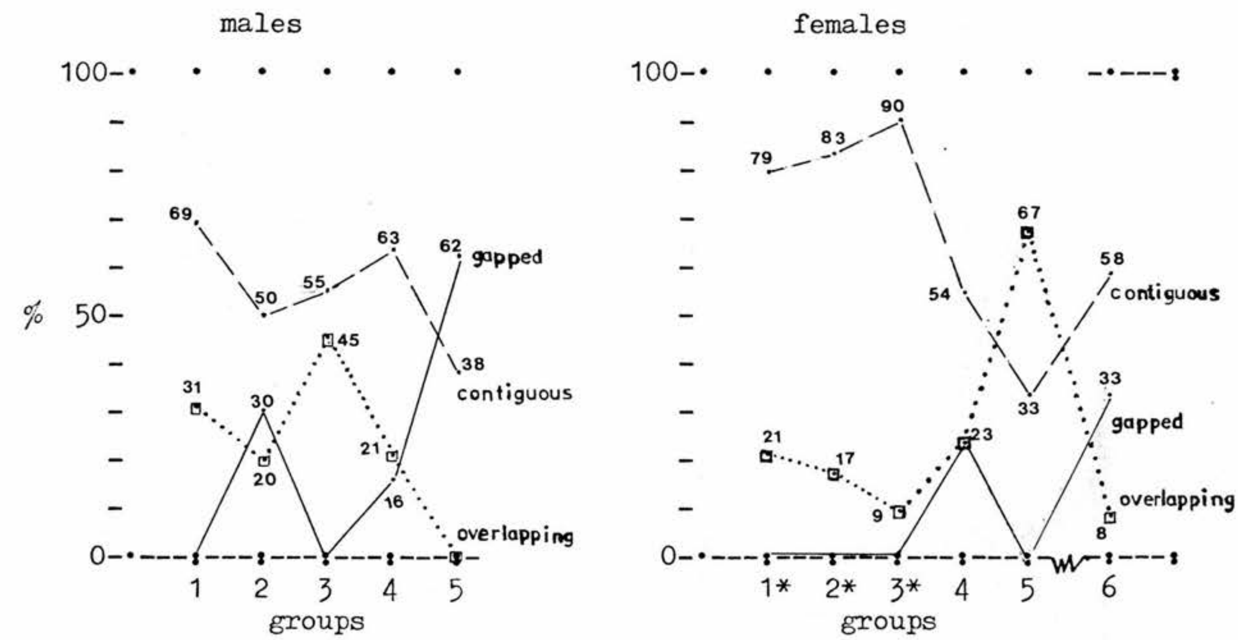


FIGURE 5 C (i)

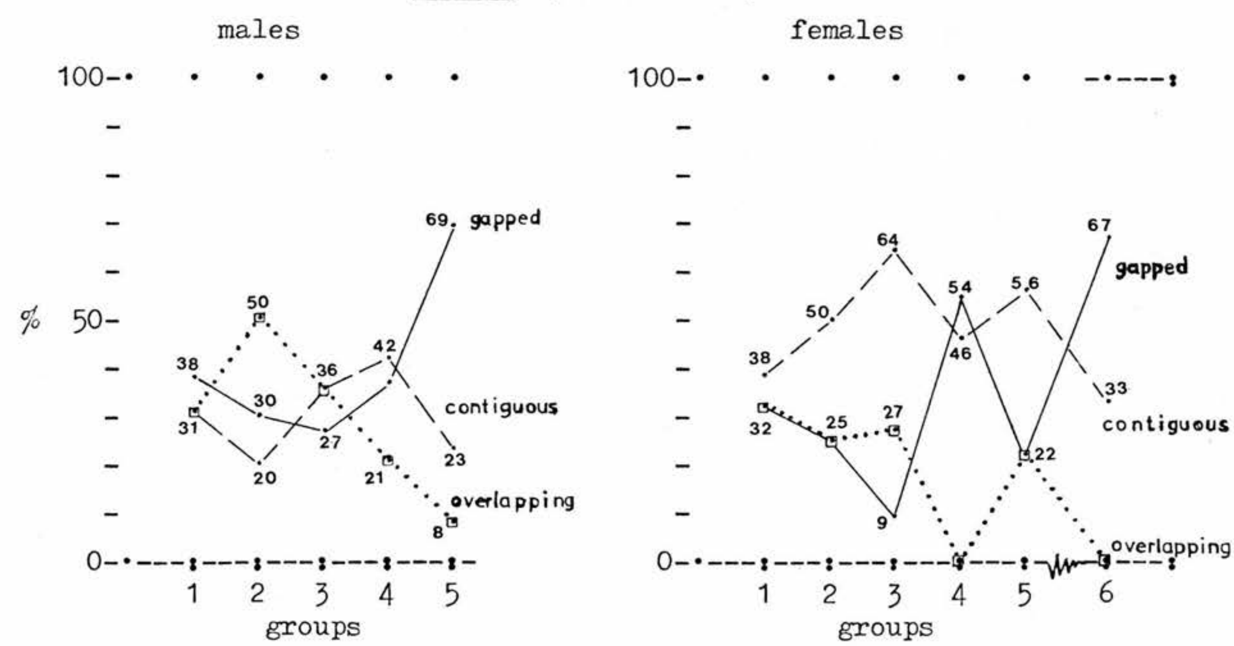
Percentage frequency of Category Relation Values, by Form, Sex and Age. An asterisk beside the identity number of any age-group signifies that the set of three values for that group had probability of occurrence of less than ·05 (Kolmogorov-Smirnov One-Sample Test).

Relation II: small - not small

Form A (Ants)



Form B (Butterflies)



gapping was either as frequent or more frequent for these two Category Relations, and is significantly high both in male sub-group 5 and in female sub-group 6 for Category Relation I on Form B.

Perhaps as a result of the interruption of the size gradient represented in Form A, this form elicited more contiguity of structure than Form B, but the effect is more notable in the youngest three groups, and observed X^2 for the differences in frequency of contiguity across groups is significant only in some cases, as can be seen from the first two rows of Tables 5.3.5.2.1.A. and 5.3.5.2.1.B. When the sub-group structure is preserved, significance at the chosen level is found in Category Relation I (big - not big) only for males and only on Form B; and in Category Relation II (small - not small) it is found only for females and only on Form A. For the age variable alone (Table 5.3.5.2.B.) X^2 for the two Relations is significant at the chosen level only on Form A.

A number of differences in frequency of Category Relation values are associated with the variable of sex. So, for example, it can be seen from Figure 5B (i) that Group 1 males' structures were far less differentiated than those of the female sub-group, and there was far more overlapping in the males' results than in the females' for big - not big. On Form B this difference is significant for presence or absence of contiguity ($X^2 = 4.15$, $p<.05$, d.f.1), and the overlapping of big and not big is a direct consequence of the over-large category widths found among some boys in Group 1, and already reported at the end of section 5.3.5.1.4. The effects of the sex variable are not wholly independent of age, however, since they fluctuate in strength as the age of the sample increases. Thus collapsing the age-group structure in sub-groups 1 - 3 results in a consistently higher contiguity frequency being revealed for females for big - not big and small - not small on both Forms, but

X^2 is significant only for small - not small on Form A (males N = 34; females N = 42; $X^2 = 4.49$, $p<.05$; d.f.l.). This higher frequency of contiguous structure among the girls is maintained in all cases when the results from all the child groups are pooled, but the difference between girls and boys is then less prominent as contiguity is less frequent in the later age-groups, and X^2 is no longer significant at the 5% level: for Category Relation I, value b,

Form A $X^2 = 2.25$

Form B $X^2 = 2.47$

and for Category Relation II, value e

Form A $X^2 = 2.25$

Form B $X^2 = 3.08$ ($p<.10$), all d.f.l.

On the other hand, collapsing the sub-group structure but maintaining the age variable, as can be seen from Table 5.3.5.2.1.B, continues to yield significant differences in the frequency with which contiguous structures occurred in the two Category Relations. This is especially the case for the children's groups on Form A: adding the results from Group 6 (which are predominantly from women) to the computation does not enhance X^2 for Form A, and although it does so for Form B none of the results is significant at the five per cent level.

It can thus be seen that there is again a sex by age interaction, but that age is the stronger variable overall. However, generalising these results to the population at large, it may be the case that the variable of sex is associated with faster or slower progress in the development of particular category relations. Support for such a view is found in Figures 5B (ii) and 5C (ii), which present the relative percentages of frequency for just the contiguous structures in each Category Relation.

For big - not big, Figure 5B (ii) shows the highest frequency of contiguity for girls is in Group 2, after which there is a decline.

Percentage frequency of Category Relation Values typical of antonymy. Each histogram shows the superimposed results for males (broken line), females (dotted line) and each group as a whole (solid line), by Form and Age.

FIGURE 5 B (ii)

Category Relation I: big - not big   Value: b (contiguous)

Form A   Form B

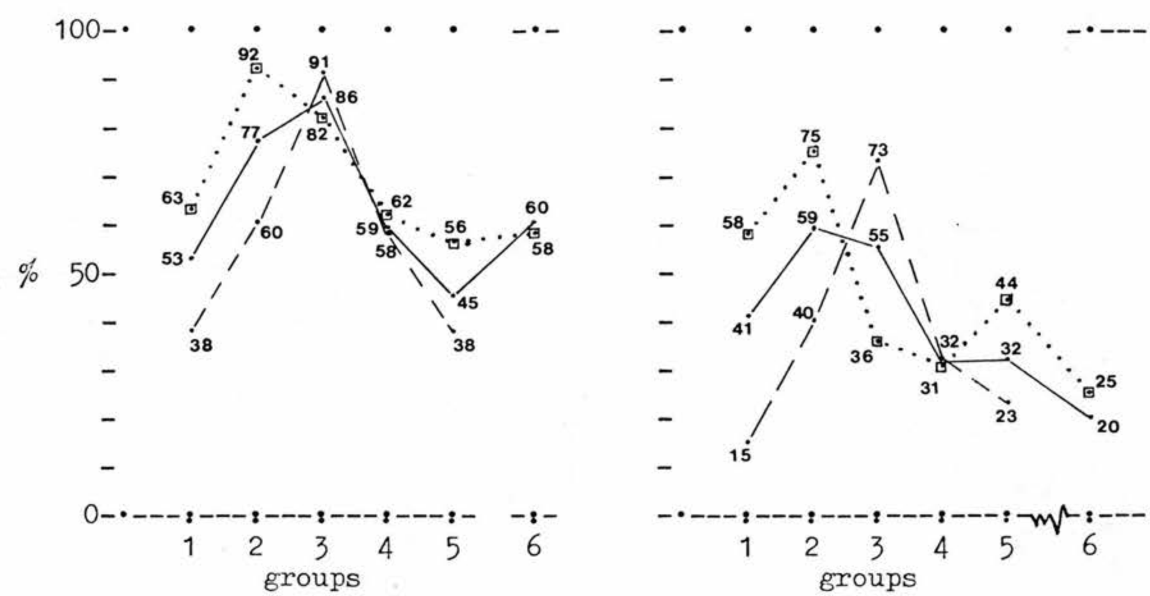
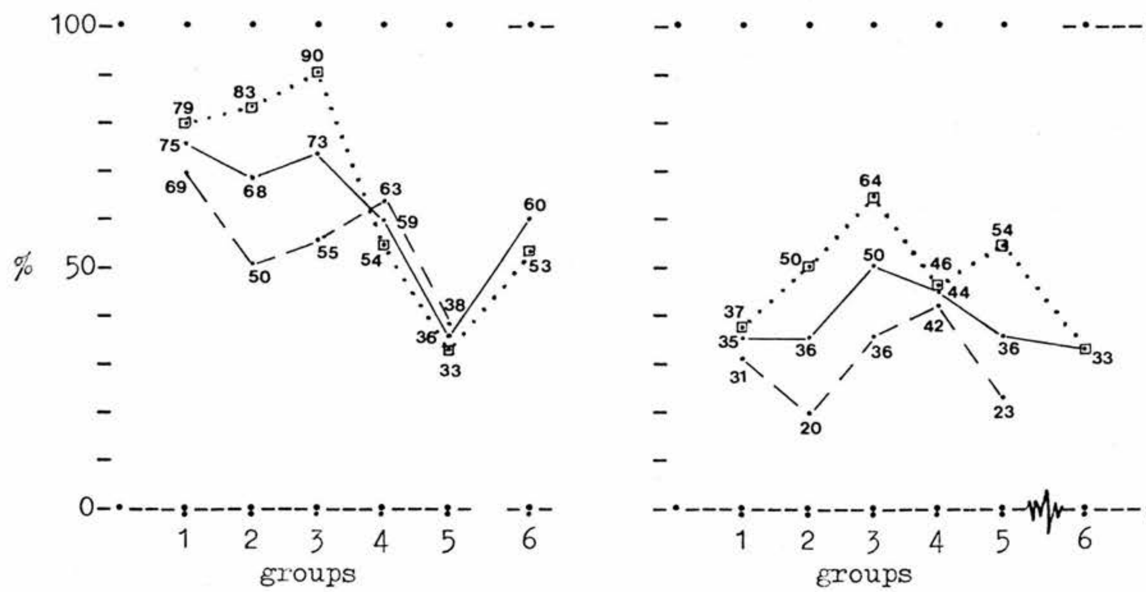


FIGURE 5 C (ii)

Category Relation II: small - not small   Value: e (contiguous)

Form A   Form B



For boys, on the other hand, the highest frequency is located one year later, in Group 3. Prior to this the frequencies are low, and much lower than for girls of the same age. After Group 3 there is again very low frequency for contiguity in the male sub-groups, whereas the reduction is not so marked among females. This general description applies to the results on both Forms, although for Form B the frequencies are generally lower all round. The Kolmogorov-Smirnov One-Sample Test applied to the frequencies for the three different values on big - not big - the frequencies for only contiguous structure are given as percentages in Figure 5B (ii) - gives the scores for Groups 2, 3 and 4 as significant on Form A ($p<.01$, $p<.01$, and $p<.05$ respectively) but on Form B the scores for Groups 4, 5 and 6 are significant ($p<.01$, $p<.05$ and $p<.05$ respectively). On the Form A result it is the frequency score for contiguous structure that is significantly high, and on Form B it is the frequency of gapping. Interestingly, the Group 4 result is significant on both Forms, although the predominant structures are different! A large proportion of the group had big and not big contiguous when categorising ants, but gapped when categorising the butterflies on Form B. This gapping in the structure is related to the findings, already reported in sections 5.3.5.1.1. and 5.3.5.1.4., of restricted category widths for big and not big in this group.

It would be natural to suppose that because Category Relations I and II are both of complementary type, they develop together, but Figures 5C (i) and 5C (ii) show that the structure of small - not small, while bearing some similarities, differs in a number of respects from big - not big. The highest frequency for contiguous structure among females is found in Group 3 on both Forms: see Figure 5C (ii). For males, the highest frequency is found in Group 4, but the Group 1 result is also high enough to be treated as equivalent, and generally the frequency scores for the four youngest male groups are quite similar, suggesting that the structure of small - not small is relatively poorly differentiated. As can be seen from Figure 5C (i), none of the sets of male values on this Relation had frequencies which were significant on the Kolmogorov-Smirnov test, whereas female sub-groups 1, 2 and 3 had significant results on Form A. The frequencies in the male sub-groups generally do not surpass those found in the female sub-groups, and this is different from the results for big - not big; although it still appears to be the case that males in the younger half of the sample are less able than their female counterparts to structure small - not small as contiguous, there is no inference to be made in this instance that males lag behind females by a year which they then make up by about the age of Group 4 - 5. Testing the frequency of the values d-e-f found in each age-group revealed significant departures from chance for only the scores of Groups 1, 2, 3 and 4 on Form A, where contiguity was dominant (Kolmogorov-Smirnov One-Sample Test; $p<.01$, $p<.05$, $p<.01$, $p<.05$ respectively). On Form B no score was beyond chance level, and the implications of these two findings are that small - not small is not such a well-organised structure as big - not big.

The paradox in these results is that in both Relations the older groups (4, 5 and 6) seem less logical than the younger ones, since they have comparatively low frequencies for contiguous structure, and many of the older subjects have gaps in the structure of the positive-negative relations which ought to be closed. The fact that gaps occur more frequently needs to be explained.

Clearly the experimental conditions were the same for all groups, and these two Category Relations should have the same structural value no matter whether big and small were coded as antonyms or as complementaries, since in either case each adjective will always be the complementary of its negation, so that the category widths of an adjective and its negation should exhaust a set of entities which they are used to characterise. An explanation does not lie in this direction, then. Where it does lie is in the unavoidable inference that there are two kinds of logic, one of which is in process of dissolution and replacement by the other during the long period of childhood represented by the experimental sample. Detailed discussion of the nature of this transition will be delayed until the other results have been presented, but it will become clear as these are introduced and analysed that up to approximately the age of Group 3 (11;02 years) contiguity - and its correlate, isomorphic structure - is a basic structural value <u>for all</u> Category Relations, whereas from Group 4 upwards the structures of the Relations begin to take on a variety of values, so that while the underlying logic of Group 1 - 3 judgements is consistent with complementarity, the prevailing logic underlying judgements made in Groups 4, 5 and 6 is increasingly that of antonymy. We can see this especially unambiguously in the structure of the relation <u>big-small</u>, which will be described next.

(ii) Category Relation III

As can be seen from Figure 5D (i), amongst the frequencies that were significantly different from each other in the set of values obtained from each sub-group (Kolmogorov-Smirnov One-Sample Test), Form A results are significant for contiguity of structure in Groups 2, 3 and 4. Form B did not produce such high frequencies, although contiguity is still the most frequent structure for the first three female sub-groups. The Group 5 male results are significant on both Forms, as is the adult female Group 6 result on Form B: both these groups, however, have high frequencies for gapping rather than for contiguity of the categories <u>big</u> and <u>small</u>, so that X^2 for the association between age and differences in structure is significant with at least $p<.05$ in all cases except

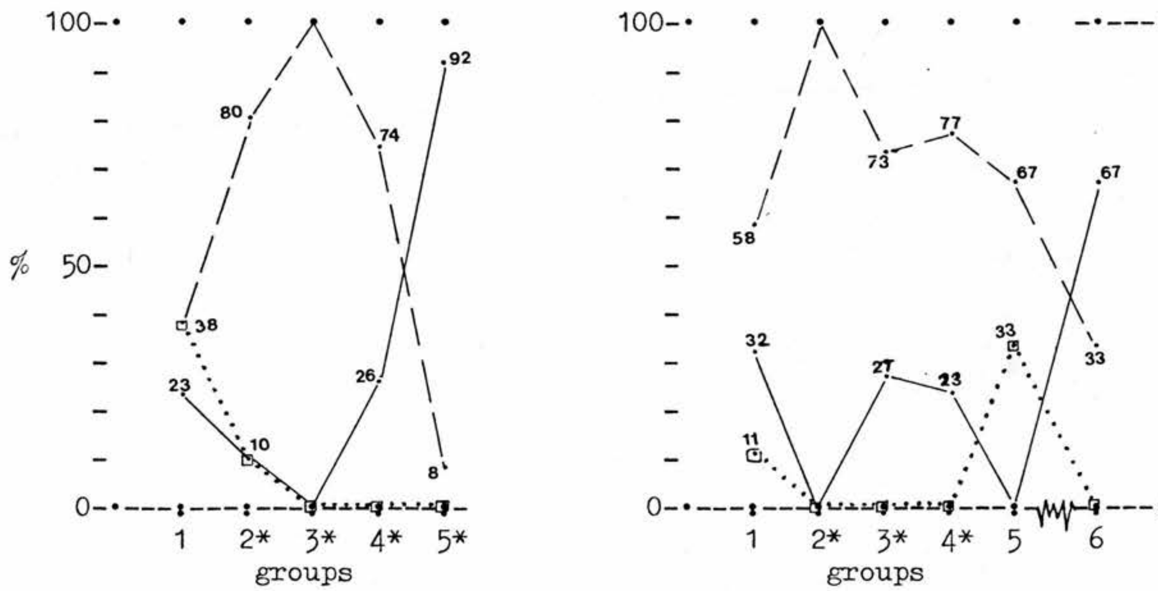
FIGURE 5 D (i).

Percentage frequency of Category Relation Values, by Form, Sex and Age. An asterisk beside the identity number of any age-group signifies that the set of three values for that group had probability of occurrence of less than ·05 (Kolmogorov-Smirnov One-Sample Test).

Relation III : big - small

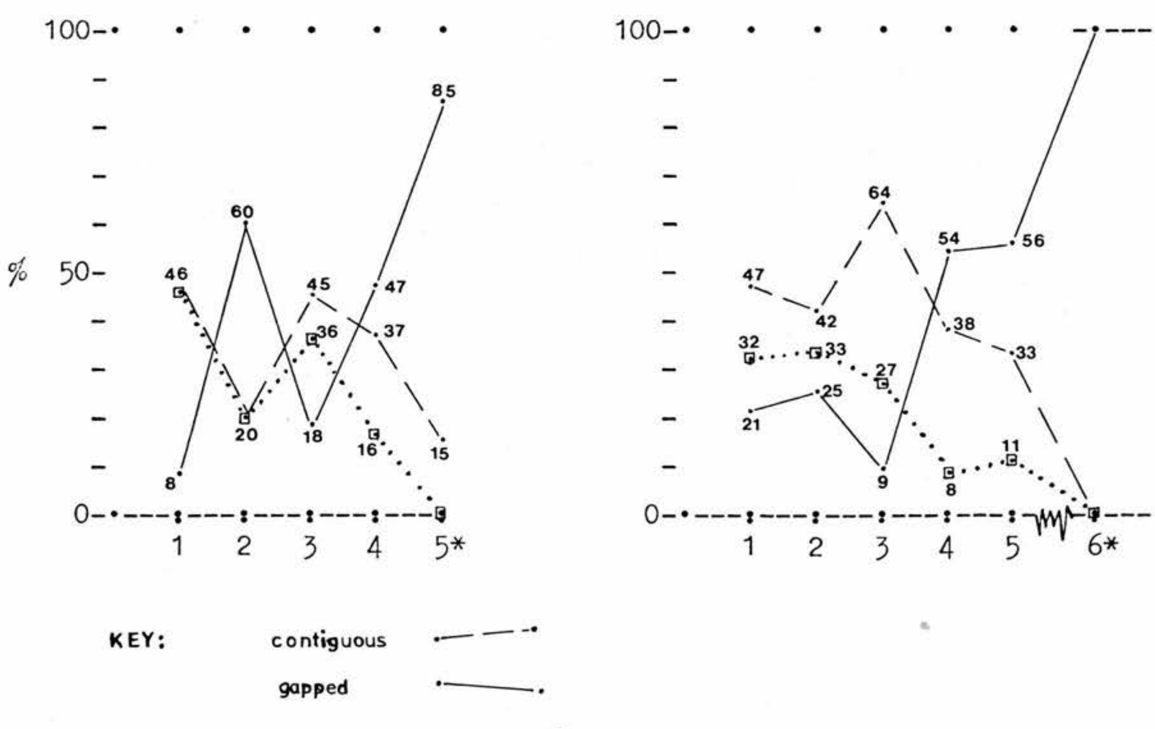
Form A (Ants)

males females



Form B (Butterflies)

males females



female sub-groups 1 - 5 on Form A: see Tables 5.3.5.2.1.A and B for the results on Category Relation III. The reason for lack of significance for the female sub-group results on Form A can be seen in the top right histogram of Figure 5D (i), where frequencies are shown to be consistently high for contiguity right up to the oldest group of girls.

This suggests that the older girls were affected in the same way as younger children by the visual peculiarities of Form A, while the older boys, in Group 5, were able to overcome these, producing no overlapping and very little contiguity of structure. The Forms A and B are discrepant by one year as regards the age at which the transition from contiguity to gapping appears among the majority of children in a group. Form B shows this occuring definitively for males and females at about the age of Group 4 (11;0 - 12;7 years) - see Figure 5D (i) - but Form A shows the transition only for males in Group 5. In this connection the frequency of gapping among male sub-group 2 on Form B appears eccentric, but is explained by their premature narrowing of category small (see section 5.3.5.1.2.). We must note, though, that whereas all these males had reduced category width, only 60% produced gapped structure for big-small, and this shows that there is no total correlation between differences in category width and differences in the structure of category relations produced by any one group, even if, as inevitably must be the case, the reduction in category width for one or both adjectives is a pre-requisite for gapping to occur.

This last observation particularly applies to Group 5, whose sub-groups,as can be seen from Table 5.3.5.2.1. for Form A, produced sets of values totally at variance with each other, a difference which is highly significant for presence versus absence of gapping ($p<.005$, Fisher Exact Probability Test).

Figure 5D (ii), which summarises the sub-group and general age-group

Percentage frequency of Category Relation Values typical of antonymy. Each histogram shows the superimposed results for males (broken line), females (dotted line) and each group as a whole (solid line), by Form and Age.

FIGURE 5 D (ii)

Category Relation III: big - small Value: g (gapped)

Form B | Form A

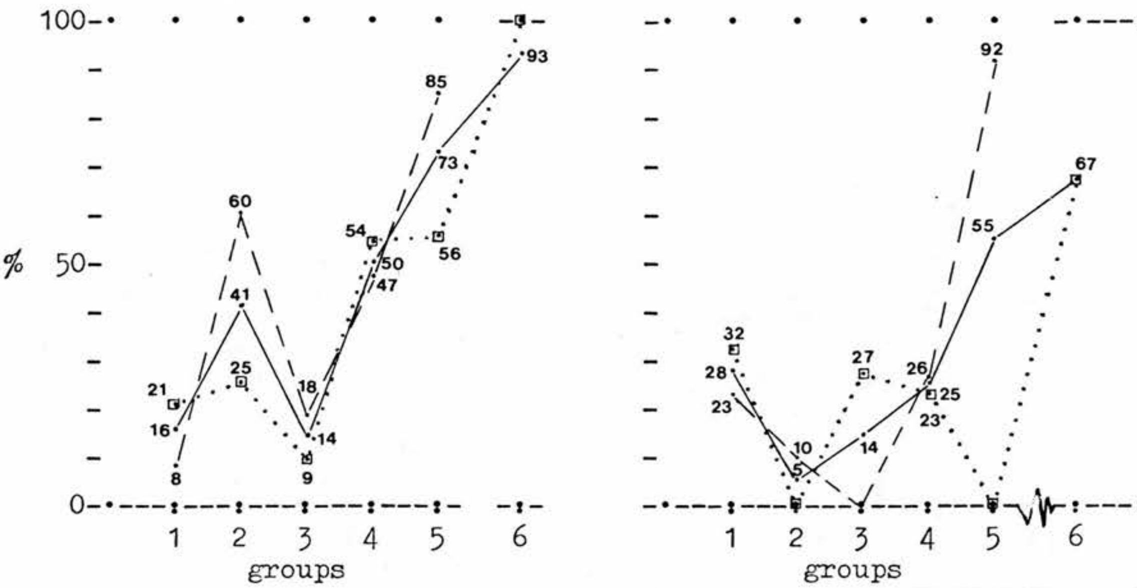
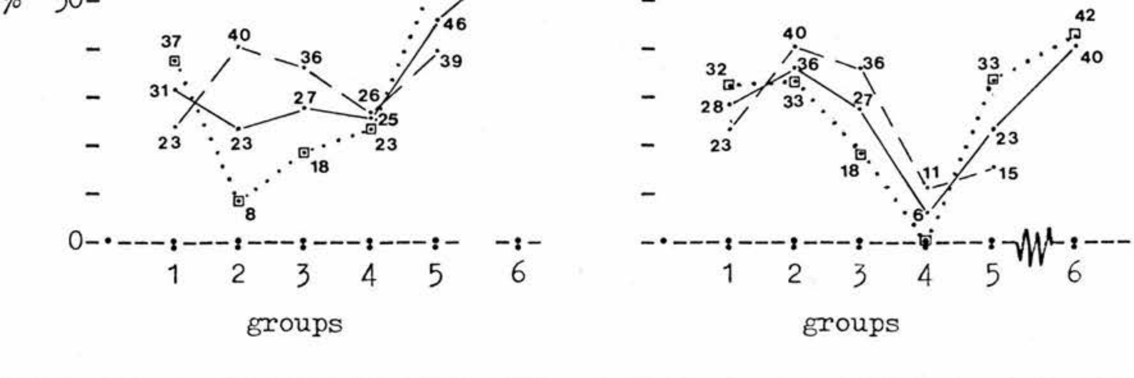


FIGURE 5 E (ii)

Category Relation IV : not big - not small Value: l (overlapping)

Form A | Form B



frequencies of gapping on the two forms, shows girls and boys to be very close in Groups 1 and 3, in Group 2 on Form A and in Group 4 on Form B. The frequencies of gapping in age-groups 2, 3 and 4 on Form A are significantly low, when tested together with alternative values ($p<.01$ in all cases), on the Kolmogorov-Smirnov One-Sample Test, and on Form B for Groups 5 and 6 they are significantly high ($p<.05$ and $p<.01$ respectively.). The underlying feature of these data seems, then, to be a process of change associated with increase in age, whereby the mass of children move from a relatively undifferentiated set of structures at mean age 8;8, through a period when big and small are marked by contiguity of structure for the majority, to a stage of development around mean age 13;0 when gapping appears, signifying a change in the dominant form of logic for these adjectives from complementarity to antonymy. Girls appear to be slightly ahead of boys in the development of complementarity, but boys appear to make up this disadvantage rapidly and to be earlier in developing the logic of antonymy.

(iii) Category Relation IV.

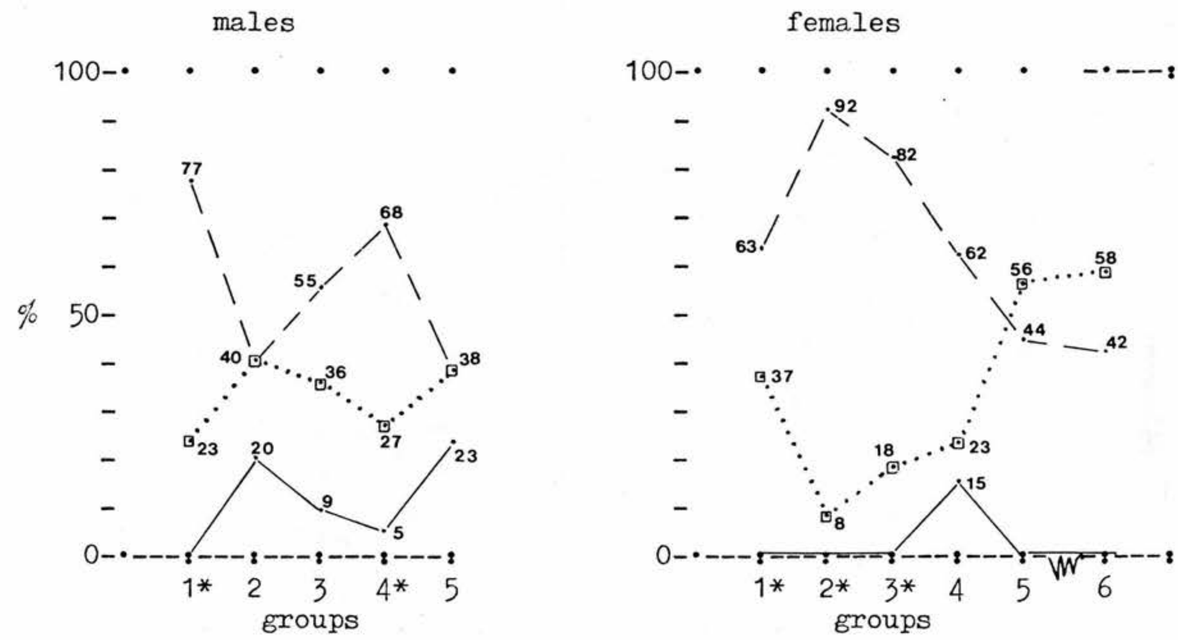
Of all the six Category Relations, that between the two negatives, not big and not small, is the least clearly structured, as can be seen from Figure 5E (i), and there is very little in the way of radical change visible in the results of the child groups. The behaviour that would be typical of ideal antonymy, namely overlapping of categories, is rarely found to be dominant: even among the adult females it is only slightly more frequent than contiguity on Forms A and B, although on Form A this causes the only significant X^2 result (see Table 5.3.5.2.1.A), mainly because the adult achievement contrasts with a very high frequency for contiguity in the three youngest groups, whose individual sets of scores are also significant (Kolmogorov-Smirnov One-Sample Test). Two other high frequencies for contiguity, in male sub-groups 1 and 4 on Form A,

FIGURE 5 E (i).

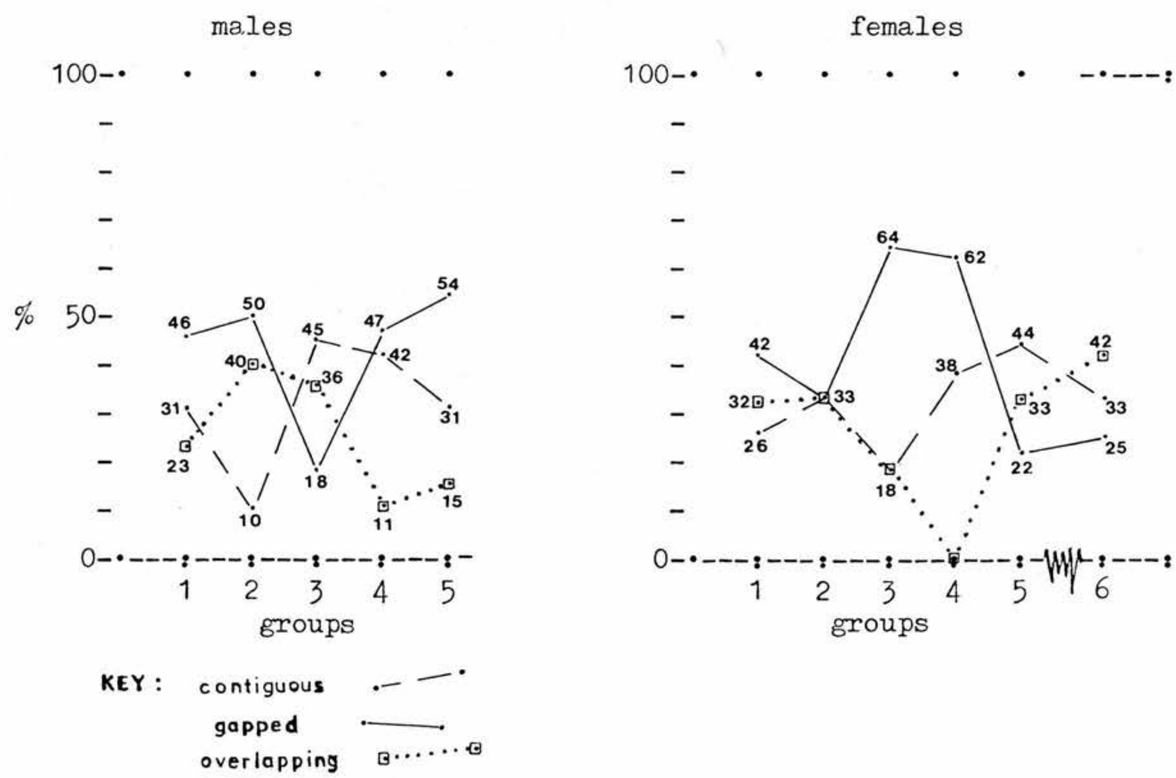
Percentage frequency of Category Relation Values, by Form, Sex and Age. An asterisk beside the identity number of any age-group signifies that the set of three values for that group had probability of occurrence of less than ·05 (Kolmogorov-Smirnov One-Sample Test).

Relation IV : not big - not small

Form A (Ants)



Form B (Butterflies)



are also extreme and part of significant sets of value frequencies on the Kolmogorov-Smirnov test.

The Form A results displayed in Figure 5E (i) suggest contiguity as again the most dominant structure, with gapping the least frequent and overlapping somewhere intermediate between the two. It is difficult to know whether the superiority of overlapping over contiguity of structure in the results from female sub-group 5 on Form A is indicative of a permanent development occurring at that age, since nothing similar occurs in the Form B data. It seems much more likely that this is directly related to the fact that girls in Group 5 had larger category widths in general on Form A, causing quite high frequencies for overlapping in all the Category Relations so far discussed: Cf. the second histogram in each of Figures 5B (i), 5C (i) and 5D (i).

Form B results are generally lower, and also different, since gapping seems slightly more frequent than other structures, and no set of values in sub-group data is significantly different from chance.

When the sub-group structure is collapsed, the virtual disappearance of gapping and the high frequency of contiguity makes the set of frequencies from Groups 1, 2, 3 and 4 significantly different from chance ($p<.01$, $p<.05$, $p<.05$, $p<.01$; Kolmogorov-Smirnov) on Form A, and in Group 4 on Form B the extremely low frequency of overlapping makes the set of value frequencies also significantly different from chance probability ($p<.05$; Kolmogorov-Smirnov).

The absence of anything like a sudden increase in overlapping of structure among the oldest children, and if anything a prominence of either contiguity or gapping, implies that the overlapping of negatives <u>not big - not small</u> is much later to develop than any of the Relations so far discussed: even the data from Group 6, as can be seen in the synopsis of Figure 5E (ii), while showing an increase in frequency of overlapping compared with the Group 5 results, are not particularly convincing, and are not high enough to be within the region of rejection on any test of significance.

One last point to be made here, and which will be taken up later in the discussion, is that on the basis of the category width data for not small and not big (sections 5.3.5.1.3. and 5.3.5.1.4.), certain groups could have been expected to show quite high frequencies of overlapping in the Category Relation, and yet they show no such frequencies, which indicates that broad categorisers for one negative were not always broad categorisers for the other. This observation helps us to understand the nature of the development of antonymic logic, as will later emerge.

(iv) Category Relations V and VI.

Figures 5F (i) and 5G (i) show the big - not small and small - not big Relations to be predominantly isomorphic in structure for those age-groups where contiguity is the main structure in the other four Relations. Isomorphic structure is not found to be consistently dominant, however, since in Groups 1 and 2 it is relatively undifferentiated from the alternative structures, and in Groups 5 and 6 inclusion is sometimes a significantly more frequent structure. It also seems that inclusion becomes a dominant structure earlier for big - not small than for small - not big and that males are ahead of females in developing it in both Relations.

As Figure 5F (i) shows, few of the individual sets of frequencies are extreme enough to reach significance on the Kolmogorov-Smirnov test. Significance is found for the high frequencies of isomorphic structure in female sub-groups 2 (on Form A) and 3 (on Form B), and the high frequency of included structure found in the data from the women in Group 6 also reaches significance on Form B. When sub-groups are

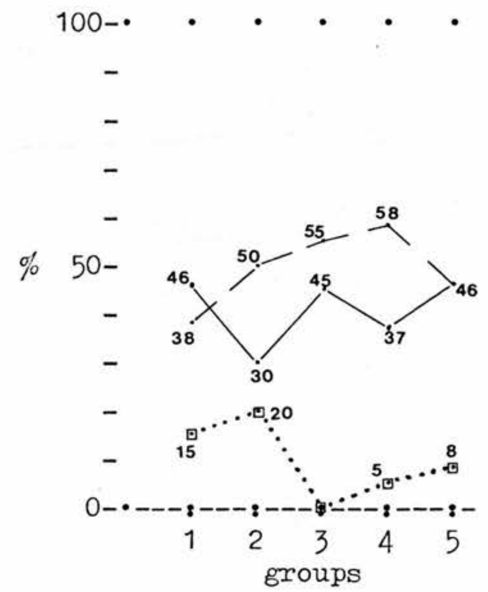
FIGURE 5 F (i).

Percentage frequency of Category Relation Values, by Form, Sex and Age. An asterisk beside the identity number of any age-group signifies that the set of three values for that group had probability of occurrence of less than ·05 (Kolmogorov-Smirnov One-Sample Test).

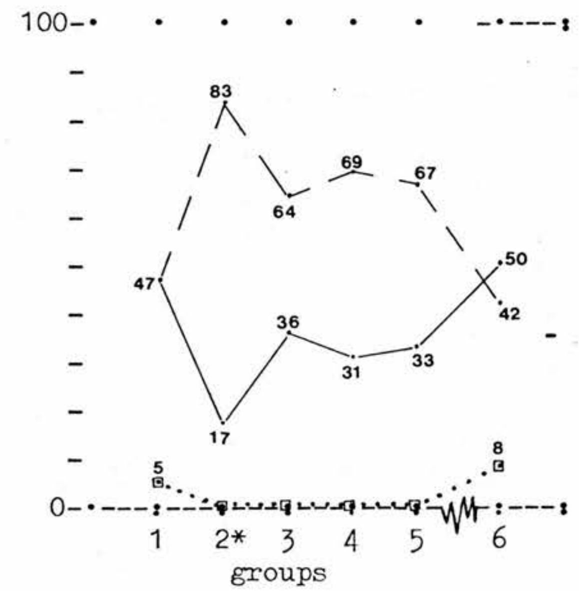
Relation V : big - not small

Form A (Ants)

males

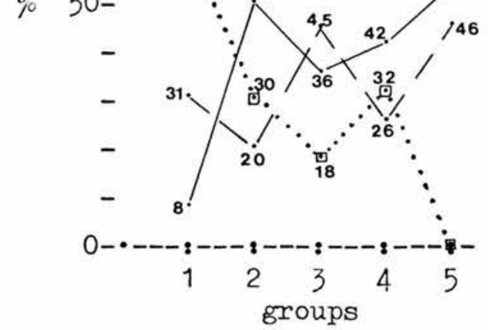


females

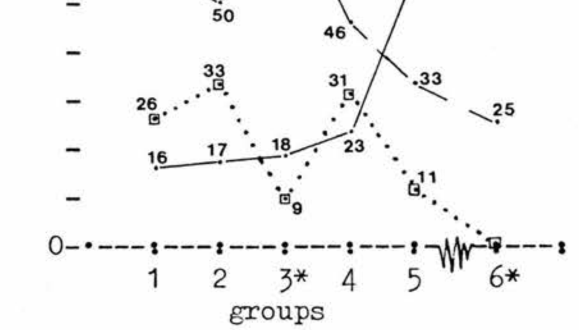


Form B (Butterflies)

males



females



KEY: included

isomorphic

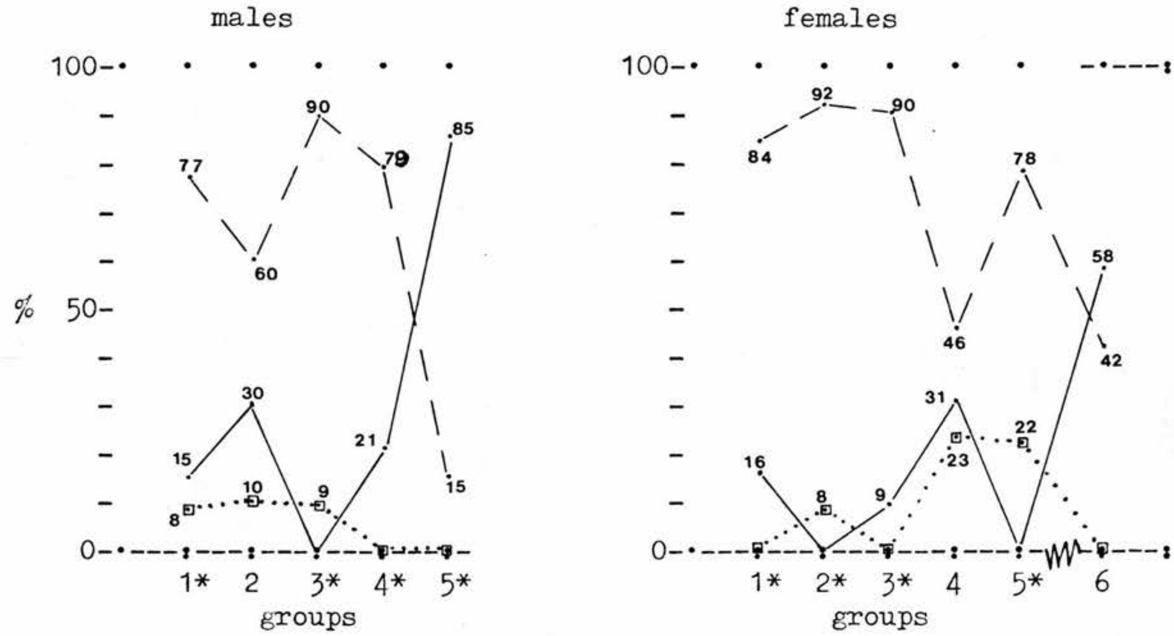
reversed

FIGURE 5 G (i).

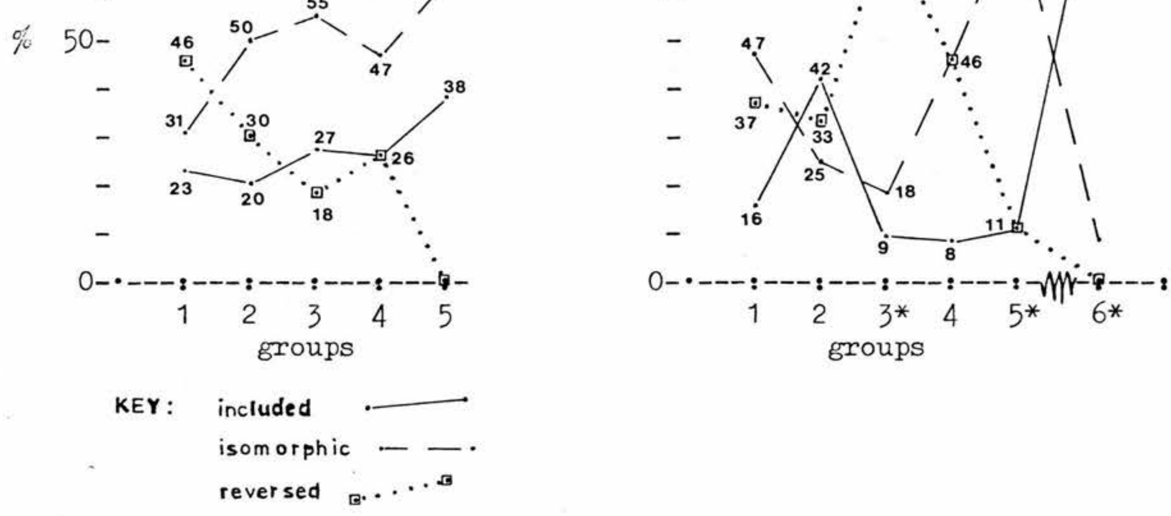
Percentage frequency of Category Relation Values by Form, Sex and Age. An asterisk beside the identity number of any age-group signifies that the set of three values for that group had probability of occurrence of less than ·05 (Kolmogorov-Smirnov One-Sample Test).

Relation VI : small - not big

Form A (Ants)



Form B (Butterflies)



collapsed, the sets of frequencies provided by Groups 1 - 5 on Form A are all significantly different from chance (Groups 1, 2, 3 and 5: $p<.05$; Group 4 $p<.01$; Kolmogorov-Smirnov One-Sample Test), as are the sets of frequencies from Groups 5 and 6 on Form B. On the first Form this is because of high frequencies for isomorphic structure, and on the second it is because of the high frequencies for included structure. On Form B males and females in the first four age-groups have as great a percentage of reversal as of inclusion - especially is this true of male sub-group 1 - which shows that this Category Relation is not yet differentiated for the majority of subjects. The frequencies on Form B in the female sub-groups are the only ones different enough from one another to be significant on the X^2 test for presence versus absence of value m: see the fifth row of Table 5.3.5.2.1.A. However, this is almost wholly due to the adult results.

Included structure is seen to be relatively high in frequency for males on both forms from Group 2 onwards and also for females on Form A, so that although it does not emerge as a significantly frequent structure until around Group 5, and then only on Form B, it is seen to be a constant factor in the data from children of age nine upwards. This steady emergence of inclusion and the decline of isomorphic structure results in X^2 significant for the association with the age variable, both with and without the adult data included in the computation: see Table 5.3.5.2.1.B.

Figure 5F (ii) shows up quite well the lack of difference between groups and sub-groups in the results for Form A, while there is a much more clearly visible rise in frequency of included structure on Form B associated with age. The slight superiority of the boys over the girls in Groups 2 - 5 is more attenuated in the Form B results, but there is no suggestion of differences in speed of development associated with the

Percentage frequency of Category Relation Values typical of antonymy. Each histogram shows the superimposed results for males (broken line), females (dotted line) and each group as a whole (solid line), by Form and Age.

FIGURE 5F (ii)

Category Relation V : big - not small   Value: m (included)

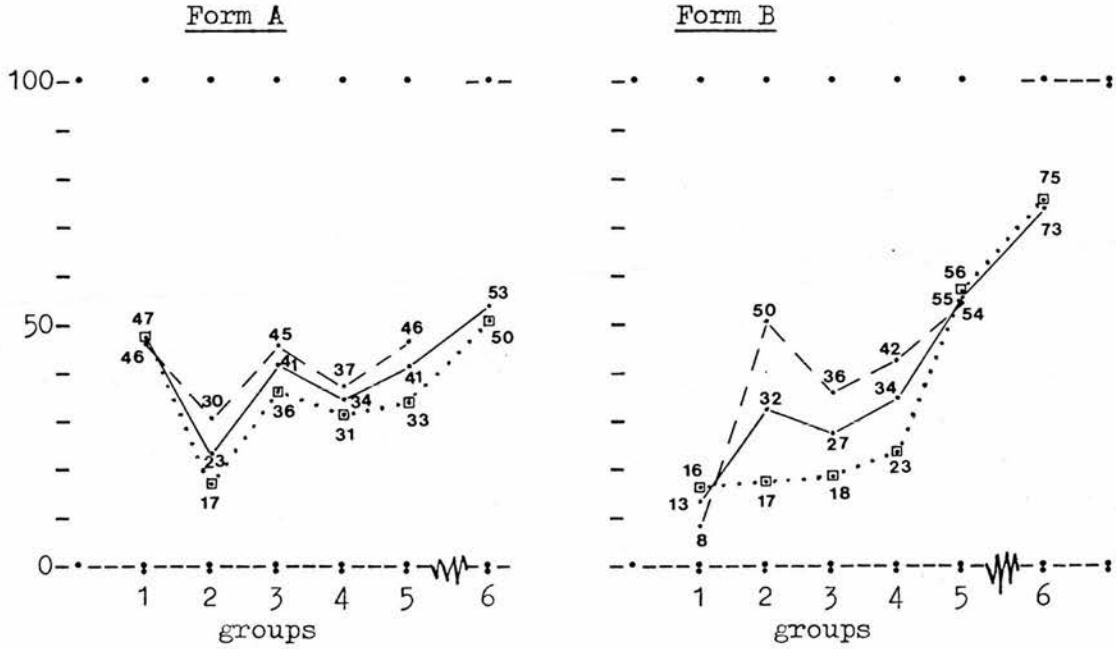
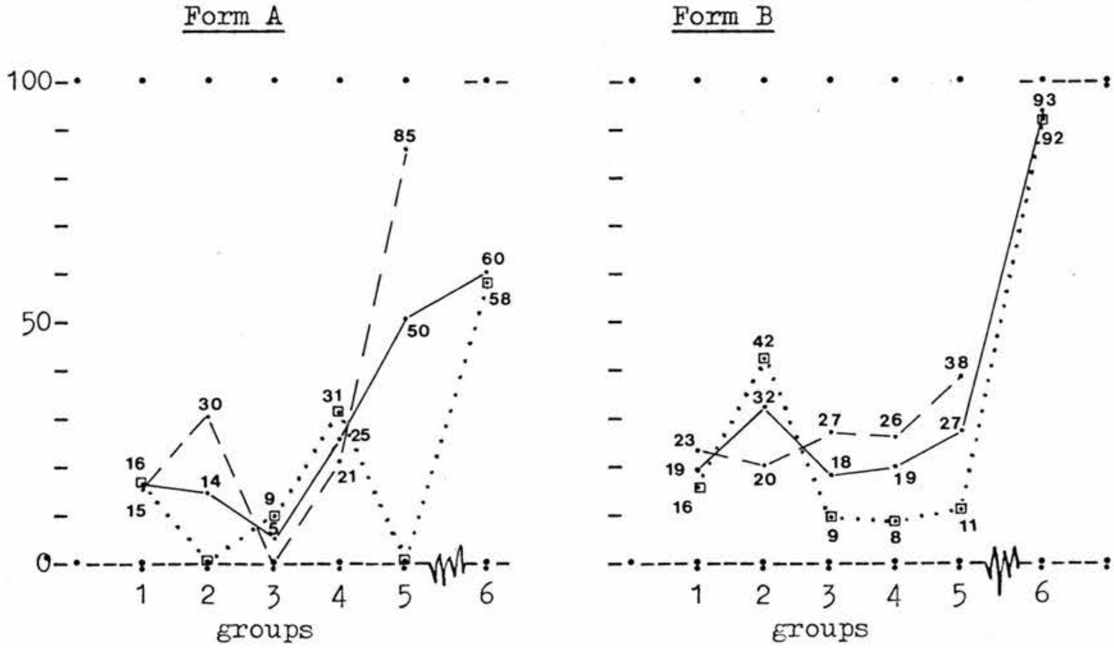


FIGURE 5G (ii)

Category Relation VI : small - not big   Value: p (included)



sex variable, as there was in other Category Relations, and it may be that this is because the age-range sampled in this study is not wide enough to capture the full emergence of structure of this Category Relation, perhaps at around the age of fourteen.

Turning now to Figure 5G (i), representing the relation small - not big, we see similar developments to those for Category Relation V, except that here the frequency scores are more extreme, especially on Form A, and mainly for dominant isomorphic structure. Individual sets of values depart significantly from chance (Kolmogorov-Smirnov One-Sample Test) for male groups 1, 3 and 4 and female groups 1, 2, 3 and 5, all of whom show high frequencies for isomorphic structure on Form A. Male Group 5 has a significantly high frequency for included structure, which is also the most frequent structure in the two adult results, thus again suggesting that the males in Group 5 are progressing much more swiftly towards an overall antonym structure for these Category Relations than are girls of the same age. In fact, inclusion is nowhere seen to be successfully differentiated in the female groups in the sample, which is again attributable to the earlier-mentioned fact that Group 5 males have already started to narrow the category width for small, whereas generally the females have not. The difference between males and females in the frequency with which inclusion appeared in the relation small - not big is highly significant on Form A (occurrence versus absence of value p: Fisher's Exact Test $p<.005$), for Group 5 alone, and it is this difference between Group 5 and the others that gives such a high X^2 statistic in Tables 5.3.5.2.1.A. and 5.3.5.2.1.B. A similar effect is also observed to be caused by the adult scores, which result in all cases in significance, as measured by X^2, for the association between age and change in the structure of the Category Relation.

The Form B results displayed in Figure 5G (i) do not show any clear emergence of one particular structure: in the histogram for the male sub-groups we note that isomorphic structure is slightly the more frequent from Group 2 onwards, but that inclusion is not clearly separated from reversed structure except in Group 5, and furthermore no single set of frequencies is such that it would be unlikely to have occurred by chance alone. The female sub-groups' histogram for Form B also fails to show the unambiguous emergence of one particular structure for small - not big, although there are quite extreme fluctuations in frequency for all three structures, in Groups 3, 5 and 6, and all of these are at levels of chance probability of below 5% on the Kolmogorov-Smirnov test. The high frequency of reversal in Group 3 and isomorphic structure in Group 5 correspond to some extent to the fluctuations found in the basic category width data: Cf. Table 5.3.5.1. (ii) and the corresponding histograms of Figure 5.A.(ii) for small and not big on Form B. Extensive category widths for small were found in Group 3, but they were reduced enough in Group 5 to bring about the general difference in structure illustrated in Figure 5.G.(i).

Figure 5G (ii) summarises the age by sex interaction in the development of included structure for this Category Relation: at various ages there are fairly large differences between sub-groups, as there are indeed between age-groups, and there are also considerable fluctuations within both sub-groups and age-groups on different Forms. Boys are quite clearly seen to differ from girls in Group 5 on Form A, but not so extremely on Form B. If these results are characteristic of the child population at large, then boys seem to be about two years ahead of girls in frequency of antonymic behaviour on this Relation, as there looks to be the beginning of a steady increase in included structure frequency after male sub-group 3, while no similar observation is made for girls.

The sets of frequencies on the age variable alone differ within themselves significantly in each of Groups 1 - 4 on Form A, where isomorphic structure was the most frequent structure and reversal virtually disappeared ($p<.01$ in all cases; Kolmogorov-Smirnov One Sample Test), and on Form B the sets of frequencies from each of Groups 5 and 6 are significant ($p<.05$ and $p<.01$ respectively, same test), Group 5 having mainly isomorphic and Group 6 mainly included structure.

In contrast to big - not small, Category Relation VI results shows few signs of included structure emerging in the data from children. Except for one result, from male sub-group 5 on Form A, there is virtually no evidence of its successful differentiation from alternative structures, and this implies that, like the structure for the double negative of Category Relation IV, it emerges at a later age in the child population than is represented by Group 5 (mean age: 13 ; 00 years) in the sample.

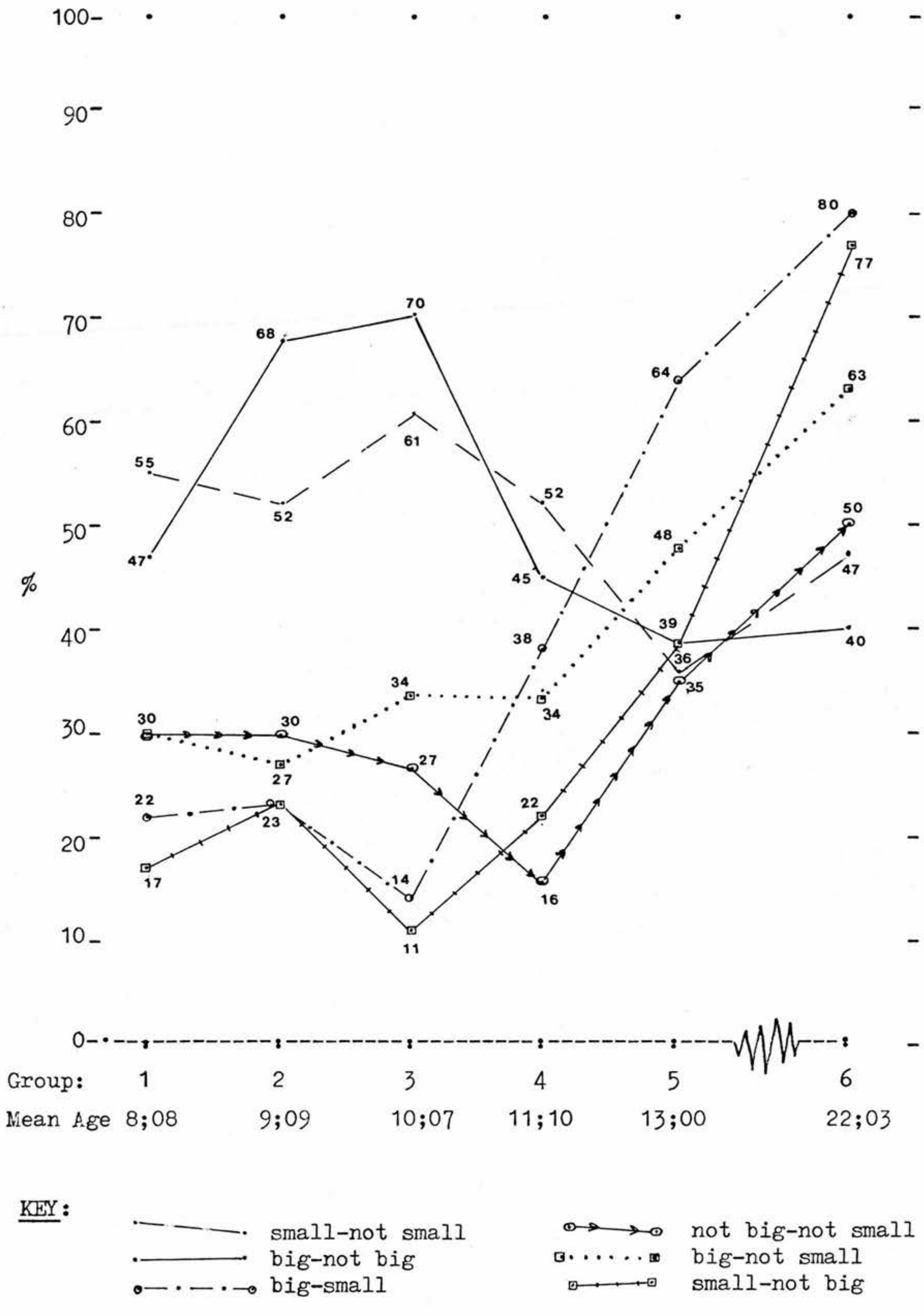
(v) Synopsis.

Ignoring for a moment the question of whether Forms A and B elicited the same sort of response (a question which will be considered in the next section) as far as Category Relation logic is concerned, we may regard Figure 5H, which is a composite of the results from both Forms, as a summary of the levels of attainment of antonymic logical structure for the adjectives big and small and their negatives, in the age-groups sampled, namely children between the ages of 8;01 and 13;07 years, and a group of (predominantly female) adults between the ages of 19;00 and 33;00 years.

It can be seen that apart from the relations of each adjective category with its negative - what have been referred to as Category Relations I and II in this study - which are peculiar in that they belong to the logical systems of both complementarity and antonymy, none of the other structural relations characteristic of antonymy begins to reach more than a chance frequency until after the age of 10;02 - 11;02 years, and that even after this age the increase in the frequency of antonymic

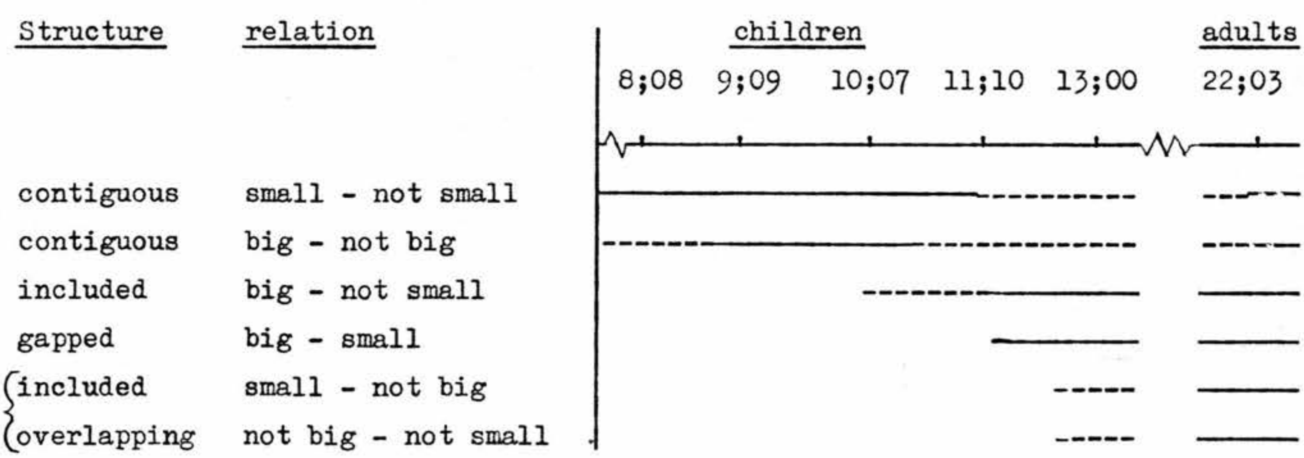
FIGURE 5H

Summary. Percentage frequencies of Category Relation Values typical of antonymy (b-e-g-l-m-p), related to the age-groups in the sample.



structure is not uniform. Some types of Category Relation seem to develop more quickly than others in this respect, and to judge from the adults' performance it may be that antonymic structure never becomes perfectly developed in some of these Relations.

Using the results in Table 5.3.5.2.1., which have been presented in this section, and with Figure 5H as a guide, we are in a position to conclude that for the majority of children the development of the logic of antonyms, as exemplified by <u>big</u> and <u>small</u>, is such that they are at first coded as if they were complementaries, and subsequently change in logical structure - defined in terms of six Category Relations - so as to become antonyms. This transition is a lengthy process in the population at large (although it may not be so for individuals), appearing to begin in or after the tenth year of life, and generally earlier for boys than for girls. We may represent the chronological change for the six Category Relations by means of the following diagram, where the solid line represents at least 50% frequency of antonymic structure, and the broken line more than 33.3% frequency. The top row lists the age-means sampled in the population (in years and months).



The relations seem to evolve in the order of Category Relations II, I, V, III, and then either VI or IV or both together, with VI certainly attaining higher frequency by adulthood. There are strong chronological links between the first two and also between the second two Relations just listed, and we cannot help but note the apparent destabilisation of Category Relations I and II with age, a situation from which they do not appear to recover, if the adult sample is typical. (On this point: the failure to achieve a balanced sub-group structure in the adult sample may well have been critical, since we have already seen that in the older children's groups males were proportionately further ahead than females in the development of antonymic logic. We shall return to this in the Discussion, Section 5.4.) But why should such a phenomenon occur, and what sort of theory could explain this kind of development? These are questions which will be pursued in Section 5.3.5.2.2. and in the Discussion following.

(vi) Postscript: Correlation with other language behaviour.

The association between the behaviour of Groups 1, 2, 3 and 6 in this study and their behaviour in the vocabulary elicitation study described in Chapter 4 was examined (where subjects had participated in both studies) for the following three associations:

a. Contiguity of structure for big - small and the absence of Intermediary Adjectives in the elicitation.

b. As a corollary: the use of Intermediary Adjectives in the elicitation, and the occurrence of gapping in the structure of big - small in this study.

c. The correlation of the use of negative polarity Specialised adjectives (short, low, narrow) with antonymic structure in any of Category Relations I - VI.

No association was found to be significant when the Category Relations were treated individually. This is perhaps unsurprising under the circumstances, since as we have seen, the major cognitive changes appear to occur after the age of Group 3 and so the earlier language data could perhaps not be expected to relate significantly to the results of this study. However, when the syntagmatic aspects of the present results were considered, there were found to be significant interactions with other language behaviour earlier studied.

5.3.5.2.2. Syntagmatic aspects of Category Relations

So far we have seen that both the extension of antonymic categories as represented by big and small and their respective negatives, and the cognitive organisation of the relations between them apparently undergo change with age. It is worth recalling for a moment what the initial expectations of category width were for the four categories on Forms A and B. Remember that the two sets of pictures were organised in such a way as to represent two gradients of size, each with a "displaced middle" so that category widths for any category were expected to be relatively extended on one Form and relatively reduced on the other, in terms of an adult's knowledge of the relevant size norms for the two sets of entities represented. These extensions can be summarised as follows:

	Form A width	Form B width
big	extended	restricted
small	restricted	extended
not small	extended	restricted
not big	restricted	extended

The expected category widths generally were found in the results of the adult sample, but not in those from children in the age-band up to nine years, where instead of each expected extension its opposite was found to be generally prevalent. The frequencies for individual category widths suggested that after this age there is a progressive change which approximates increasingly the extensions found for adults, and the frequencies for individual category relations also indicated structural change consistent with a process of cognitive organisation and then subsequent re-organisation of the following kind:

Stage One: lack of structural definition, leading to inconsistency in category relations.

Stage Two: The relations become organised on the basis of complementary logic, as represented in figure 1 of Section 5.1.

Stage Three: Complementary structure becomes de-stabilised, in association with changes in category width.

Stage Four: The structural relations characteristic of antonymy emerge and become stabilised.

In the data gathered from children, all of these stages are represented, although Stages One and Four are not entirely present. In the youngest group (age range 8;01 to 9;02) we seem to have indications of Stage One strongly present in the male sample, and in the oldest group the transition from Stage Three to Stage Four seems to be approaching completion for some subjects (age range 12;07 to 13;07), again mainly male. But if this interpretation of the change in individual Category Relations is correct, then certain combinations of values (i.e. "syntagmatic" sets) ought to be found in the results from the different age groups. We could reasonably expect that values characteristic of a lack of differentiation would combine more often in the younger groups than in the older groups of children, that the middle groups should show more value combinations characteristic of complementarity, and the older groups more combinations indicating antonymy. So for Stage One we would predict sets of values like c-f-i-l-o-r as typical, and for Stage Two b-e-h-k-n-q, and at Stage Four b-e-g-l-m-p. But we have already seen in Section 5.3.5.2. that there were relatively few perfect structures of these last two kinds, and the obvious conclusion to draw from this is that there are a number of sub-stages involved in the development of category relations. The question is whether these sub-stages are amenable to analysis.

In the belief that they are, the data for Category Relations III and IV were analysed for their combinatorial permutations[7], and these were then ordered around the hypothetical sequence of overall development for big - small, from lack of differentiation (causing value i to appear in the data) through complementary structure (value h in the data) to antonymy (value g). Category IV was more problematic in this respect, since when it is undifferentiated it might show the overlap value, l, or the contiguous value, k, or the gapping value, j. It ought to then achieve k value when complementarity is reached and revert to l for antonymy, so there may well be two periods of development represented by the occurrence of k and l values in the Category Relation data. There are nine possible sets of structural combinations overall between Categories III and IV, and they were all found in the results. They were ordered tentatively on the basis of the interpretation outlined above, in the following way: for Stage One, the three combinations ik, il and ij were considered typical, having as a common feature an overlap between big and small categories. As these drew apart, they would go through a stage of contiguity, producing either hj or a complete complementary structure in hk, with both pairs of categories contiguous. The transition to antonymy could then be accomplished either through the big - small relation or through the negative not big - not small. These two alternatives can be described as the "pull" versus the "push" processes respectively. In the "pull" process, the categories big and small become progressively more differentiated and restricted, such that they draw apart, but the double negative remains in contiguous relation, so that values gk are found in the transition between Stages Two and Four. Alternatively, the transition could take place through the double negative, which will extend sufficiently in both directions to create an overlap structure in Category Relation IV, and Relation III will temporarily remain complementary, so that the combination hl appears in the data, before big and small are then pushed further apart to produce the final antonymic combination gl. On the face of it, the "pull" process seems a better explanation in view of the earlier results, and is likely to cause less cognitive stress, since in the "pull" process the result will be that certain entities will neither be categorised as *big* or *not big* nor will they be categorised as *small* or *not small*. In the "push" process, there will be objects categorised as both *big* and *not big*, etc.

In fact, the combination *hl* (*big - small* contiguous, negatives overlapping) is a much better candidate for the transitional process between Stage One and Stage Two, if we assume a "pull" model as the more natural description of underlying change. This then gives us a sequence of combinations of the following kind:

Stage One | *Stage Two* | *Stage Three* | *Stage Four*

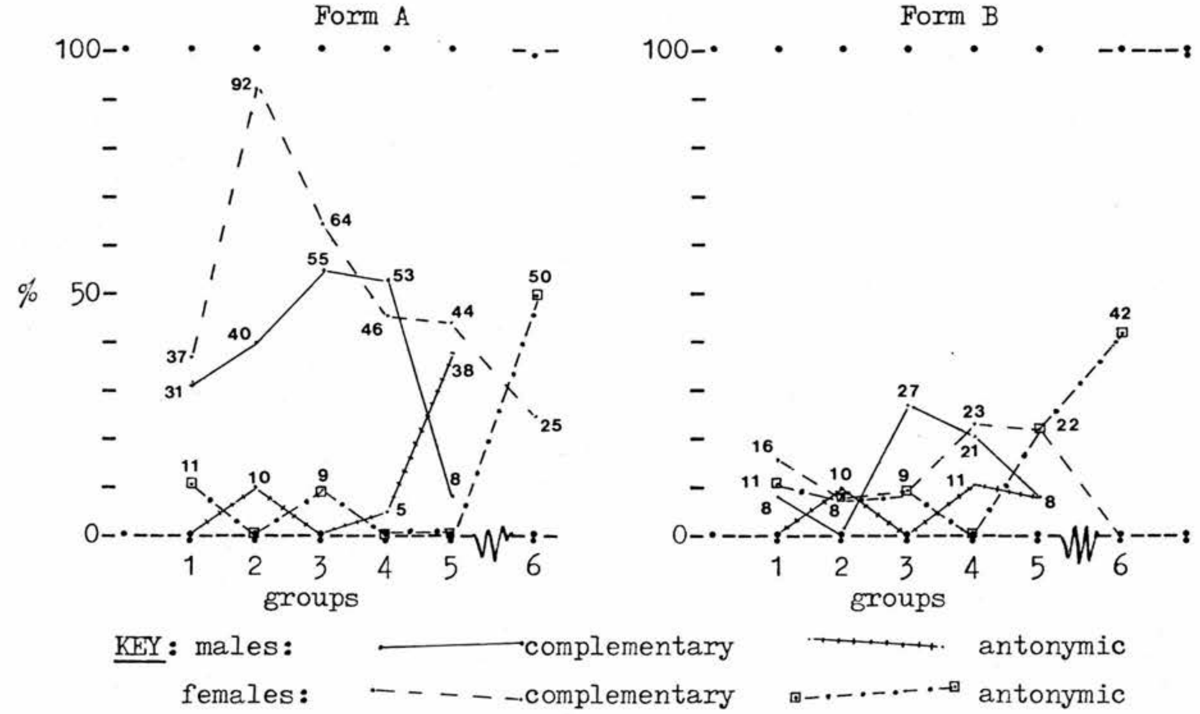
$$\left.\begin{matrix} ik \\ il \\ ij \end{matrix}\right\} \longrightarrow \begin{matrix} hl \\ \\ hj \end{matrix} \longrightarrow jk \longrightarrow gk \longrightarrow gl$$

It will have been noted that one combination is missing, namely *gj*. These values were at first thought to belong to Stage One, but in the results about to be presented they have been allocated to Stage Three instead, as the largest frequencies for the combination are found in Groups 4, 5 and to some extent 6. We shall consider this problem in more detail in the Discussion.

Appendix 4.B. tabulates the frequencies and distribution of values on the six Category Relations combined, and these are organised on the basis of the sequence of values just outlined for *big - small* together with *not big - not small*. The distributions of value combinations *hk* (complementarity) and *gl* (antonymy) are illustrated in Figure 5J, and we can see that the earlier interpretation of the paradigmatic aspect of the results was fairly accurate, although the results from Form A are proportionately much higher than those for Form B, both for complementarity and for antonymy. On Form A females are shown to have higher

FIGURE 5J.

Percentage frequency of complementary and antonymic structure combinations in Category Relations III and IV, by Form, Sex and Age. The top diagrams present the sub-group data, and the bottom diagrams the frequencies for each age-group in general. Male sub-group 6 is not individually plotted.



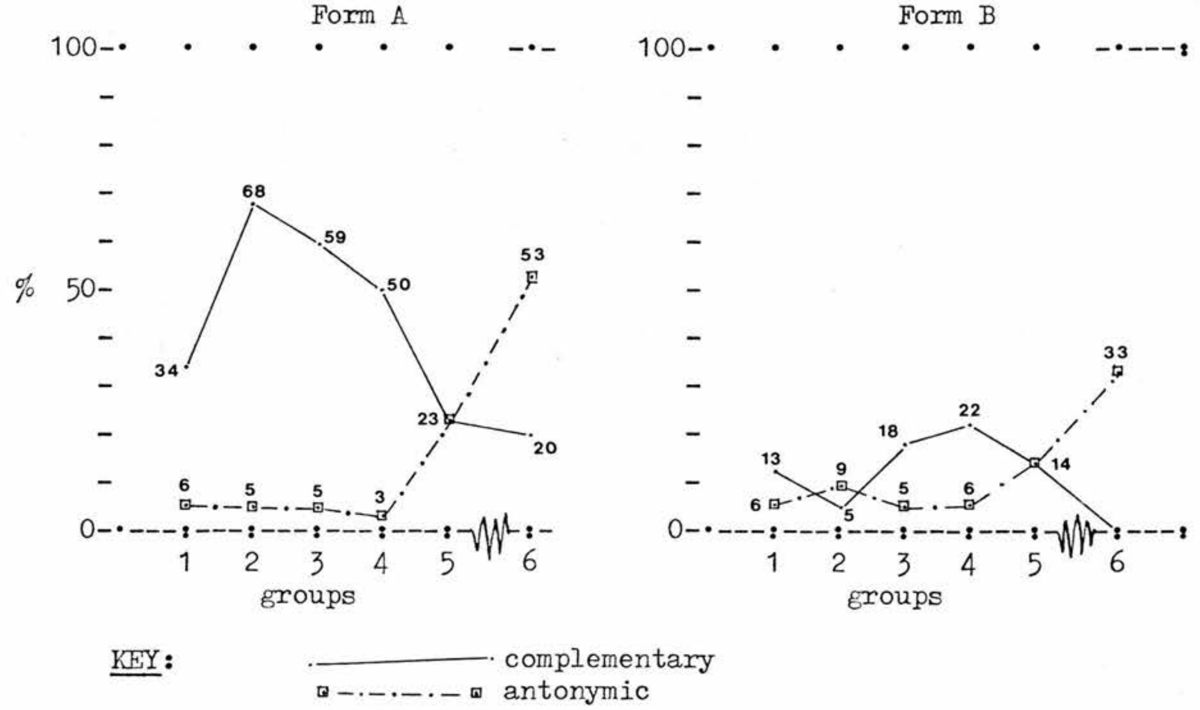


TABLE 5.3.5.2.2.A.

Simplified contingency table, based on that given in Appendix 4C, of value combinations for Category Relations III and IV on Form A, with the associated Form B combinations.

		Form A values								
Form B		ik/il/ij/		hj/hl/hk		gj/gk/gl		Totals:		
values	group Sex:	m	f	m	f	m	f	m +	f =	T
ik/ il/ ij	1	4	1	1	3	1	2	6	6	12
	2	-	-	2	4	-	-	2	4	6
	3	-	-	4	2	-	1	4	3	7
	4	-	-	2	1	1	-	3	1	4
	5	-	-	-	1	-	-	-	1	1
	6	-	-	-	-	-	-	-	-	0
hj/ hl/ hk	1	1	1	4	5	1	3	6	9	15
	2	-	-	2	5	-	-	2	5	7
	3	-	-	5	5	-	2	5	7	12
	4	-	-	6	5	1	-	7	5	12
	5	-	1	-	2	2	-	2	3	5
	6	-	-	-	-	1	-	1	-	1
gj/ gk/ gl	1	-	-	-	3	1	1	1	4	5
	2	1	-	4	3	1	-	6	3	9
	3	-	-	2	1	-	-	2	1	3
	4	-	-	6	4	3	3	9	7	16
	5	-	2	1	3	10	-	11	5	16
	6	1	-	-	4	1	8	2	12	14
Totals:	1	5	2	5	11	3	6	13	19	32
	2	1	-	8	12	1	-	10	12	22
	3	-	-	11	8	-	3	11	11	22
	4	-	-	14	10	5	3	19	13	32
	5	-	3	1	6	12	-	13	9	22
	6	1	-	-	4	2	8	3	12	15
					Total child:			66	64	130
					Grand total:			69	76	145

Contingency Coefficient: (max: 0.816)

males,	groups	1-5:	0.434,	p<.01
		1-6:	0.404,	p<.01
females,	groups	1-5:	0.068,	p>.99
		1-6:	0.214,	p<.50
	groups	1-5:	0.340,	p<.01
		1-6:	0.303,	p<.01

complementarity frequencies than males in the younger groups, and antonymy is seen to show signs of increase among males in Group 5. On the age-variable alone the two Forms are seen to have captured similar information, but not to the same degree, with the Form B results much weaker, and this leads one to explore the question of correlation between the two Forms.

Appendix 4.C. presents a 9 x 9 contingency table of the Form B value combinations of Category Relations III + IV associated with those that occurred for Form A. The column and row totals for each group show that there is a relatively good fit with the age variable, the younger groups tending towards the top and the left, and the older groups, especially the adults, tending to group around the bottom and the right of the table. Unfortunately there are too many empty cells and low expected frequencies to be able to use X^2, but a simplified version of this Appendix is presented in Table 5.3.5.2.2.A., which displays the contingencies for correlation between Forms on the Category III Relation alone. The Contingency Coefficient $\underline{C}$ (Siegel, 1956: 196 - 202) shows significant, fairly high positive correlation between Forms A and B for males and for age-groups, but not for females separately. This is because the requirements of $\underline{C}$ are the same as those for X^2 and these were violated during the computation of the Coefficient for the female sample. X^2 cannot capture significance where the weight of data is symmetrically distributed, and there was no way in which cell frequencies could be meaningfully combined without losing comparability.

However, under slightly different assumptions, namely that the cells of Table 5.3.5.2.2.A. represent an ordinal variable, information was combined from different parts of the contingency table and tested for goodness of fit against the age and sex variables on a null hypothesis of no difference. If the cells are identified as follows:

A B C
D E F
G H I

it is possible to order the cells: A/B+D/G+C/E/H+F/I. This increased the degrees of freedom by one, but it achieved the same result for males as before, while significance at very high level was found for the female results:

males	Groups	1-5 (boys)	$X^2 = 18.36$	($p<.01$, d.f.5)	C: 0.467	(max 0.833)
		1-6	$X^2 = 18.04$	($p<.01$, d.f.5)	C: 0.455	
females	Groups	1-5 (girls)	$X^2 = 35$	($p<.001$, d.f.5)	C: 0.595	
		1-6	$X^2 = 30.74$	($p<.001$, d.f.5)	C: 0.537	

There was found to be no significant difference between males and females or between boys and girls when this ordering of the data was tested. (boys versus girls: $X^2 = 7.59$, d.f.4; males versus females: $X^2 = 1.60$, d.f.4).

As a further test of goodness of fit between the age variable and the proposed order of Category III and IV combinations, the frequencies in the contingency table of Appendix 4C were re-arranged as in the procedure just outlined above, and the ordered combinations were ranked, as shown in Table 5.3.5.2.2.B. The median rank was established to be 28 for the groups 1 - 5, and 31 for all the subjects together, and the frequencies of each group and sub-group were cast into a 5 x 2 or a 6 x 2 contingency table and submitted to the extended Median Test (Siegel, 1956: 179 - 184). This was significant in all cases except female subgroups 1 - 5. The results are as follows:

<u>Median Test</u>:	males,	Groups 1 - 5	$X^2 = 24.48$,	$p<.001$,	d.f.4.
		Groups 1 - 6	$X^2 = 31.66$,	$p<.001$,	d.f.5.
	females,	Groups 1 - 5	$X^2 = 7.96$,	$p<.10$,	d.f.4.
		Groups 1 - 6	$X^2 = 20.9286$,	$p<.001$,	d.f.5.
	children,	Groups 1 - 5	$X^2 = 25.72$,	$p<.001$,	d.f.4.
	all subjects,	Groups 1 - 6	$X^2 = 39.39$,	$p<.001$,	d.f.5.

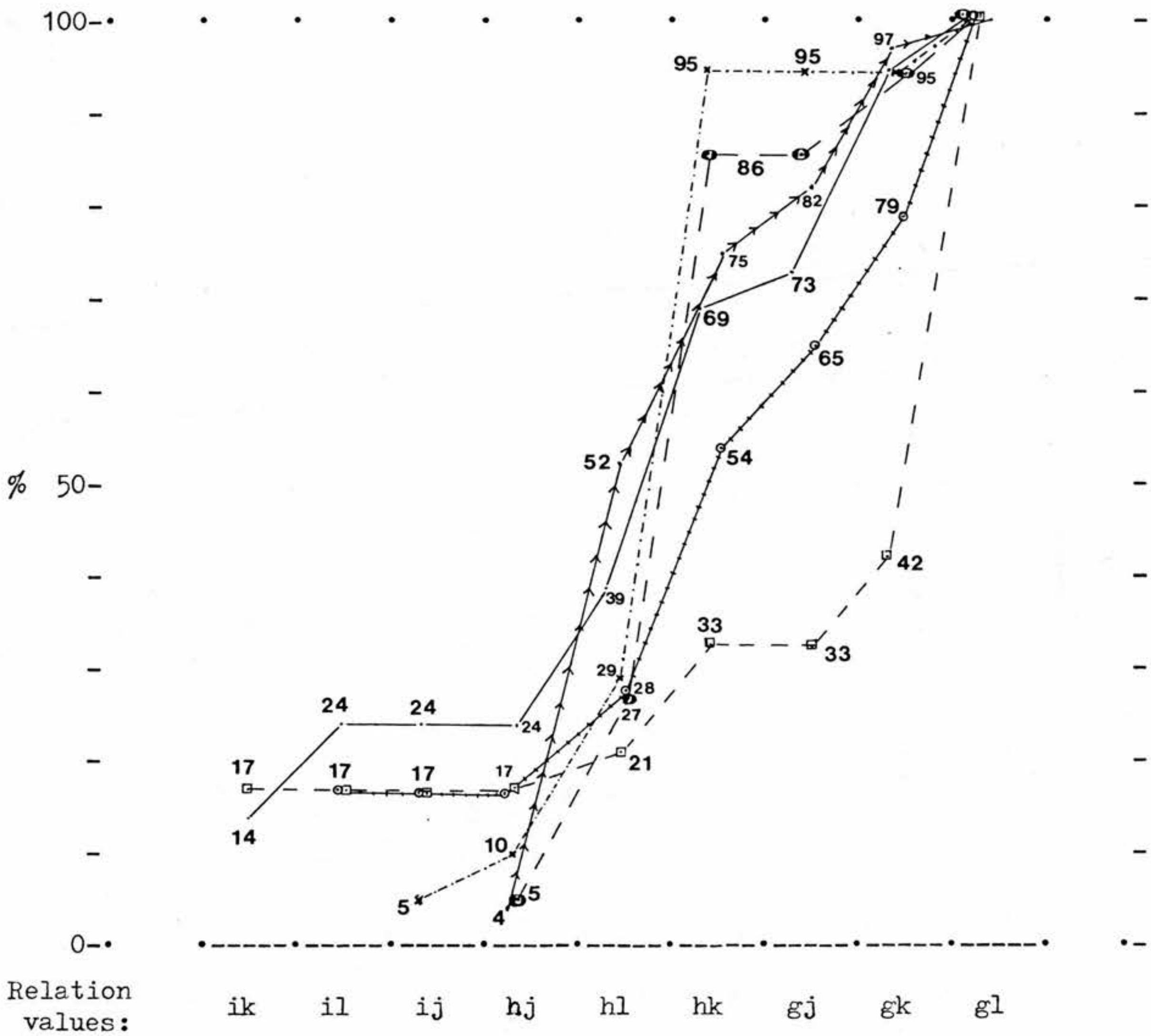
TABLE 5.3.5.2.2.B.

Ranked contingency frequencies of value combinations for Category Relations III and IV, Form A by Form B, derived from Appendix 4.C.

Rank	Values	Frequencies											
		Group: 1		2		3		4		5		6	
	A x B	Sex: m	f	m	f	m	f	m	f	m	f	m	f
1	ik ik	1											
2·5	ik il	1	1										
	il ik	1											
4·5	hl ik		2										
	ik hl	1											
6·5	hk ik	1			2								
	il ij	1											
9	ik gk											1	
	gk ik						1						
	il hj		1								1		
11	gl ik							1					
12	hl il				1	2							
13·5	hk il			1		1					1		
	hj ij								1				
15	il gj										1		
16	hl ij			1				1					
18	il gl										1		
	gl il		1										
	hk ij		1		1	1	2	1					
20	hl hj								2				
21	ij gj			1									
22·5	gk ij	1	1										
	hk hj	2	2		2	1	5	3					
24	hl hl		1			1							
25·5	hj gk					1							
	hj gj			1									
27·5	hl hk	1				1					1		
	hk hl	1	1	2	2								
29	gk hj	1	1										
30	hl gj			1				1					
31	hk hk		1		1	2		3	3		1		
32·5	hl gk							2	1				1
	gk hl						1						
34	hk gj		1	1	1			2	2				1
35·5	hl gl		1	1			1				1		
	gl hl									1		1	
37·5	hk gk				1	1			1	1	2		
	gk hk		1					1		1			
39	gj gj								1	1			
40·5	hk gl		1		1			1					2
	gl hk		1				1						
42·5	gj gk									2			
	gk gj	1	1					1	2	2			
44·5	gj gl							1					
	gl gj									4			2
46	gk gk							1					
47·5	gk gl									1			2
	gl gk			1								1	3
49	gl gl												1

FIGURE 5K.

Cumulative percentage frequencies, by age, in the development of antonymic structure in Category Relations III and IV (big - small and not big - not small), based on data from Form A.

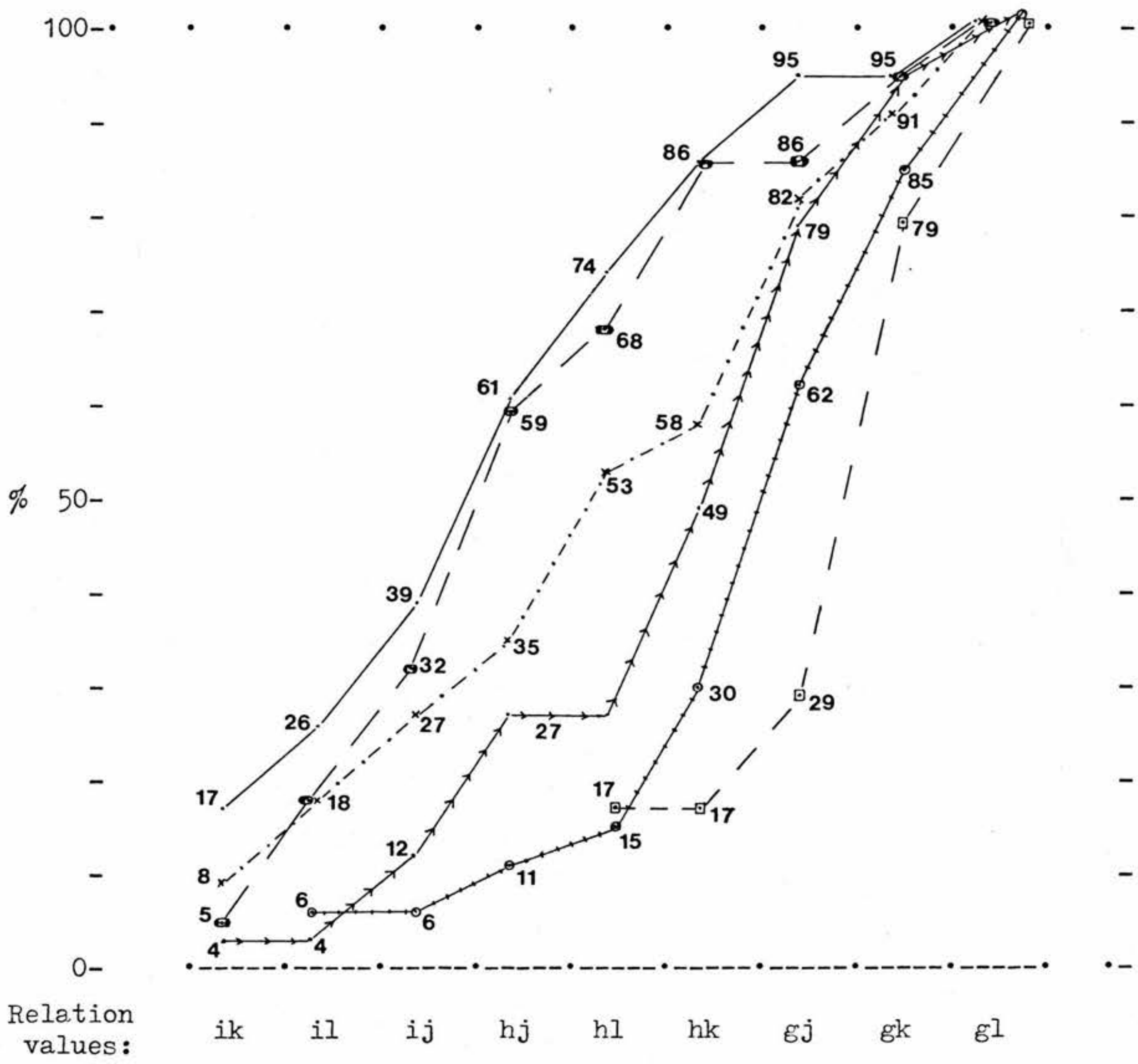


KEY:

Symbol	Group	N	Mean Age (yrs;mths)
	1	32	8;08
	2	22	9;09
	3	22	10;07
	4	32	11;10
	5	22	13;00
	6	15	22;03

FIGURE 5L.

Cumulative percentage frequencies, by age, in the development of antonymic structure in Category Relations III and IV (big - small and not big - not small), based on data from Form B.



KEY:

Symbol	Group	N	Mean Age (yrs;mths)
	1	32	8;08
	2	22	9;09
	3	22	10;07
	4	32	11;10
	5	22	13;00
	6	15	22;03

This shows a good fit between the hypothesised order of structural change and the age variable, with not enough difference between the female sub-groups to make for a significant result on the test, which agrees with the results presented earlier.

In further support of the proposed order of structural change, the cumulative frequencies derived from the column and row totals of the Appendix 4.C. table have been plotted in a linear histogram - in order to be able to include information from six groups in the one table - for each Form. Figures 5K and 5L, for Forms A and B respectively, show the overall differences between groups, with the cumulative frequency of each succeeding age group dropping away from the left and moving its bulk to the rightward relation values. Figure 5L is more elegant in this respect, since Form A was, for reasons already outlined, more problematic generally, so that there is less regularity apparent in Figure 5K, although the general outline of development is similar.

In connection with the word elicitation results described previously in Chapter 4, there was found to be an association between subjects having the hk value combination on Form A and/or B and the incorrect use or absence of Intermediary adjectives such as middle-sized in the language questionnaire for LENGTH. Seventy-five child subjects contributed data in both studies, and were located as follows:

	male	female	Total
Group 1	13	18	31
Group 2	10	12	22
Group 3	11	11	22

The contingency tables for the performances of these subjects are shown below in sub-groups. Only one individual result was significant: that for female sub-group 1 on the association hk x Applicable/Inapplicable Intermediary. The table overleaf is repeated from Section 4.4.1.3 (d) with adjustments.

Group 1:

usage:		males, value combination: Other	males, value combination: hk	females, value combination: Other	females, value combination: hk
No Intermediary		1	3	2	3
Intermediary	Logically Applicable	4	0	8*	1*
	Inapplicable	3	2	0*	4*

* p<.01, Fisher Exact Probability Test.

Group 2:

		males: Other	males: hk	females: Other	females: hk
No Intermediary:		5 4	0 7	0	7
Intermediary	Logically Applicable	1 -	1 2	1	2
	Inapplicable	0 -	0 2	0	2

Groups 1, 2, 3 Totals:

usage:		males, value combination: Other	males, value combination: hk		females, value combination: Other	females, value combination: hk	
No Intermediary		11	10		2	14	
Intermediary	Logically Applicable	5	0		11	5	
	Inapplicable	3	5		0	9	
		19	15	34	13	28	41

The results for the last part above are as follows:

a. overall contingency: males $X^2 = 5.15$, d.f.2
females $X^2 = 17.04$, $p<.001$, d.f.2

b. No Intermediary/Intermediary: males $X^2 = .03$, d.f.1.
females $X^2 = 3.14$, $p<.10$, d.f.1.

c. Applicable/Inapplicable: males $p<.05$ (Fisher Exact Probability)
females $p<.005$.

The combined results, also, were significant for the c condition ($X^2 = 10.64$, $p<.01$, d.f.1) and for the overall contingency ($X^2 = 14.86$, $p<.001$, d.f.2), but not for the hk results in the b. condition above. The important association is therefore between complementary category structure and logically inapplicable usage of Intermediary adjectives, rather than their presence or absence in a child's vocabulary.

A second result that bears on the language-logic relationship is the finding that subjects who had used negative polarity Specialised Adjectives on the questionnaire were no more likely than their peers to show developed logical structure for antonyms. Their Category Relation value combinations are generally equally distributed around the median rank combination for their individual group in Table 5.3.5.2.2.B, but in Group 1, of the nine subjects (5 male, 4 female) who were defined in section 4.4.1.3. (d) as showing advanced verbal knowledge because they used Specialised adjectives like short, eight were situated in Table 5.3.5.2.2.B. below the class median rank of 22.5. This is significant at the five per cent level of chance ($p<.02$, Binomial Test), and suggests that advanced linguistic knowledge, at least as is grossly captured by a word-count, does not entail the presence of an advanced cognitive schema for the logic of antonyms.

5.4. Discussion

The finding that there are two types of logical structure rather than one at the heart of gradability was totally unexpected, and the implications are far-reaching, since a number of other research results can be seen in a new light.

The question is, however, whether the results here are reliable and do reflect a change in logical structure. To answer this, it must be shown, firstly, that the discovery is not incompatible with the results presented in earlier chapters, as this will give internal consistency to the hypothesis; secondly, that it is compatible with results found by other researchers. Even if these two things could be done, is it an intuitively satisfying thesis to declare that the logic of antonymy develops out of the logical structure of complementarity? It is my belief that all three requirements are met.

To work back from the last point: if antonymy is based on complementarity, then in the course of cognitive development there must come a time when the extension of the opposing categories is reduced. In the example studied here, the boundaries of the categories, either of <u>big</u> or of <u>small</u>, must recede. It seems to be <u>big</u> that does this first. The reason might be that as children grow, many things which at first appear <u>big</u> to them cease to be so (the underlying assumption here being that a child judges size of objects firstly in relation to himself and secondarily in relation to framework features; but this seems reasonable: recall the way many young children treated the figure of Norma[n] in the chapter 4 study.). As soon as things which previously seemed <u>big</u> appear less imposing, the category <u>big</u> for various sets of objects will begin to lose members. On the other hand <u>small</u>, if this hypothesis fits, will not lose members while the child is increasing in size, and might even gain some. Thus <u>small</u> is not likely to undergo category reduction until the body reaches its full stature in adolescence, when category <u>big</u> also stops contracting and casting out members. The last stage is not absolutely necessary, however, since antonymic structure is created as soon as just one adjective category is reduced and its respective negative is proportionately extended. As can be seen from the data, small - not small is the most stable category relation.

The early restriction of category width for big causes a certain amount of instability in the younger age groups, as can be seen when the opposing categories small and not big are examined: there does seem to be a tendency for small to extend slightly and for not big to contract, instead of the reverse as expected. This phenomenon is not unique to the present study, and has been noted by Wales, Garman and Griffiths among much younger children examined on the relations more, less and not more. It was found that - in the jargon of this study - the category widths for less appeared more extensive than those for not more. English speaking children, asked to indicate one of three piles of sand or blocks that varied in size, distributed their choices like this in response to instructions containing more, less, and not more (Wales et al., 1976: 38):

		Size of pile:		
		large	medium	small
gradable:	more	25	7	0
	less	1	16	15
	not more	0	11	21

This can be interpreted as meaning that at first it is the overt negative that has polar characteristics while the antonym fulfils a complementary function. However paradoxical this situation may seem, on careful consideration it does resolve itself. The overt syntactic negation is a much more obvious signal of negativity to a child than a negative polarity antonym would be, and unmistakenly marks reversal by means of the negative operator. In this context we may also note

Ehri's (1976 378-9) report that children (aged 4-8) instructed to pick objects that were _not bigger than_ a comparison object, always picked those that were smaller but rarely those that were the same size: "Almost two-thirds of the errors (63%) involved Ss failing to include the same-sized object" (_op.cit_.: 379). This again implies a lack of an antonymic type of logic: children treat _not_ as a predicate negator rather than as a nexus negator, and cannot see the hidden structure.

Investigations reported by Donaldson (1963), as well as remarks made by Riley and Trabasso (1974: 197) can also be approached from a new direction. The possibility that gradable adjectives may at first be coded as complementaries goes some way towards explaining the oft-attested tendency for young children to replace comparative forms with absolute ("base") forms of antonym during transitive inference tasks. Yet whereas this act is usually explained as substituting a "nominal" term for a "relational" one (and seen from the point of view of a developed adult logic that is what it is), the present hypothesis would say that the underlying binary logic is the same in both cases, and perhaps the substitution occurs because the child sees the binary similarity of _bigger-smaller_, _longer-shorter_, etc. and _big-small_, _long-short_, as he codes them. After all, in many situations where the logic of small sets operates,(see section 4.5.), there is no difference in extensional meaning, as far as the child can gauge by studying adult usage and consulting the objective environmental conditions prevailing around him.

Within the confines of the present study there are several results that are mutually reinforcing. The correlation between use of a set of complementary category relations and logically inappropriate use of intermediary adjectives does give credence to the hypothesis that complementary structure is cognitively more basic than antonymic structure is. The fact that subjects who produced negative polar specialised vocabulary in the elicitation were not more likely because of this to be able to code big and small antonymically makes sense if short and low are coded primarily on the basis of shape. Alternatively, it is possible for people to grade adequately by using positive polar specialised size adjectives and negative global ones such as small. In this connection it is interesting to note that in many mathematics materials for children of about the age studied here, size adjectives are not presented in a systematic fashion according to the model assumed in the Semantic Feature Hypothesis. Rather, tall and long are quite often opposed by small, and not short.[8] Long and tall might not be as inextricably linked with this last adjective as the semantic and psycholinguistic analysts assume.

CHAPTER 6

CONCLUSIONS

6.1. Gradable adjective development

A number of proposals have been made in this thesis, partly as a result of analysing previous theories, and partly as a result of my own experimental investigations. It is necessary here to attempt a synthesis of some kind, but such new ideas as there are will be briefly presented.

It is here proposed for child language that the order of development of gradable adjectives of antonym type, can be characterised adequately by distinguishing properly between acquisition and semantic construction. From the point of view of acquisition, there seems little doubt that the forms of adjective first to appear are the uninflected "base", or absolute, adjectives, and that these are followed by superlative then comparative and equative, negative equative and finally negative comparative. However, for the viewpoint of semantic construction, it is argued that superlative and comparative forms develop appropriate semantic content before absolute adjectives can do so. The reasons for this assertion are logical and pragmatic, in that the superlative and comparative forms of adjective derive much of their meaning from their functional domain, which I have called "the logic of small sets": the comparative relation is fundamentally dyadic, but its function may be usurped by the superlative. The two forms complement each other to the extent that the superlative is used to define the limits of a gradable range, while the comparative creates structured relations within that range. The reason why it is held that absolute adjectives are not fully "semanticised" when they first begin to be used by children, is that their domain of function is in the logic of large or universal sets, which can only be established after considerable experience of the world, and on the basis of learning quasi-statistical norms which result from manipulating logical relations like class-inclusion and disjunction.

It is hypothesised that because absolute gradable adjectives are also used to describe small sets, the child first learns about their meaning in this way, and assumes they are a type of comparative, with an underlying dyadic logical structure. It is accepted that syntactically the "comparative expansion" may be difficult for very young children to use or even to understand, because processing capacity and short term memory may be relatively limited in the early years, and thus absolute adjectives can by functioning as substitute comparatives reduce some of the demands on linguistic structure.

This is very general, of course, and though the idea has been developed as a result of the work presented in chapters 3,4 and 5, the cry must inevitably go up for more research and more data. At this point, however, it will not go amiss if a few analytic remarks are made on the nature of the "comparison sentence" - which is taken to be made up of permutations of positive/negative and comparative/equative. Other structures will be neglected.

6.2. The Comparison sentence

It seems that on the foundation laid by Higgins (1977) a far more satisfactory analysis of comparison sentences can be erected, and a good deal of future confusion avoided. Higgins' distinction between ratio and ordinal types of gradable adjective can be cast in a slightly different way by looking at the formal characteristics of the adjectives involved. It is a commonplace that English is privileged in having two ways of forming comparative sentences, either with adjectives that inflect or with those that do not. There is a third category of adjectives that can form comparisons in either way. Thus we have adjectives like big-small, quick-slow and good-bad, which inflect with -er suffix for the comparative; let these be called mode 1. Then there are adjectives like beautiful, gigantic and hypocritical, which make their comparatives with the premodifier more; let us call these mode 3. Between these two types there is a third, which may be called mode 2. These are the adjectives which can take either form of comparative, and do on occasion: huge, clever, stupid, ugly, saintly. To reveal their structural character properly, mode 1 and 3 will first be examined, and then mode 2.

For mode 1, the examples we shall treat will be these:

1. Mary is taller than Jane.
2. Jane is shorter than Mary.
3. Jane is not as tall as Mary.
4. Mary is not as short as Jane.
5. Sue is as tall as Mary.
6. Sue is not shorter than Mary.
7. Sue is not taller than Mary.
8. Mary is as tall as Sue.
9. Mary is not shorter than Sue.
10. Mary is not taller than Sue.

What all of these sentences have in common is their statement of a size relation that holds for Mary, Jane and Sue such that Mary and Sue are of the same height and Jane's height is less than theirs. However, although this relation is not changed through the set of sentences, there is a difference in what is asserted about the pragmatic relationship Mary, Jane and Sue bear as individuals to the norm-for-the-class.

This is what previous researchers have confusingly referred to as the presuppositional component of the various utterances. Thus in some cases,comparison sentences express two sets of relations, which may be called the <u>foreground relations</u> and the <u>background relations</u> respectively. The foreground relations provide the basis of a "relative code" for judging contingencies of a situation, whereas the background relations provide an "absolute code" that allows one to recognise recurrent features common to many situations.

The reciprocal nature of sentences 1 and 2, above, is a characteristic of foreground relations, since as Higgins has shown (1977), the majority of people would not consider that there is any assertion of a background relation involved (i.e. 1 does not assert of necessity that either Mary or Jane is <u>tall</u>, and nor would 2 be held to assert that either is <u>short</u>). However, matters differ with respect to 3 and 4. As well as the foreground relation of difference with respect to height, there seems to be a predication of a background relation to the norm-for-the-class, such that in 3 Mary, at least, would be held to be <u>tall</u>, and in 4 Jane would be held to be <u>short</u>.Thus choosing, in a particular situation, to utter 3 rather than 1 will be taken as implicating an additional fact about Mary - but not always about Jane, although some English-speakers would infer this further fact (more about this below).

Examples 5 and 8 are interesting for the distinction here asserted to hold between foreground and background relations, since there seems to be a difference between the types of antonym that enter the equative structure. If we transform 5 into 5a.:

5a. Sue is as short as Mary.

it is clear that the foreground relation of equality in height remains unchanged. But the background relation is altered, since Mary and Sue are now implicated to be short. However, consideration of sentence 5 does not lead everyone to an inference that Sue and Mary are tall. The reason for this is that there has to be one structure that will express just a foreground relation, and as there is no independent means of doing this, the positive equative in mode 1 adjectives does so. The alternative structures available to assert the same foreground relation, namely negative comparatives like 6,7,9, and 10, are rejected as ambiguous since there is in these an additional problem of nexus versus predicative negation - also present in the negative equative to some extent, but usually noted only under special circumstances in the spoken language, with marked tonic in an utterance - which will be examined in more detail below.

In this connection, the early meanings of <u>tall</u> and <u>long</u> found in the present study, namely in the coding of shape, or the inherent ratio of a major axis to a secondary axis of extent, are suggestive, since they are primarily relative-code meanings rather than absolute, and would thus be ideal in linguistic situations where only foreground relations were predicated. <u>Tall</u>, for example, could simply pick out a vertically extended object whose primary axis was noticeably more extensive than any of its others, without making any comparison with a norm-for-the-class, or with other objects.

If one now considers the negative equative structures 6, 7, 9 and 10, one of the reasons why people do not generally prefer negative information to positive becomes clear. 6 and 10 would normally be treated as synonymous, as would 7 and 9. But if 6 is paired with 7, it is striking that they are not synonymous in what they exclude. Nor are they synonymous in what they could be held to assert; although one "possible world" is compatible with both sentences, there are two other "possible worlds" each of which is excluded by one sentence but not the other. From 6, Sue could be understood as either the same height as or of <u>greater</u> height than Mary, and from 7 as either the same height or lesser height. The common equative meaning of the two sentences is derived from nexus negation, but if predicative negation is operating then the mutually exclusive meanings result. However, things become really complex when it is realised that an equivalent to the predicative negation meaning of 6 or 7 can be introduced in the form of a negative equative structure containing the relevant antonym, thus:

Sentence	Interpretation	Equivalent sentence
6.Sue is not shorter than..	Nexus negation	6.a.Sue is as short as ..
	Predicative negation	6.b.Sue is taller than...
		6.c.Sue is not as short as..
7.Sue is not taller than..	Nexus negation	7.a.Sue is as tall as...
	Predicative negation	7.b.Sue is shorter than...
		7.c.Sue is not as tall as...

What this means is that for 6 to be asserted, one of the situations described in 6a, 6b, or 6c will be the case. But we have already noted that in pragmatic terms 6a and 6c together differ from 6b on the kind of relational information which is salient: in 6b it is a foreground relation which is predicated, but 6a and6c predicate both a foreground and a background relation. Moreover, 6c was introduced via an equivalence with 6b, but now we have the paradox that 6a and 6c appear to assert contradictory propositions about Sue. We can see exactly the same result in the examples for 7, where the only difference is the replacement of one adjective from each of 6, 6a, 6b and 6c by its antonym.

The problem of contradiction can be resolved by blocking the introduction of background relations into the paraphrase transformations of statements asserting foreground relations. In performance terms, this means giving a preferred interpretation to sentences of types 6 and 7 such that the possible meanings are scanned and one is selected that maintains only the foreground relation of the original, i.e. 6b and 7b respectively. However, this procedure does not work when 6 and 7 are both intended to refer to the same state-of-affairs: when they are conjoined, the predicative-negation interpretation of each again produces a contradiction, this time between the assertions of 6b and 7**b**.

It is small wonder, then, that the negative comparative structure is not the preferred one for making statements, at least for mode 1 adjectives. The problem is basically that the predicative and nexus elements are syncretized, and there is thus no way of separately marking, in the negative comparative of mode 1, whether it is the predicate or the nexus which is being negated. Any knowledge coded by means of a negative comparative is for this reason insecure. Of course, a number of pragmatic variables intervene to ensure that this is not always the result. These have been skirted around so far, owing to the failure to properly distinguish between sentences uttered in meaningful contexts and those uttered in vacuo, or at least away from the contexts that gave rise to them; and it is also an important principle to distinguish between written and spoken language in this case. What has been said above applies to written sentences out of context. With spoken sentences in a context, matters are no doubt easier, since, firstly, intonation will sometimes disambiguate a speaker's intentions, and secondly, the listener can consult the visual context and see what size relation actually obtains among Sue and Mary and Jane, or whatever. Language structure is less important to communication when there is a supportive context, as Donaldson (1978) and many others have pointed out.

Many investigations of gradability, however, are pursued in rather barren environments, devoid of supportive context, where the importance accorded to language is proportionately greater. In this type of situation, which often also involves the written medium instead of the spoken, all the possible meanings have to be considered by the subject judging the logical truth of relations expressed in comparison sentences, and this means mentally running through a list of possible contexts where the (contextless) sentences would be true or false. But this demands a certain degree of academic self-discipline that many people lack. In such circumstances, they would tend to select the first compatible meaning for a comparison sentence and assume that it is the intended one. With the negative comparative of mode 1 adjectives, for example, the preferred reading would be that, say, for 6 there is still difference between Sue and Mary, but in the reverse direction, since this is a situation which is much more likely on the basis of experience: most things differ in some way from one another; few resemble one another even partially.

Mode 1 adjectives have been said to syncretize the nexus and predicative aspects of comparative structure. A consideration of mode 3 adjectives shows them to be quite different in this respect, and also in a number of other ways.

To begin with, the attempt at constructing a set of example comparison sentences in a similar paradigm to that for mode 1 is instructive:

11. Mary is more beautiful than Jane.
12. Jane is more repulsive than Mary.
13. Jane is not as beautiful as Mary.
14. Mary is not as repulsive as Jane.
15. Sue is as beautiful as Mary.
16. Sue is not more repulsive than Mary.
17. Sue is not more beautiful than Mary.
18. Mary is as beautiful as Sue.
19. Mary is not more repulsive than Sue.
20. Mary is not more beautiful than Sue.

Immediately one can note that sentences 11 and 12 are not reciprocal in the way 1 and 2 were, since they predicate not only a foreground relation but a background relation as well, and the reason for this is that the sentences carry separate syntactic realisations of the nexus and predicative components of comparison structure. The foreground relation of 11, for example, may be expressed as Mary more than Jane, and the background relation - Mary's (and Jane's?) status with regard to the universe, or the norm-for-the-class - as beautiful, i.e. "in the class of beautiful things".

There appears to be no way of introducing just foreground relations in mode 3 comparisons. It seems that, just as with the limitations imposed by the equative structures of mode 1, mode 3 comparisons always commit the comparer to a predication of background relations. This perhaps explains why good-bad are such a prominent pair of adjectives in English: they can be used in mode 1 style to assert foreground relations, and it is quite impressive how many mode 3 comparisons have periphrastic equivalents containing good-bad and their related compared forms (in the present case, beautiful may be replaced by good-looking; gigantic by good-sized; hypocritical by bad-hearted, and so on.). On the other hand, the disadvantages of mode 3 in positive comparative structures is compensated for by their advantage in negative: the nexus and the predicative component are available for separate negation, thus:

Sentence:	Type of Negation	Resulting sentence
11. Mary is more beautiful than...	Nexus	11d Mary is less beautiful than
	Predicative	11b Mary is more repulsive than

It is possible, then, to achieve greater precision in mode 3, since neither type of negation produces an ambiguous interpretation. Of course, there are in addition the same set of ambiguous sentences available as in mode 1: 16 and 17 can be paraphrased in a similar way to that used for 6 and 7.

Mode 2 adjectives like clever, huge and ugly seem to have both sets of characteristics described above for modes 1 and 3. Taking clever as the paradigm case, one can imagine the following types of comparison sentences on a par with 2 and 12 :

22a. Mary is cleverer than Jane

22b. Mary is more clever than Jane

It may be that the cause of much of the confusion that has crept into psycholinguistic research (e.g. H. Clark, 1969a; 1969b) could have been avoided if proper attention had been paid to the semantico-syntactic distinctions that have just been discussed.

Many adjectives - if not all - that code scalar properties such as size, weight, temperature and speed, are mode 1 adjectives that are capable, when inserted into a suitable comparison structure, of predicating exclusively foreground relations, and it is quite likely, if the other hypotheses concerning "ostension" are accurate, that children will be able to learn these first on the basis of situational experience.

On the other hand, many adjectives of mode 3 are more "scientific" in the sense that they code background relations when used in comparison sentences, and children up until the age of about eleven or twelve appear not to have a logic that could deal with this sort of relation, since they are seemingly unable at an earlier stage to make use of the concept of "norm-for-a-class".

Further research will be needed before a more substantial hypothesis can be formulated on another point of interest arising from the present work. This concerns the way children manage to develop from coding foreground relations to coding background relations in comparison sentences. It has been noted during the interview and questionnaire work for this thesis that children's comparison schema tends to centre on one adjective of an antonym pair to the exclusion, at first, of the other. In this way a complete but restricted set of comparisons becomes possible through the -er than structure and the two equatives. For big, the commonest structures seem to be, for example:

X is bigger than Y

X is not so big as Y

and X is as big as Y or: X is the same(size)as Y

This implies that antonyms are at first treated monadically, in isolation from their respective pair-members. The negative equative structure must code only a foreground relation for the child, however, as I have argued elsewhere that the "base" adjective has a binary logic similar to the comparative. To hazard a guess: the negative equative comparison sentence provides a link,in the developmental process, between foreground and background coding : it has common characteristics in all three modes of adjective structure. As the child begins to learn mathematics and science in school, experience of measurement will give him the necessary impetus to learn the empty-space concepts that form part of the meanings of size adjectives for an adult. He will learn that a long ladder is something quite other than a ladder three feet long. With the move from attribution to predication, focus shifts from filled space to empty space: to measure an object's length, one can merely put a chalk mark on a surface adjacent to two extremities of the object, and then measure the empty space, disposing of the object entirely if one wishes. As soon as the child learns that he can do this, length takes on an independent existence: it becomes a background feature, separate from the objects in which it inheres. The same is true of other physical concepts that are expressed by adjectives of gradable type.

Although in the last few years some efforts have been made towards helping children accelerate the process of developing empty-space physical concepts as well as ability in coding background relations (e.g. Nuffield Mathematics: cf. Nuffield Decimals Teacher's Guide), far more could be done to systematise the language used in school instruction. Certainly for the teaching of science subjects that have a strong mathematical content, such assistance should go further than providing a haphazard list of words for school teachers, with the instruction to "check them informally", and more specific direction should be given than that these words "should be used in a context of ordinary speech with comparatives and superlatives where relevant" (Gardner, Glenn and Renton, 1973: 70).

Gradability is slow to develop, and the increasing ability to abstract does not obliterate earlier prototypes of gradable concepts. They seem to persist, ever ready for service when the occasion demands. From the logic of small sets to that of universal sets, from notions of filled space to those of empty space, from the predication of foreground to the predication of background relations: these seem to be the signposts along part of the route that gradable adjectives travel. And yet the mementoes gathered on the way persist, and are all carried along to be traded with when the occasion demands: it is possible for an adult to consider an array of rectangles of equal height and pick out the one that is least extended horizontally, calling it <u>tall</u> . To paraphrase <u>Notes on Mathematics for children</u> (1977): "man is simultaneously as primitive or as sophisticated as the particular environment allows him to be". There can, despite Piagetian theory, always be more of the small ones than of the ones that aren't big.

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PAGE NOTES

Introduction

1. Although the term acquisition is used here, it is intended as a neutral description of the transition period from no use of language to use of language by the child. It should not be understood as implying that I subscribe to the simple incremental view of language development shared by some recent researchers whose work is discussed in section 2.4.2. ff.

2. Of course, the concept of 'universals' has a very long philosophical tradition antedating both modern psychology and linguistics and traceable ultimately to Plato.

   It is worth noting at this point that Langacker (1976), in a recent appraisal of the Linguistic Relativity Hypothesis, has questioned the whole idea of linguistic universals, even at the deepest level of linguistic structure, namely that of semantic representations. He suggests instead that what might be universal is the conceptual structures, the objects of cognition as it were, on which the processes of semantic representation operate. Langacker's argument is not incompatible with the findings of this thesis, especially as regards the conceptualisation of specialised adjectives of size such as tall, short and long: see Chapter 6 below.

3. In his discussion of this fruitful notion, McNeill quotes an observation from Braine (1970) in which two nonsense words niss and seb, the first a noun and the second a verb, were taught to his two-year-old daughter, to refer to a kitchen utensil and the act of walking with the fingers, respectively. Whereas she used niss exclusively as a noun, and at first used seb as a verb, after a while she also used seb as a noun, but niss was never accorded verb status. McNeill concludes from this evidence, and more of a similar kind, that the syntactic category of noun is a strong linguistic universal, and the category of verb is a weak linguistic universal. (Cf. also Lyons, 1977 : 427 ff., where the same sort of point is made.)

4. More enjoys the apparently ambiguous status of being adjectival or adverbial, depending on whether it occurs with ('modifies') a noun (e.g. There are more cakes here) or an adjective (e.g. The cakes here are more plentiful), and yet clearly there is an underlying commonality of function which is captured by calling it a "quantifier", as some psychologists seem to do.

5. Examples from Braine, 1963, tabulated in Brown, 1973 : 18.

6. It is interesting that Vygotsky (1962 : 66 ff.) suggests that the level of pseudo-concepts in the development of child thinking functions as a bridge between child and adult by means of language meanings which are to some extent shared.

7. Representing as they do the "top 2%" of the population, these students might be expected to show more development both linguistically and cognitively than the average adult. See Chapman and Chapman, 1959, and Henle, 1962, who discuss aspects of "normal" adult logic in a connected field of research.

8. Pessimists have suggested that in some cases the mind may never develop to the level where it could handle a complete set of conceptual structures such as that proposed for Piaget's stage of formal operations; see Halford, 1972 : 180, for a discussion of the problems. My own results, especially in Chapter 5, also tend to support this view.

9. This is not to deny of course that there are exceptional and exemplary, longitudinal studies; such as the work of Donaldson, Campbell and Wales.

Chapter 1

1. Chapters 1 and 2 post-date the experimental work reported in subsequent chapters. None of the post-1975 work discussed here was available at the time my research was conducted, but it has helped to clarify and crystalise a number of points concerning the interpretation of my data, and for this reason the relevant recent work has also been included.

2. Sapir nowhere makes clear whether he is talking from an ontogenetic or a phylogenetic point of view, or whether he intends the statement merely to refer to the way we act in particular situations. He also seems to assume that measurement and counting are distinct activities, whereas it can be seen that the former directly depends on the latter, as even Plato was aware (Cf. Philebus, 17A ff.)

3. Sapir's intentions are not perfectly clear here. That he does not intend run and red as nouns is assumed from the presence of gracefully, which cannot be treated nominally and can only be an adverb.

4. There are of course perfectly meaningful expressions like half red, half run, ten reds, eight runs - although I can think of no such examples for gracefully. However, if we examine these, we can see that they do not belong in Sapir's level (2) grading. Half red would either (a) refer to a surface (i.e. an "existent" in Sapir's terms), as in This table is half red (and half white) or (b) refer to a location in the spectrum (Sapir has nothing to say about locations, but presumably as these are parasitic upon "existents" - see Jessen, 1975 - they might be treated as a sub-type of these; they certainly fit in none of the other three categories) as in This colour is half red (i.e. reddish). In neither of these cases does the word half represent a ratio of $\frac{1}{2}$. Reference to properties should not be confused with reference to objects to which they are attributed: the problem of separating qualities from the objects in which they inhere has been appreciated for a considerable time (Cf. Plato, Philebus, 53A ff: the discussion of whiteness.). If we examine half-run (as a verb) it would have to mean something like "running divided into two" for it to belong in Sapir's level (2), but its usual gloss is either "sometimes run and sometimes do something else - such as walk" or "move at any speed slower than running but faster than walking", as for example in John half ran to the station. Depending on the gloss, we are either talking about alternation of activities or about time taken, but not about something cut into two. Similarly, ten reds and eight runs would have to be somehow glossed as nominal, i.e. as "ten instances of red" or

"ten red objects" and as "eight distances run" or "eight occasions where running occurred". The closest we would come here to Sapir's apparent criterion would be with glosses like "ten types of red" or "eight kinds of running", but even these seem to differ from *ten houses*, which could denote either ten identical or ten disparate objects, whereas the types of red or kinds of running - I think I'm right in saying - would have to be disparate to be enumerated. This cannot be pursued further here.

5. Such as *little* and *much*, which appear to fulfil the syntactic function of adverbs sometimes, as for example in *He comes here little* or *He doesn't come here much*. However, if we delve deeper to the semantic interpretation of such sentences, it can be seen that *little* and *much* quantify some other aspect of the situation than the activity represented by the verbal element: in this case it is the background, or contextual, feature of temporal extent for the activity that is being quantified, and this may be represented as points or stretches, parasitic upon our notions of spatial extent.

6. What Sapir possibly had in mind in choosing this term is the notion of what has come to be called "intensional meaning" (see Carnap, 1956), something again discussed by Plato (Cf. *Philebus*, 14C - E).

7. In the *Timaeus*, on the other hand, Plato seems to have grouped gradable concepts, like *hot* together with the elements such as *fire* on the grounds that it was ever-changing (*Timaeus*, 49E - 50A).

8. So, for example, immediately after mentioning his four classes of grading, Sapir says: "Only the last two types of terms are of further interest to us here. We shall briefly refer to the quantifying elements of terms of class 3 as *implicitly graded quantifiers*, to explicitly grading terms as *graders* (more than, less than), and to the implicitly quantifying elements of terms of class 4 as *explicitly grading quantifiers*." (Sapir, 1949 : 125). It is not at all clear what is meant by this. We have three sets of grading expressions distributed over two "terms", and only one of the expression-types is exemplified. The only reasonable interpretation is that *terms* are some kind of superordinate structures of which *elements* form a part, so that in the above quotation the two types of *quantifiers* would actually be most often nominals: e.g.

$$\overbrace{\text{much of }\underbrace{\text{the house}}_{\substack{\text{quantifying element}\\ \text{(implicitly graded quantifier)}}}}^{\text{Class 3 term}}$$

and

$$\overbrace{\underbrace{\text{more}}_{\substack{\text{explicitly}\\ \text{grading}\\ \text{term}\\ \text{(grader)}}}\ \underbrace{\text{houses than}}_{\substack{\text{implicitly}\\ \text{quantifying}\\ \text{element}}}}^{\text{Class 4 term}}\quad \text{(explicitly grading quantifier)}$$

Even if this interpretation is correct, which is far from certain, it can be seen that there is a confusion of levels in Class 4, since _term_ appears in superordinate and in subordinate structure. The difference between what counts as an _implicitly graded_ versus _explicitly grading_ quantifier is also untenable, since _the house/houses_ seem to be interchangeable in the two classes, according to the examples of Classes 3 and 4 given by Sapir himself. Finally, in the same section Sapir interchanges the words _term_ and _concept_ freely, so that further confusion arises as to what exactly the metalanguage function of the former word is.

9. As, for example "_More_ is obtained by going from _twenty_ to _twenty-one_" or "_Less_ is obtained by going from _twenty_ to _nineteen_" (Class 3 defined operationally in terms of class 2). Similarly, the class of rational and cardinal numbers can be defined in terms of Unity, the cardinal numbers being built up first and the rational numbers in turn derived from them and Unity.

10. Piaget's claim can also be countered, as will be contended in this thesis, by showing that although the _forms_ of adjectives occur in the order stated, possibly the full meaning of absolute adjectives, depending as it does on an often unstated "norm", is slower to develop than the full meaning of comparatives.

11. This is after leaving aside the question of whether the attribute "logical" is at all appropriate in this case. Sapir in fact shows alarming ignorance of Logic: he does not distinguish metalanguage from object-language, nor the notions of factual and synthetic truth, although these were distinctions that were already available to him at the time he wrote this paper (Cf. Tarski 1936; Black, 1937; and early works of Carnap.)

12. Despite the logical conventions regarding "the excluded middle", philosophers have long been aware of the kind of fallacy into which Sapir's discussion falls. There is even an early example of this awareness in Plato's _Philebus_, 43D - E, where freedom from pain is denied identity with pleasure. Cf. also Aristotle's _Categories_, 11^b 52 ff.

13. It is Bahm's aim to build a totally positive ("organic") system where the truth of propositions cannot be introduced by establishing the falsity of their negations. This is an idea taken over from Intuitionist logic, and avoids the kind of problem with "unlimited antonymy" that was experienced in linguistic semantics by following certain ideas presented by Katz (1964; 1966). This problem is discussed in Bierwisch (1969 : 165 ff.).

14. _Apposite_ connotes 'suitable', in a sense that a dimension may be said to be well-defined by opposites which are suitable or apposite. Thus _good_ and _bad_ are appositely opposed, whereas, say, _good_ and _slim_ are not apposite oppositions in this sense.

15. This is a fundamental principle of structuralist thinking which also has ancient roots: the idea that a structure is more than the sum of its parts is prefigured in Plato, _Timaeus_, 31 C.ff.: "But it is not possible that two things alone should be conjoined without a third; for there must needs be some intermediary bond to connect the two. And the fairest of bonds is that which most perfectly unites into one both itself and the things which it binds together . . .".

16. Cf. Lyons (1977 : 286): "Oppositions are drawn along some dimension of similarity." The same point has been made elsewhere (Bierwisch, 1970b : 170) in the definition of 'antonyms'.

17. Lyons has coined the term antipodal for this kind of opposition (1977 : 283). Examples given by Ogden of this kind of dynamic opposition are: backwards-forwards, up-down, into-out of. Mirror images, enantiomorphs, and all forms of geometric reversal may be regarded as directional opposites in rotation, and Ogden therefore counts these as examples of reversibility. One is reminded of Piaget's use of reversibilité, to describe one of the logical structures arising in the early stages of intellectual development which allows the child to realise that if X is bigger than Y then it follows that Y is smaller than X. Here, too, the underlying concept is one of directionality.

18. This does, of course, depend to some extent on how we perceive "death", and how we define it, since presumably living things do go on to shrink and disappear after death. If our perception of this matter were organised differently, we might then decide to use the term death for the end of this period of perishment and loss of form of the grown organism, rather than to the end of its period of structural self-maintenance (or motility or animism, in the case of animate beings). This broader view of things is characteristic of some types of oriental mysticism.

19. Scherer (op. cit.) suggested that in Sanskrit the underlying meaning of the superlative suffixes -ma, -ta, -va, was greatness or magnitude. In the root ma the idea of growth, expansion or greatness is found, which may be taken as the semantic source of the superlative suffix -ma. The root ta (expand; grow) points to a similar meaning in the suffix -ta. Scherer also contended that the comparative suffix -tara (root tar: sich hinausbewegen über) and the suffix -ra (root ar: arise or grow) are related; and further, that the comparative suffix -jans is a participle formation on the root i (go). Small (op.cit: 21) says that this relationship would seem to provide a syntactical reason for the choice of the ablative case for the object with which the comparison is made, since -jans would then have the meaning going away from and the object which is left behind (i.e. the point of departure) would then necessary be represented in the ablative case.

20. In particular the direct locative expression in tallness is introduced to provide a region or background universe against which the other reference objects are to be located in this case, but this seems to introduce an infinite regress, since we glossed sentence 1 by the same expression. I shall in fact later argue that the predicate expression is tall is in fact ambiguous, and shall introduce the notion of filled and empty space - or frameworks - to explicate this notion. The direct locative expression in tallness is intended to refer to empty space.

21. It should be pointed out that I only became aware of the shortcomings of Handel et al. (1968) after performing my own experimental work, so that my critical comments are really a case of being wise after the event. I overlooked this as a factor (see my discussion in section 4.2.), as, it seems, have a number of other researchers (For other examples of "dimensional collapsing", Cf. Bartlett, 1976;

Donaldson and Wales, 1970; Kuczaj and Lederberg - for the treatment of younger-older - 1977; Townsend and Erb, 1975; Wales and Campbell, 1970; and possibly Lumsden and Poteat, 1968). Of course, things may look different to adults: the fact that no one appears to have foreseen this problem certainly supports this conclusion. In this case Handel *et al.*'s interpretation of their results could be appropriate.

22. Plato is not aware of this anthropocentricity, though, since he inverts cause and effect: "To it (the head: M.E.) the gods delivered over the whole of the body they had assembled to be its servant, having formed the notion that it should partake in all the motions which were to be . . ." (*Timaeus* 44D). Later, in the *Laws* (896A), Plato talks of ten motions instead of seven, but apart from the first they bear virtually no relation to the seven motions, and it seem that he uses "motion" (Kineseis) in a much more abstract sense there.

23. The original misprints have here been corrected. Cf. Sapir, 1949 : 129.

24. There is some doubt as to whether they are even logically the same, since in a predicate calculus analysis it is possible to show that *better* and *less bad* make different predications, since it is possible to distinguish between nexus and predicate negation (Cf. Lyons, 1977 : 773 ff.). In general semantic terms, it can be seen that the *-er* inflexion represents the directional principle of opposition, whereas the adjectives taking *more-less* premodification embody the locational principle. There has been some controversy on this subject recently, although not expressed in these terms: Cf. Higgins (1976). Note that Sapir nowhere treats *more-less* premodification as different logically in meaning from *-er* suffixation. The desire to treat these as essentially the same has resulted in a number of problems in linguistics (See sections 1.3.4.1. and 1.3.3.).

25. Bolinger (1967b) has explicated some of these difficulties by pointing out that *more-less* are quite often sentence adverbials even when used with adjectives in apparent comparative structures as for example *This is hot but that is more warm.* Sapir appears to have been unaware of this fact.

26. I.e. propositions containing *first-order predicates* in the sense used by Lyons (1977 : 150). The terms of such predicates refer to first-order entities in the object-language (Lyons, 1977 : 442). Gradable attributes may also be ascribed, of course, to second and third order entities.

27. Thus unconsciously matching one of the suggestions made in Sapir (1949 ; 147). Cf. section 1.3.3., last page.

28. The term is used to refer to first-, second- and third-order entities in the sense of the definition given in Lyons, 1977.

29. The sentences below are examples of comparisons: (i) of inequality, and (ii) of equality. The *a* versions are explicit comparisons, and the *b* versions are implicit.

    (i) a. John is taller than Mary
        b. John is tall.

(ii) a. John is as tall as Sally.
b. John is medium (tall)/medium height.

30. In fact, as I suggest in 1.3.4.1. and propose in Chapter 6, this distinction might well be a useful one to make if one is to distinguish logically between nexus and predicate negation of comparison and clarify some of the confusion that has crept into this area of linguistics.

31. It is not absolutely clear what Crystal means by inflect. Since he later gives alike as an adjective which meets this criterion, he may intend the inclusion of syntactic processes like more-and most-premodification.

32. Bolinger has subsequently enlarged on this distinction in a study of "adjective comparison", and pointed out that whereas adjectives that allow either type of comparative form are freely usable as predicate adjectives, not all predicate adjectives allow the comparative. He also distinguishes between a "pertaining to" and a "having the quality of" meaning in certain adjectives: the former blocks a comparative, but the latter does not (Bolinger, 1967b : 5). The two different types of adjective meaning appear also to be correlated with different types of cognitive processing carried out by means of language, so that the rates of development of the relevant adjectives differ in child language. Cf. Nelson, 1976.

33. As Bolinger has indicated, looking for purely syntactic criteria with which to characterise these adjectives seems pointless: ". . . attempting to define a class of comparable (i.e. gradable: M.E.) adjectives along formal lines - by finding particular morphemes that are identified with comparison and others that are not - is likely to be unfruitful." (Bolinger, 1967b: 5). There are also quite important semantic problems at issue - for instance, logical entailment conditions - that are quite crucial to any understanding of the attributive-predicative distinction. See 1.3.4.1.

34. Cf. Ziff, 1960 (Ch. VI) : 202: "The word good characterises something that may or may not answer to certain interests." See also Ljung (1974 : 80); and Leech (1974 : 110): "It is largely because of this threefold variability of the norm that words such as good and bad are thought to be vague and shifting in their meanings." This may also relate to Osgood, Suci and Tannenbaum's (1957) reported findings of consistently high values for good-bad in the Evaluation factor loadings on their Semantic Differential scales.

35. One wonders whether Chomsky's choice of more clever rather than cleverer was deliberately made to avoid the difficulties I discuss in the next few paragraphs.

36. The only source where even a hint can be found that the two comparatives are different is Bolinger (1965 : 571, footnote 8), but the nature of the difference is not revealed there. Higgins' work is described in section 2.5.1. of this thesis. In this connection it is notable that the two types of comparison are treated as equivalent by Lyons (1977 : 273), who considers their logical implication in his discussion of the semantics of "gradable antonyms".

37. This observation also relates to one of the types of fallacy familiar in Applied Logic, namely the verbal fallacy of _division_, which is quite often associated with the violation of the formal rules for _distribution_. In this particular case semantical and syntactical rules are in conflict, since an equative structure of the type exemplified, while syntactically well-formed, is at the semantic level a predication whose predicate-term is of the type that cannot take two arguments of different rank. _John_ is an individual and must be paired with another individual term or terms (e.g. _John is as rich as Peter (and Mary)_): _anyone_ is not an individual but a universal term.

38. This is not the definition according to Lyons (1977 : 154). I have followed Quine (1974 : 159) in this case. Though the example given by Lyons seems correct, it fails to correspond with his formula for symmetricality, which maintains the order of terms while changing the relation to its converse, i.e. $R\ (x,y) \equiv R^{1}\ (x,y)$. This seems to be one of several misprints in Lyons' account.

39. _More_ and _less_ are in fact _asymmetrical_, since _X is more than Y_ is not logically equivalent to _Y is more than X_.

40. Cf. Aristotle, _Categories_: 5^{b} 18 ff.: "For nothing is called large or small just in itself, but by reference to something else. For example, a mountain is called small yet a grain of millet large - because one is larger than other things of its kind while the other is smaller than other things of its kind." See Ackrill's comments on this (1963 : 95 - 96).

41. Aristotle seems to have had difficulty with this problem: Cf. _Categories_, 5^{b} 30 ff.

42. Where the gradable adjective may involve some kind of evaluative judgement together with dependence on a norm other than what Leech calls "object-related" (see section 2.2.2.4.2.), conditions may be different. While _A small elephant is a big animal_ may not be contradictory, _A bad elephant is a good animal_ is certainly odd. Compare this with ? _A bad husband is a good man_.

43. It is not clear what is meant by "average" here. Bierwisch probably does not intend an arithmetic mean, since we are dealing with a "vague area". See Black (1937) for a suggested way of defining this.

44. Note here also the impossibility of an example _c_ generic interpretation for sentences like _The mountain is big_ or _The galaxy is big_.

45. Cf. Plato, _Republic_: 436, where the principle is elucidated that a thing cannot admit "contraries" at the same time _and_ in the same respect _and_ in relation to the same thing, and so on. Note, too, the superficial formal similarity of the example in Leech to those already discussed in the previous section, where no contradiction was said to arise.

46. There is a fairly clear connection between what Leech says about norms and how Vendler (1968) classifies adjectives according to the characteristics of the nouns they modify (see pages 53 - 54). There is furthermore in principle nothing to prevent "non-evaluative" adjectives (e.g. _big-small_, _heavy-light_) from appealing to all three

kinds of norm mentioned above, despite the inference that might be drawn from Leech that this does not occur. An adjective pair like big : small might appear to appeal only to object-related norms for sets of physical entities, but a moment's reflection shows this not to be the case. For example, what is big for a child is not necessarily big for an adult; and a European considered by his compatriots to be of diminutive stature would presumably appear big to a Japanese or a pygmy. Similarly, parallel to good boss, quoted above, we have examples such as big employer, which surely must be related to a role norm.

47. Givon (1970) has reported a number of tests for recognising "negatively related" pairs of adjectives and determining whether an adjective has positive or negative polarity; and Osgood and Richards (1973) have indicated that pairs of predicates containing adjectives are usually conjoined with and if their polarity agrees, but with but if they are of opposed polarity. Compare, for example, the following:

He is wise $\begin{Bmatrix}\text{*but}\\ \text{and}\end{Bmatrix}$ good versus He is wise $\begin{Bmatrix}\text{but}\\ \text{*and}\end{Bmatrix}$ bad.

He is stupid $\begin{Bmatrix}\text{*but}\\ \text{and}\end{Bmatrix}$ good versus He is stupid $\begin{Bmatrix}\text{but}\\ \text{*and}\end{Bmatrix}$ bad.

48. There may well be a confusion of levels here: note the equal oddity of saying small things lack bigness or what is required is less highness. See the discussion of hyponymy, later in this section.

49. This is to be differentiated from another use of this term, mentioned in Lyons (1977 : 279), to cover one half of a contrast in which the negative term denotes complete absence of what is denoted by the positive, as in the pair: animate-inanimate. Lyons distinguishes privative opposition from equipollent opposition, where each lexeme of the contrast pair denotes a positive property, as for example male-female. On this analysis gradable antonyms like big and small resemble equipollent opposites, since they both denote size, just as long and short both denote values in the dimension called length (H.H. Clark, 1970b : 271).

50. Note, yet again, the similarity of these sentences to those used in the preceding subsection 1.3.4.1. (A small elephant is big), where no contradiction resulted.

51. The only researcher to even remotely acknowledge the possibility is Givon (1970 : 822, footnote). After precipitately dismissing The line is three millimetres short as unacceptable, he concedes that it may mean "the line falls short of the mark by three millimetres". One might also note, as an aside, the peculiarity of the questions used by Wallach and Kogan (1965 : 113) to determine "category width" as a cognitive variable. Notice the b question here; one wonders what the full answer might be!:

"Most whales are about 65 feet long.

(a) How long is the longest whale?

1. 69 feet 2. 150 feet 3. 76 feet 4. 90 feet

(b) How short is the shortest whale?

1. 37 feet 2. 8 feet 3. 51 feet 4. 58 feet "

52. _Neutralization_ is used in the same sense by Lamb (1964) and Lehrer (1974). The term _syncretization_ is used in this sense, too (e.g. Hjelmslev, 1953 : 56 ff).

53. Not the least reason for my saying this is that a diligent search of Hjelmslev (1953) revealed that he never uses these terms at all - or at least the translation of the _Prolegomena_ does not contain them. Hjelmslev does use the term _extension_, but this is not in anything like the way necessary to support Greenberg's statement (Cf. Hjelmslev, 1953 : 26 - 27), which is not annotated with a page-reference in his bibliographical information. See Hjelmslev's remarks on _syncretism_ (_op. cit_. : 56 ff).

54. Quoted in Greenberg (1966 : 72).

55. Greenberg says nothing of adjectives which do not inflect. If frequency is his criterion, then clearly the comparatives and superlatives of these, formed by use of _more_ and _most_, will not show up separately in word-counts.

56. His later discussion clarifies what he intends by this: "In a language without a grammatical category of diminutives and augmentatives, where size is indicated by modifying adjectives, if we use 'house' in a sentence without modifiers, the size is unspecified but the house may in fact be unusually large or unusually small. We will usually assume that it is of normal size because most houses are of normal size. On the other hand, 'small house' or 'large house' excludes explicitly from interpretation as normal size. The frequent assimilates the ambiguous, save contrary indications." (Greenberg, 1966 : 97).

57. It is difficult to know what Greenberg means here, since presumably _width_ is marked in relation to _wide_, by the criterion of both morphological marking (_wide_ + _th_) and of frequency (_width_ is less frequent than _wide_ according to both Thorndike and Lorge, 1944 and Kučera and Francis, 1967. The same is true of the other pairs). The question of which adjective of a pair appears in demands for quantification (i.e. in "How - questions") will be pursued in more detail later in the section.

58. An example is the singular-plural distinction. Although plurals in English are marked formally with respect to singulars, "it is by no means so clear that the same is true from the more 'abstract' point of view" (Lyons, 1970 : 17).

59. A similar view is presented by Greenberg (1966 : 97).

60. Ogden's (1932 : 99 - 101) analysis supports this asymmetry: _bad_ is defined by negation of _good_. As already noted in section 1.2.2., Bierwisch (1967 : 12) suggests that the _good : bad_ opposition is different from size antonyms in that these latter are paired symmetrically about an intervening norm, whereas _good_ is itself the norm in the opposition _good : bad_. Cf. also Clark and Clark (1977 : 539).

61. The _marked - unmarked_ distinction is not as general for gradable antonyms as linguists claim or imply. It appears limited to adjectives representing physical dimensions that have scalar properties, e.g. size, length, width, weight, etc. Even here, though,

some adjectives do not display the distinction: consider fat and thin. Both How fat is your granny? and How thin is your granny? are distinctly odd.

62. Marking is realised in these cases by the placing of the tonic syllable in the tone group, and/or by the placing of foot-boundaries. Cf. Berry (1977 : 88-89): "There is a choice, then, between a usual or unmarked position for the tonic and an unusual or marked position for the tonic. If the marked position is chosen, attention is drawn to the new bit of information contained in the utterance." The same sort of distinction can be found with regard to foot-boundary placing at the level of rhythm in phonological analysis.

63. Kiefer has recently given a similar analysis for the German comparative sentence, although he talks of presupposition rather than marking (Kiefer, 1978).

64. Thus following to some extent Aristotle's notion of 'paronymy'. See Categories, 1[a]12. But as Ackrill comments: "A thing is paronymous if its name is in a certain way derivative. The derivativeness in question is not etymological. Aristotle is not claiming that the word 'brave' was invented after the word 'bravery'. He is claiming rather that 'brave' means 'having bravery'; the brave is so called because of ('from') the bravery he has . . . . To say that an X gets its name from something (or is called X from something) does not necessarily imply that there is a name for the something . . ., or that, if there is, 'X' has any similarity to that name . . . But only if these conditions are fulfilled does an X get its name from something paronymously." (Ackrill, 1966 : 72). Givon, it seems to me, does not distinguish between categories internal to the language system and categories belonging to the world, which the language system is employed to talk about. Ljung makes this distinction initially, but then loses it. (See the text following).

65. This has been discussed: see section 1.3.3.

66. This is not to deny the value of some of Ljung's other proposals. For example, his extension of the gradable adjective class to include adjectives like toothy, busty, leggy, etc. expands considerably the range of adjectives that can be termed gradable, and points up the fact that opposition is not a criterial characteristic of all such adjectives.

67. "A lexical set may be defined at the primary level of delicacy as a group of items which have the potentiality of realising at least one semantic component in common. The more delicate the lexical set, the greater the number of semantic components common to the description of the members of the set. This largely forms the basis for their collocability (i.e. privilege of occurrence) with items from other lexical sets . . ." (Hasan, 1971 : 144).

68. De Saussure (1916 : 166): "De même un mot peut être échangé contre quelque chose de dissemblable: une idee; en outre, il peut être comparé avec quelque chose de meme nature: un autre mot. Sa valeur n'est donc pas fixée tant qu'on se borne à constater qu'il peut être échangé contre tel ou tel concept, c'est à dire qu'il a telle ou telle signification; il faut encore le comparer avec

les valeurs similaires, avec les autres mots qui lui sont opposables . . ."

69. Katz and Fodor, for example, in their initial formulation, specifically exclude sociocultural context, or setting, from the phenomena which a semantic theory must try to account for (Katz and Fodor, 1963 : 176 ff.), and a similar view is expressed by Leech (1969 : 13ff.) who states that a semantic theory should concern itself with logical rather than factual truth in statements, i.e. that it be a theory of 'meaning' rather than 'reference'. Kempson even goes so far as to present semantic components in predicate calculus notation, since "each semantic component will be one part of a lexical item's contribution to sets of truth conditions" (Kempson, 1977 : 92). The use of componential analysis in linguistics is thus somewhat different from its use in anthropology, where setting assumes great importance (Wootton, 1975 : 37).

70. This combinatory structure is clearly inadequate to characterise all sense relations between lexical items, as a number of linguists following Katz and Fodor (1963) were quick to point out: cf. Bar-Hillel (1966) and Bierwisch (1969), as well as Weinreich's (1966) suggestion that some kind of ordering among features was necessary. Lyons also comments: "It is arguable that the notion of product with which we operate when we say that the sense of a lexeme is the product of a set of atomic concepts must be even richer than the one that we have elaborated so far." (Lyons, 1977 : 321).

71. Cf. also Burling (1964 : 20): "Componential analysis is applied to a set of terms which form a culturally relevant domain and proceeds by recognising semantic distinctions (components) which apportion the terms of the set into contrasting sub-sets, such that every item is distinguished from every other item by at least one component."

72. We shall not have anything to say about the marker-distinguisher dichotomy in Katz and Fodor's semantic formulation: a number of scholars have criticised this distinction as theoretically untenable (Bolinger, 1965; Bar-Hillel, 1966; Bierwisch, 1969; and Weinreich, 1966). Later versions of the theory have tended to neglect distinguishers, though Lyons appears to find the distinction feasible (cf. Lyons, 1977 : 326 ff.), since it bears a certain resemblance to the classeme-seme distinction made in some European theories of structural semantics.

73. ". . . it is clear, that the number of dimensions is specific for each type of space. This can be represented formally by taking (space) not as a binary feature with values "+" and "-", but as a marker with numerical value (n Space) . . ." (Bierwisch, 1967 : 16). However, it should be noted that referring later to this paper(in Bierwisch, 1970a : 43), Bierwisch makes no distinction, and calls both types of component "simple markers".

74. See, for example, Bower (1977 : 63): "Abstract descriptions such as 'rounded with a piece cut out' are commonly referred to as 'distinctive features'. It appears that our perceptual system operates with distinctive features rather than sense-specific items."

75. Cf. also Chomsky (1965 : 164), who also points out the necessity of taking field properties into account.

76. The adjectives are as follows:

A: lang weit weit breit hoch tief dick dick gross
B: kurz nah eng schmal niedrig flach dünn schlank klein

A: alt alt schnell lang früh
B: neu jung langsam kurz spät

A: gut gut schön groß schwer schwierig stark
B: böse schlecht häßlich klein leicht leicht schwach

A: laut hoch hell
B: leise tief dunkel

and Bierwisch adds the comment:

> "In this list the items are arranged in pairs due to the already known fact that 'polarity' plays an important role in the structure of adjectives. The set of pairs can easily be extended, and a lot of 'derived' adjectives receive their counterpart by the prefix un as in königlich - unköniglich, amerikanisch -unamerikanisch, etc." (Bierwisch, 1967: 6)

77. It is also worth noting that according to Levi-Strauss (1962), quoted in Culler (1975 : 15), one of the major problems that arise in using binary oppositions is that the simplification achieved by setting two items in opposition to one another results in complications on another plane, because the distinctive features on which various oppositions rest will be qualitatively very different. In the componential analogies, cases become similar because each involves the presence and absence of a given feature, but this similarity is deceptive in that features in question may be of very different kinds.

78. Op. cit. : 7. Cf. Clark (1970 : 275) who takes a similar view of antonyms.

79. This fact also puts a hole in Bierwisch's justification for allocating a (+Pol) marker to long. In a sense I am cheating by saying this, of course, since Bierwisch's discussion is limited to lang and kurz, not long and short, and the same phenomena as I am discussing for English do not occur in the German adjective pair. An additional preposition/particle zu would be needed to allow the German adjective kurz to be used in measure phrases: e.g. Der lange Leiter ist zehn Zentimeter zu kurz. This is parallelled in English by the use of too with many of the other "diminutive" adjectives: e.g. The wide door is six inches too narrow.

80. The use of ratio expressions to justify the allocation of the (+Pol) marker, for example, cannot cope with pairs of antonyms like beautiful-ugly, since the adjectives' privilege of occurrence in a frame like X is twice/half as . . . as Y is uniform. Bierwisch's claim that there are two classes of (± Pol) features, namely "orientated" and "unorientated", made to cope with this sort of difficulty, disturbs the principle that a component should

be atomic. He also suggests, in his classification of adjectives, that those adjectival predicates that can be modified by a "Measure Phrase" (MP) are a subset of one of his two defined classes of adjective, namely the "orientated" type, but this is inaccurate, in my view, since only (numerical) scalar notions fit the adjectives in this class, and they are all modifiable by MPs. Thus they form the whole class, not a subset of it.

It is also worth noting that Bierwisch himself later points out some of the inadequacies of marker-theory (1969 : 166-168), although he does not take up the above points specifically.

81. In fact, in subsequent papers Bierwisch attempted to replace the (± Pol) marker values by relational terms, a procedure not without its own problems, and criticised by Leech (1974 : 118): "The difficulty is that the more one tries to reduce one sort of opposition to another in this way, the more complex and problematic becomes the task of relating semantic structure to syntactic structure . . ."

82. I speculate as to the name for this component. Possibly it might be VOLUME.

83. Leech believes, for example, that for <u>beautiful</u> "a polar dimension of meaning is specified without any indication of inclination towards one pole or the other. Notice, for example, that 'Welsh slag-heaps are more beautiful than English ones are' does not entail 'Welsh slag-heaps are beautiful'.". This is a point which has already been partly discussed in 1.3.3. and 1.3.4.1., and I think there is a failure here to differentiate semantically between <u>-er</u> comparison and <u>more-less</u> comparison, so that Leech's statement is inaccurate.

CHAPTER 2

1. Compare Hasan's comment: "One may grant the possibility that the total inventory of semantic components of all languages would be identical; this remains to be proved. There is however no doubt that the meaning structure of all languages is not identical; that is to say, the manner in which these components combine in a given language is not the same as in any other language." (Hasan, 1971 : 138). This can be seen to represent either the first or second view, whereas the work of Katz and Fodor (1963) represents the third, as does the discussion by Lyons (1977 : 331 - 333).

2. Cf. Katz and Fodor (1963 : 188 - 189) who exclude "distinguishers" from the phenomena to be accounted for in semantics; Katz's (1967 : 186 - 188) discussion of gradable adjectives in comparison structures also assumes a pragmatics dimension. Bierwisch comments (1970b : 183): ". . . The semantic interpretation of a given sentence might depend in part on the particular linguistic or extralinguistic context in which it occurs . . .".

3. This is of course an echo of Chomsky's very similarly worded claim (Chomsky, 1965), a later version of which was quoted on page 3 of the Introduction.

4. In other words, the scale and the cut. The first is a "physical conceptual thing" and the second a "mathematical conceptual thing": "The concept of the continuum is, in a sense, the complement of the point. It is just as unphysical, but within its own scope extremely valuable . . . The important advantage of the concept of the continuum over the atom picture is that it emphasises properties which are to do with the whole of whatever is under scrutiny. Bulk, rather than atomic properties, the holistic, rather than the microscopic, are picked out and given prominence. The detail is deliberately obscured so that the manifestations of the whole stand out clearly." (Ridley, 1976 ; 18 - 19). It is interesting that Ridley implies everything in the universe, from the very smallest thing studied in physics to the very largest, can be visualised as a series of nested structures consisting alternately of point particles and continua. In this sense gradability reflects a universal structure relation.

5. The philosophical side of the problem, i.e. whether universals exist, in the sense discussed by Plato, is here left out of account. As Peri puts it: "One thing in common to the universals accepted in a philosophical system, is their assumed ontological status. In contradistinction to material-physical entities, universals have been considered to be non-physical entities, existing 'outside' space and time. In extreme Platonism, they are considered as the only real being, the material world being of a lesser reality" (Peri, 1976 : 447). Peri suggests that an explication of the philosophical concept of universals is possible in terms of problems of perception and categorization, and that automata are already capable of perceiving and categorising certain of the "simpler" universals postulated by philosophers, such as "redness" and "triangularity" (Peri, 1976).

6. Such an inference seems to be made, for example, by E. Clark (1977a : 20): "The child obviously starts with a handicap: he lacks the adult's experience of the world, of social constraints,

and of linguistic communication. What he has in common with the adult is that he is a member of the same species, and hence possesses the same biological structure with which to process information."

7. In grouping, objects separated by relatively small distances tend to be linked in perceptual processing: and "temporal 'dots' form temporal groups just as simultaneously given dots tend to form groups in space. This holds for hearing and touch no less than it does for vision" (Köhler, 1970 : 55).

8. It now seems much more likely than before that new fibre connections may be established between neurones when learning takes place, the outgrowth being stimulated by chemicals extruded from the recipient cells. Recent work with the mammalian sympathetic nervous system has established such processes and isolated some of the chemicals involved (Levi-Montalcini and Calissano, 1979).

9. The question of what is actually stored in memory, whether a set of perceptual "distinctive features" or an unanalysed eidetic trace, or prototype, is clearly of interest. The former is more desirable for those subscribing to a version of the "innate (linguistic) universals" hypothesis, since the sensory abstractions would form convenient bases on which to build semantic components. Griffiths has argued that the prototype image is a much more likely candidate for coding, although, as he says, a theory of "criterial attributes" might possibly be compatible with early, pre-linguistic perceptual processing (Griffiths, 1977). It seems that the two types of coding are not necessarily mutually exclusive, however, since there is evidence that children up to the age of five or so, when presented with abstract figures in drawings, tend to turn these "the right way up". This shows clearly that children have established expectations of how objects should look, on the basis of perceptual data from the world around them. But when they rotate the abstract pictures to turn them "upright", what sort of stored sensory data are they using? Either prototype images of real-world objects or sets of abstract features could be involved. (Cf. Ghent, 1961; and Eldred, 1973).

10. E.g. on page 38: "These adjective pairs differ, however, in their conditions of application. high-low, for example, requires that the object to which the adjectives are applied be three-dimensional and have a vertical dimension. To say The glip is tall is to presuppose these two conditions about glips."

11. It is interesting to compare the views of Piaget and Inhelder (1956) on such suggestions as these. They point out that it is topographical notions of space which are earliest to develop, and that projective and euclidean structures of space - the ones which Clark considers basic to P-space - "are therefore more complex in organization and are only evolved at a later stage in the child's development" (op. cit. : 153). There is a great difference, moreover, between being able to perceive a straight line and being able to re-create it in the imagination, and this latter is presumably what is demanded for a "concept" to be in P-space. Piaget, Inhelder and colleagues have a few ripe comments for those who express the opinion that notions of projective or euclidean space are elementary (Piaget and Inhelder, 1956 : 155).

12. In fact there is increasing evidence of very large age disparities in the onset of the various stages, as more cross-cultural comparisons become available from other investigators using Piaget's techniques. Cf. Piaget (1977).

13. The second example is the same sort of relation as is referred to by Lyons' term <u>converseness</u> (Lyons, 1977 ; 273) (See section 1.3.4.1.). There is <u>transposition</u> (i.e. reversal of order) of the nominal expressions, together with reversal of polarity either in the gradable adjective if it is antonymous and takes <u>-er</u> comparative form (<u>big-small</u>) or in the pre-modifier (more-less) if it takes the alternative, non-inflected form. The first of Piaget's examples only transposes nominal expressions, and this would also be the case if an adjectival rather than a purely verbal structure were used, such as <u>A is equal to B</u> or <u>A is the same as B</u>. Clearly there are grounds for regarding converseness as a more complex process than mere transposition, from the linguistic point of view, although Piaget does not appear to think that they are of different degrees of cognitive difficulty.

14. Piaget does tend to skirt around more awkward facts, such as that even deaf-mutes learn language, albeit through another medium; and until recently they tended to have fewer educational and training facilities available than normal children. Language is of great importance to setting up the experiments on conservation, and this is an awkward fact that has to be accounted for, but is mentioned in covert form by Piaget and Inhelder (1969 : 88), for instance; note the last part of their comments on work with deaf children: "Seriation and spatial operations are normal . . . The classifications have their customary structures and are only slightly less mobile in response to suggested changes of criteria than in hearing children. The learning of arithmetic is relatively easy. Problems of conservation (an index of reversibility) are solved with a delay of only one or two years compared with normal children. The exception is the conservation of liquids, which gives rise to special technical difficulties in the presentation of the assignment, since the subjects must be made to understand that the questions have to do with the contents of the containers and not with the containers themselves." It seems strange that they should not have thought this a problem with normal, speaking children!

15. For example, a child is presented with two dolls; one of them is "given" four large marbles and the other two small marbles. The child is then asked questions like <u>Is this fair</u>? <u>Are both dolls happy</u>? <u>Why not</u>? There is evidence that adjectives like <u>fair</u> and <u>happy</u> are not understood properly by children until after the age of twelve: Ervin and Foster (1960) found that children failed to differentiate properly between <u>pretty</u>, <u>happy</u>, <u>clean</u> and <u>good</u> in more than 50% of cases in a study involving sixty-nine children, half of whom were first-grade, and the other half sixth-grade school-pupils.

16. This is a reference to the "four-group" that is the logical basis for so many operations, the so-called INRC group (Identity, Negation, Reciprocality, Correlation) of four transformations.

17. It is interesting that Carnap has observed that anyone learning a foreign language which has already been analysed will learn intensions

before extensions, whereas someone analysing a language for the first time for himself - Carnap talks of a linguist, but it could equally well be a child learning its own language - will begin by establishing a theory of extension, and will only later be able to build a theory of intension, since the extension of terms can be inferred from actual usage, but the intensional theory has to account not only for actual but for all logically possible cases. It is therefore quite possible for two people to agree totally on the extension of a given predicate in a given region and yet ascribe different intensions to that predicate, "For there are more than one and possibly infinitely many properties whose extension within the given region is just the extension determined for the predicate" (Carnap, 1956 ; 237).

18. Anecdotal support for Vygotsky's view is found in Biggs (1971 : 20), where sameness of length took longer for children to acquire than did difference: "We played with lengths of ribbon, vinolay, cardboard, and so on. I would hold up two pieces, and the children decided which was long and which was short. Then, I might move one piece up or down and ask again which was long and which short . . . Then I tried the same method using strips of the <u>same</u> length. Funnily enough, the 'sameness' of length, regardless of position, took much longer to acquire . . ."

19. It is not at all clear what exactly Bruner intends us to infer from the first example (heavy-light). Is this intended as an example of a syntactic transformation that preserves intensional synonymy (i.e. so that <u>light</u> ≡ less heavy), or are we supposed to understand that language allows us to re-group or re-categorise objects previously categorised as <u>light</u> by calling them <u>less heavy</u> (i.e. predicating two properties of the same class, or in Carnap's terms providing an extensional predicate with two intensions that are not synonymous)? Unfortunately, nowhere in his paper does Bruner systematically distinguish between "base" adjectives and their comparative forms, either on syntactic or semantic grounds, and as has already been shown elsewhere (sections 1.3.3. and 1.3.4.), failure to do this causes a number of difficulties.

20. The results of my own study (see Chapter 4) suggest that <u>long</u> (and possibly therefore also <u>longer</u>) may be coded as a shape adjective for young children, and <u>short</u> might not be known or understood at age four or five. This implies that the reason for the discrepancy in Riley and Trabasso's results could be related to verbal familiarity in ways other than they consider.

21. Miller (1956) has reported a number of experiments which show that although there are limits on human abilities to recognise and remember more than about seven values of a unidimensional stimulus variable - which constitute what he calls the <u>span of absolute judgement</u> - it is possible enormously to increase the volume of what is memorable by increasing the number of dimensions: "It seems that by adding more dimensions and requiring crude, binary, yes-no judgements on each attribute we can extend the span of absolute judgement from seven to at least 150. Judging from our everyday behaviour, the limit is probably in the thousands, if indeed there is a limit" (Miller, <u>op. cit.</u> : 39). Miller also suggests that there might be an upper limit of about ten on

the number of dimensions that can be simultaneously processed, this limit being the span of perceptual dimensionality. Of course, even with language available to increase channel capacity, the child's brain is - probably for maturational reasons - incapable of dealing with the same amount of information as an adult's (see also McLaughlin, 1963; Pascual-Leone, 1970).

22. The notion of strategies was suggested according to McNeill (1970), from studies of child syntax by Bever, Mehler and Valian, as a result of an examination of the links between situation structure and the reversibility of passive sentences. Thus a strategy is a method of using semantic coherence as a means of facilitating a syntactic analysis. In itself it is not a syntactic analysis. "Strategies of this kind depend on a conviction that utterances make sense and (in the case of passives) on knowledge of what causes a situation to be reversible and non-reversible. Such information is distinct from the strictly grammatical information about the underlying relations in a sentence - subject, verb, and object. Semantic strategies are acquired later than knowledge of grammatical relations, at four years instead of two, and are derived from a different source . . ." (McNeill, 1970 : 124).

23. I quote verbatim from the relevant part of Clark (1969b : 206): "Several generations of linguists (e.g. Bierwisch, 1967; Greenberg, 1966; Lyons, 1963, 1968; Sapir, 1944) have observed that word pairs like good and bad are not symmetrical. Good, the so-called unmarked member of the pair, can be neutralized in some contexts, as in "How good was the movie?", whereas bad, the marked term, cannot. Good, but not bad, can also be neutralized in comparatives: "John is better than Pete" can mean that John and Pete are only being compared evaluatively, although "Pete is worse than John" presumes Pete and John to be bad. The principle of lexical marking is that the neutral senses of unmarked adjectives, like good, are coded in memory in a simpler form than the senses of marked adjectives, like bad. The main consequence is that storage and retrieval should be quicker for comparatives containing unmarked adjectives." The "principle of lexical marking" is the second principle said by Clark (op. cit.) to affect memory. The first is the "primacy of functional relations", which makes reference to the underlying (T-G syntactic) structure of sentences expressing comparative relations, where no distinction is made between equatives and comparatives: and according to this principle, "a person 'knows' more readily that (for sentences like John is worse than Pete and Pete isn't as bad as John: M.E.) John and Pete are bad (the functional relations expressed in the base strings) than that John is more extreme in badness than Pete" (H. Clark, 1969b : 205 - 206). We shall consider some of the other points raised in Clark's paper in section 2.5.1.

24. McNeill (1970 : 115 - 116) means that in the holophrase period before combinatory speech appears, each single-word utterance by the child stands for a whole abstract sentence, and thus each word stored represents such a sentence. McNeill wholly accepts the characterisation of the dictionary given by Katz and Fodor (1963): "It is with the first construction of a word dictionary that we can date the rudiments of a semantic system basically similar to that of adults . . . In moving from a sentence to a word dictionary a fundamental change is made in the format of the dictionary entries

themselves. A child begins to elaborate a system of semantic features and sentences come to be interrelated by rules for using dictionary entries" (McNeill, 1970 : 115). The notion of a sentence dictionary, however, is the more interesting, since I believe it may last much longer than McNeill thinks. It is clear from his examples introduced into the discussion that he is primarily thinking of nouns as his word entries in the dictionary, but if one extends the entries to other word classes and examines how these classes might be stored, a phrase or a sentence dictionary might very well do the job better than a list of semantic features; this suggestion merely draws on the ideas implicit in Bolinger (1965), but if we cast further afield for support, there is a plethora of evidence to be had in word-association studies, e.g. Deese (1962; 1964; 1965). Nouns elicit other nouns far more often than members of other word-classes, showing their basic paradigmatic associative structure, whereas adverbs call forth mainly other word-classes, in syntagmatic associations. Verbs and adjectives are about midway between the two other classes, as far as syntagmatic association is concerned. Deese's (1965 ; 140) comment on the associative structure of gradable adjectives (<u>hot-cold</u>, <u>good-bad</u>) would certainly support a thesis of sentence-storage: "There is, then, considerable evidence for the correspondence between associative patterns and the contextual patterns of underlying sentences. The referential meaning of the contrasting members of pairs must be the outcome of some contingencies between events in the natural world and these words." It is interesting that McNeill, reviewing word-association experiments with child subjects (<u>op. cit.</u> : 117 - 120), does not regard the high predominance of syntagmatic responses, and the well-known phenomenon of "syntagmatic-paradigmatic shift" (H. Clark, 1970c) in children between six and eight as constituting evidence for the persistence of a sentence dictionary beyond the age (28 - 30 months) he postulates for the creation of a word-dictionary. He argues that syntagmatic responses are "actually often paradigmatic responses that, because of the breadth of the semantic categories available to young children, fall outside the grammatical class of the stimulus" (McNeill, 1970 : 119).

25. Edwards and Gibbon (1973) counted the words used by children of 5+ <u>N</u> = 820), 6+ (<u>N</u> = 794) and 7+ (<u>N</u> = 506). They divided the words by ranked frequency into blocks of 250 (1st. = most frequent 250 words, 2nd. = frequency ranks 251-500, etc.). A sample of the frequencies is given below. Note the commonly high frequency of <u>big</u> and <u>little</u>, and the gradual increase with age in the frequencies of the more specialised adjectives of size, as well as of certain evaluative adjectives.

	1st	2nd	3rd	4th	5th
5+	big-little	long good-bad nice	more		
6+	big-little good nice	long bad better, best more much	small high fat many right	deep flat thin few	 wrong

	1st	2nd	3rd	4th	5th
7+	big-little	high	small	tall	short
	long	bad	middle	deep	fat
	good	right	straight	flat	further
	nice	better,		thick	shape
		best		wrong	
	more	much	many		few
				soft	queer
					silly

26. Di Vesta(1965), studying five year-groups of children between seven and eleven, found that the following adjectives were amnng the most frequently occurring, although their relative frequencies dropped to between a half and a fifth between the youngest and the oldest children as vocabulary increased: _good-bad_, _nice_, _big_, _pretty_. There was a notable change in type of vocabulary, with reference to "concrete" properties among the first fifty words on his "entropy index _H_" dropping from 47 for seven-year-olds to 30 for eleven-year-olds.

1. Bierwisch (1970a), Leech (1974) and Chafe (1970) have all made essentially the same point, namely that although this is an elephant entails this is an animal, this is a small elephant does not entail this is a small animal. (see 2.2.2.4. (ii) further).

2. Although they used arrays of only four, Wales and Campbell (1970) seem to be aware of this problem. Other studies, notably Ehri (1976), which have appeared since this pilot-scheme was conducted, have taken more account of the difficulty.

3. It seems likely, for example, that superlative adjectives will be restricted in application, to the extreme members of an array, but they might maintain these positions even in the presence of un-inflected (absolute) adjectives if the array is large.

4. The count-superlatives (fifth longest, etc.) are problematic theoretic-ally. If they are treated directionally then in fact the polarity should be reversed or negated, since fifth longest means fifth away from long(est) not fifth towards long(est). Luckily, the results do not change when this adjustment is made.

5. Or first or last. It is also possible of course to arrive at a superlative by conjoining all instances of comparative, so that x-est is x-er than all.

1. Such as that currently proposed by Bloor (1977).

2. In the adjective list, only the polar words are given. The list is intended to be suggestive rather than exhaustive.

3. Baldwin (1965) seems to have used pictures in this way successfully, as have Bentler and Lavoie (1972).

4. The middle instance of each "Big" array was removed to form the "small" version of the page, which for reasons of space could not accommodate seven drawings.

5. One very noticeable fact is that nowhere in the data do comparatives or superlatives appear involving *less* and *least*; and their polar opposites *more* and *most* are also missing.

6. The boxed diagonal and the *k* x *r* entries are percentages generated from simple frequencies. The quadrant percentage was generated by creating a potential sum of *k* x *r* entries, $\Sigma p(k \times r)$, from each related pair of scores in the boxed diagonal: the smaller scores of each pair were entered in the body of the table and summed for each quadrant. In quadrant A of Group One LENGTH, in Table 4.4.2.2.B., for example, the potential sum was 6 + 12 + 12 (column GC+) plus 6 + 6 (column GC-) plus 24 (column GS+). Thus for quadrant A:

$$\Sigma p\,(k \times r) = 6 + 12 + 12 + 6 + 6 + 24 = 66$$

The actual sum of *k* x *r* entries, $\Sigma(k \times r)$, was then found and the quadrant percentage of interaction (Q) was calculated by the formula:

$$Q = \frac{\Sigma(k \times r)}{\Sigma p(k \times r)} \times \frac{100}{1}$$

So in the above example from Table 4.4.2.2.B.:

$$Q = \frac{33}{66} \times \frac{100}{1}$$

Similarly, for the interaction index (I), the actual column and row frequencies for an adjective type are summed (e.g. for *GC-* in the above example, total = 12) and divided by the sum of possible *kr* frequencies (in this case, 6 + 6 + 6 + 3 + 3 + 6 = 30) the formula is

$$I = \frac{\Sigma\,(kr_{Adj})}{\Sigma p(kr_{Adj})} \times \frac{100}{1}$$

7. And its synonym *high*, of course, although this appeared to be used properly mainly by Group 6.

8. This point was noted in 4.4.1.3.b. See Chapter 5, also.

9. The adjective combinations are banded so as to reflect as far as possible the stages of vocabulary development shown, proceeding from the simplest or least differentiated at the top to the most at the foot. In terms of accuracy, there are two optimal areas: the middle and the foot of the diagram on the left-hand side, with combinations of tall and high or tall + low for HEIGHT and long or long + short for LENGTH. These "optimal cells" are framed in bold line. Note that with increasing age there is a gradual increase in frequency of these "optimal" choices.

10. See Appendix 2.

11. The term antonymic is here used to cover the grouping of both gradable antonyms and their respective negated forms. Antonymous will be used for only the positive pair (e.g. Big-small), in the traditional way.

CHAPTER 5

1. For a discussion of the difference between extension and intension, see Lyons, 1977.

2. This follows from the quite general structuralist principle of semantic field theory that the meaning of an item is a function of the items it contrasts with.

3. There are notable exceptions: Ehri (1976) and Sinclair-de-Zwaart (1969), for example.

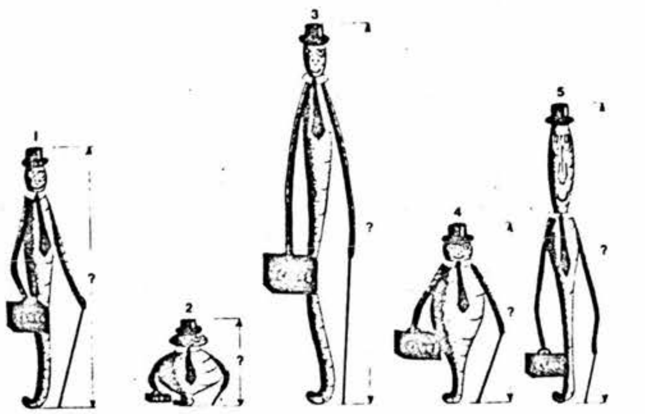
4. This is quite apart from my own evidence from the questionnaire elicitation: see section 4.4.1.3.c. and the discussion at the end of Chapter 4 and Chapter 2.

5. For example in naming. This is beyond the scope of the present study, but it seems that the primacy of binary or dichotomous logic, plus reversibility, explains a child's comment such as "Lassie's not an animal, she's a dog", reported in McNeill (1970 : 120). Clearly, the child treats the superordinate (animal) as if it is a co-hyponym of dog, and it is co-hyponyms which are subject to the either-or choices of exclusive disjunction. Now there are many situations for which the statement form X isn't a Y, it's a Z will be appropriate, as well as its converse X isn't a Z, it's a Y; for instance, when one wishes to assign an entity to one of two contiguous classes one might say: This isn't a robin, it's a sparrow, or otherwise This isn't a sparrow, it's a robin. This form of statement is also appropriate when one rejects assignment to a class although one does not know the name appropriate to the class to which an entity should be assigned, and uses a superordinate term instead: This isn't a sparrow, (but) it's a bird. Or, to take the McNeill example, Lassie's not a cat, she's an animal. The only error is to believe that sentences of this last kind are similarly reversible. There is a recognisable parallel here with findings in the Piagetian "beads task", where pre-operational children are willing to agree that there are more brown beads than wooden beads in a tray containing white and brown beads made of wood. A further discussion of the phenomenon can be found in Shipley (1975).

6. The theoretical mathematical maximum of combinations is 729, but it is not actually the case that each of the three values in any Category Relation is free to combine with each of the three values of any of the other five Relations. Once a number of these relations have been specified, the six-value structure inevitably reaches a stage where it can accept only a limited selection from the remaining potential values, which thus become totally predictable; for example, a complementary value like n cannot occur in a structure of the type c-d-h-k-( )-p (it helps to draw a diagram for this!). Or, as a more extreme example, consider how the rest of the structural description is totally determined by an initial value-combination of the form b-e-h, which is completely incompatible with anything except k-n-q, since it specifies complementary structure for all Category Relations. This kind of redundancy in structural specification is a natural consequence of constructing six Relations from the basic four categories big, small, not big and not small.

7. It should be added that the other Category Relations were subjected to the same sort of cluster analysis, but that no correlation was found between these, and little association with the age variable. The reasons for this will become clearer when the results are discussed.

8. An example of this is the following film-strip frame and caption from Rank's <u>Willie the Mathematical Worm</u>, No. 4, for children of eight years of age upwards. Note the language used in the first paragraph of the caption.



GUESS HOW TALL 17

FRAME 17

You can see that I have used my special muscles to draw myself out and stretch to a long length and then draw myself in until I am small! Don't I look funny?

What you have to do is to guess my height, first in Metres, then Centimetres and lastly Millimetres. Teacher will tell you whether you are right or wrong. Off you go then—start at No. 1 and see how many you can get right.

Well that is about the end of my adventure seeking the story of Length. I returned home safely to Johnnie and Dilly and together we put all my clues in order to make out a report for Miss Frigg, Johnnie's teacher.

19

BIBLIOGRAPHY.

The following is a list of abbreviations used for periodicals and journals mentioned in the Bibliography:

AA ... American Anthropologist. Washington. D.C.:American Anthropological Assocation.

AJP ... American Journal of Psychology. Urbana,Illinois: University of Illinois Press.

AP ... Acta Psychologica. Amsterdam: North Holland Publishing Co.

BJEP ... The British Journal of Educational Psychology. Edinburgh: Scottish Academic Press.

BJP ... The British Journal of Psychology. Cambridge, London, New York: Cambridge University Press.

CD ... Child Development. Chicago, Illinois: Chicago University Press.

Cog. ... Cognition. Lausanne: Elsevier Sequoia S.A.

DNS ... Die Neueren Sprachen: Frankfurt: Verlag Moritz Diesterweg, Hochstrasse 31.

DP ... Developmental Psychology. Washington, D.C.: American Psychological Association, Inc.

Enc. ... Encounter. London: Encounter Ltd.

FL ... Foundations of Language. Dordrecht-Holland/ Boston U.S.A. D. Reidel Publishing Company.

HER ... Harvard Educational Review.Montpelier,Vermont: President and Fellows of Harvard College.

HWPL ... Hawaii Working Papers in Linguistics.Honolulu: Dept. of Linguistics, University of Hawaii.

IRAL ... International Review of Applied Linguistics in Language Teaching.Heidelberg, West Germany: Julius Groos Verlag.

JASP ... Journal of Abnormal and Social Psychology.Washington D.C.: American Psychological Association,Inc.

JCL ... Journal of Child Language.London; Cambridge University Press.

JCPP ... Journal of Comparative and Physiological Psychology.Baltimore, U.S.A. Waverley Press, American Psychological Association,Ind.

JECP ... Journal of Experimental Child Psychology. New York and London,: Academic Press

JEL ... Journal of English Linguistics. Washington: Department of English,Western Washington State.

JEP ... Journal of Experimental Psychology. Washington, D.D.:American Psychological Association, Inc.

JL ... Journal of Linguistics. Cambridge, London, New York: Cambridge University Press.

JP ... Journal of Personality. Durham, North Carolina: Duke University Press.

JPR ... Journal of Psycholinguistic Research. New York: Plenum Publishing Corp.

JPSP ... Journal of Personality and Social Psychology. Washington, D.C.:American Psychological Association, Inc.

JVLVB ... Journal of Verbal Learning and Verbal Behavior. New York and London; Academic Press.

Lg. ... Language. Baltimore, U.S.A.: Waverley Press, Inc.

LI ... Linguistic Inquiry. Cambridge, Massachusetts: MIT Press.

Ling. ... Linguistics. The Hague and Paris: Mouton.

Lingua .. Lingua. Amsterdam: North Holland Publishing Company.

MSE .... Modern Studies In English.

PR ... Psychological Review. Washington, D.C.: American Psychological Association, Inc.

PS ... Philosophy of Science. Michigan,U.S.A.:Philosophy of Science Association.

QJEP ... Quarterly Journal of Experimental Psychology. London, New York and San Francisco:Academic Press

QJS ... Quarterly Journal of Speech. Columbia,Missouri: Speech Communication Association.

Science.. Science. Richmond, Virginia: American Association for the Advancement of Science.

Syn. ... Synthèse. Dordrecht, Holland/Boston,U.S.A. D.Reidel Publishing Company.

TCLP ... Travaux du Cercle Linguistique de Prague. Prague: Academic Tchecoslovaque des Sciences.

TDAP ... Transformations and Discourse Analysis Papers.

TESS ... Times Educational Supplement (Scotland). London: Times Newspapers Ltd.

Word ... Word. New York, Journal of the Linguistic circle of New York.

Ackrill, J.L., trans. (1963). Aristotle's Categories and De Interpretatione. Oxford: Clarendon Press.

Adams, Parveen, ed. (1972) Language in Thinking. Harmondsworth, Middlesex: Penguin.

Aiken, Leona S. and Tannis M. Williams (1973) A Developmental Study of schematic concept formation. DP vol.8, No.2. 162-167.

Anderson, Richard C. (1972) Semantic organization and retrieval of information from sentences. JVLVB 2. 794-800.

Aristotle Categories and De Interpretatione. trans. Ackrill (1963).

Asch, S.E. (1958) The metaphor: a psychological inquiry. In Taguiri, R. and L. Petrullo, eds. Person perception and interpersonal behaviour. California: Stanford University Press. 86-94.

Bahm, Archie J. (1970) Polarity, Dialectic, and Organicity. Springfield, Illinois: Charles C. Thomas.

Bailey, Charles-James N. (197o) Another look at the instrumental case. HWLP vol.2, No.8. 87-112.

Baldwin, Alfred L. (1965) A is happy - B is not. CD vol.36. 583-600.

Bar-Hillel, Yehoshua (1966) Universal Semantics and Philosophy of Language: Quandaries and Prospects. Lecture, repr. in Bar-Hillel (1970: 182-201).

Bar-Hillel, Yehoshua (1970) Aspects of Language. Jerusalem: Magnes Press. The Hebrew University.

Baron, Jonathan (1973) Semantic components and conceptual development. Cog. 2, No.3. 299-317.

Barrett, W.G. and R. Hollis (1973) Cassell's Maths Packs Sets 1-3. London: 35 Red Lion Square, WC 1.

Bartlett, Elsa Joffe (1976) Sizing things up: the acquisition of the meaning of dimensional adjectives. JCL vol.3. 205-219.

Bellugi-Klima, Ursula (1972) Some language comprehension tests. In Lavatelli (1972: Ch.7)

Bendix, E.M. (1966) Componential Analysis of General Vocabulary. The Hague: Mouton.

Bentler, P.M. and A.L.Lavoie (1972) A non-verbal semantic differential. JVLVB 2. 491-496.

Berman, Phyllis W. (1976) Young children's use of the frame of reference in construction of the horizontal, vertical and oblique. CD 47. 259-263.

Berry, Margaret (1977) Introduction to Systemic Linguistics 2. Levels and Links. London: B.T.Batsford Ltd.

Bever, T.G., J.Mehler and J.Epstein (1968) What children do in spite of what they know. Science 162. 921-924.

Bierwisch, Manfred (1967) Some semantic universals of German adjectivals FL 3. 1-36.

Bierwisch, Manfred (1969) On certain problems of semantic representations. FL 5. 153-184.

Bierwisch, Manfred (1970a) On classifying semantic features. In Bierwisch and Heidolph, (1970: 27-50). Repr. in Steinberg and Jakobovits (1971) eds. Semantics. New York. London: CUP. 410-435.

Bierwisch, Manfred (197ob) Semantics. In Lyons (1970:166-184).

Bierwisch, Manfred and K.E. Heidolph, eds. (1970) Progress in Linguistics: A collection of papers. The Hague. Paris: Mouton.

Biggs, Edith (1971) Mathematics for Younger Children. Basingstoke. London: Macmillan.

Black, Max (1937) Vagueness: An exercise in logical analysis. PS 4. 427-455. Repr. in Black (1949:25-58).

Black, Max (1949) Language and Philosophy: Studies in Method. Ithaca. London: Cornell University Press.

Bloor, David (1977) The regulatory function of language: an analysis and contribution to the current controversy over the Soviet theory. In Morton and Marshall (1977:73-97).

Bolinger, Dwight L. (1965) The atomization of meaning. Lg. 41. 555-573.

Bolinger, Dwight L. (1967a) Adjectives in English: attribution and predication. Lingua 18. 1-34.

Bolinger, Dwight L. (1967b) Adjective comparison: a semantic scale. JEL 1. 2-10.

Borówski, E.J. (1973) On the extent of John's height. FL 10. 419-422.

Bower, Tom (1977) The Perceptual World of the Child. London: Fontana. Open Books.

Braine, M.D.S. (1963) The ontogeny of English phrase structure: The first phase. Lg. 39. 1-13.

Braine, M.D.S. (1970) The acquisition of language in infant and child. In Reed, C.ed. The Learning of Language:Essays in honor of David H. Russell. New York: Appleton-Century-Crofts.

Bransford, J.D. and J.J. Franks (1972) The abstraction of linguistic ideas: a review. Cog. 1. 211-250.

Bresnan, Joan W. (1973) Syntax of the comparative clause construction in English. LI vol.4. No.3. 275-343.

Brown, Roger (1958) How shall a thing be called? PR vol.65. No.1. 14-21. Repr. in Brown (1970:3-15)

Brown, Roger (1970) Psycholinguistics. Selected Papers. New York. London: The Free Press. Collier-Macmillan.

Brown, Roger (1973) A First Language. Harmondsworth: Penguin Books.

Brown, Roger and U. Bellugi (1964) Three processes in the child's aequisition of syntax. HER 34. 133-151.

Brown, Roger and E. Lenneberg (1954) A study in language and cognition. JASP 49 (3). 454-462.

Bruner, J.S. (1968) The course of cognitive growth. In Wason and Johnson-Laird(1968 : 380-409). Repr. from American Psychologist vol.19 (1964) 1-15.

Bruner, J.S. and H.J. Kenney (1965) Representation and mathematics learning. In Mathematics Learning,Monograph of the Society for Research in Child Development,(1965). vol.30.No.99.50-59. Reproduced in Wason and Johnson-Laird (1968: 410-423).

Bruner, J.S. and H.J. Kenney (1966) The development of the concepts of order and proportion in children. In Bruner, J.S. Studies in Cognitive Growth. New York: Wiley.

Bryant, Peter (1974) Perception and Understanding in Young Children: An experimental approach. London: Methuen.

Burling, Robbins (1964) Cognition and componential analysis: God's truth or hocus-pocus? AA 66. 20-28.

Cairns, Helen S. and C.E.Cairns (1976) Psycholinguistics a Cognitive View of Language. New York: Holt, Rinehart and Winston.

Campbell, Robin and R.J.Wales (1969) Comparative structures in English. JL 5. 215-251.

Campbell,Robin and R.J.Wales (1970) The study of language acquisition. In Lyons (1970: 242 - 26o).

Carnap, Rudolf (1956) Meaning and Necessity: A Study in Semantics and Modal Logic. Originally published 1947. 2nd ed. repr. 1956 with enlargements, Chicago: University of Chicago Press. Phoenix books.

Carroll, J.B. and J.B. Casagrande (1958) The function of language classification in behaviour. In Macoby E.E., T.M.Newcomb and E.L. Hartley, eds. Readings in Social Psychology. New York: Holt,Rinehart and Winston.18-31.

Cazden, Courtney B. (1972) Child Language and Education. New York. Chicago.San Francisco:Holt,Rinehart and Winston.

Chafe, Wallace L. (1970) Meaning and the Structure of Language. Chicago and London: University of Chicago Press.

Chapman, L.J. and J.P.Chapman (1959) Atmosphere Effect re-examined.JEP vol.58. No.3. 220-226. excerpt. in Wason and Johnson-Laird (1968: 83-92).

Chi, Micheline T.H. (1977) Age differences in memory span. JECP 23. 266-281.

Chomsky, Noam (1957) Syntactic Structures. The Hague: Mouton and Co.

Chomsky, Noam (1965) Aspects of the Theory of Syntax. Cambridge, Mass.: M.I.T. Press.

Chomsky, Noam (1971) Language and the Mind. Psychology Today, February 1969. Repr. in Language in Education. London.Boston: Routledge and Kegan Paul in association with the Open University Press. (1972: 129-135).

Christie, William,Jr.(1972) A non-non-source for comparatives.LI 3. 508-510.

Clark, Eve V. (1972) On the child's acquisition of antonyms in two semantic fields. JVLVB 2.750-58.

Clark, Eve V. (1973a) What's in a word? On the child's acquisition of semantics in his first . language. In Moore (1973: 65-111).

Clark, Eve V. (1973b) Non-linguistic strategies and the acquisition of word meanings. Cog. 2. No.2. 161-182.

Clark, Eve V. (1974) Some aspects of the conceptual basis for first language acquisition. In Schiefelbusch R.L. and L.L.Lloyd (1974: 105-128). First published in Papers and Reports in Child Language Development oo7 April 1974.Stanford University,California:Committee on Linguistics.

Clark, Eve (1975) Knowledge, context,,and strategy in the acquisition of meaning. In Dato D.P. (1975: 77-98).

Clark, Eve V. (1977a) First language acquisition. In Morton J. and Marshall J.C. (1977: 1-72).

Clark, Eve V. (1977b) Strategies and the mapping problem in first language acquisition. In Macnamara (1977: 147-168).

Clark, Herbert H. (1969a) Linguistic processes in deductive reasoning. PR 76. 387-404.

Clark, Herbert H. (1969b) The influence of language in solving three-term series problems. JEP 82. 205-215.

Clark, Herbert H. (1970a) Comprehending comparatives. In Flores D'Arcais G.B. and W.J.M.Levelt (1970: 294 - 306).

Clark, Herbert H. (1970b) The primitive nature of children's relational concepts. In Hayes John R. (1970: 269-277).

Clark, Herbert H. (1970c) Word associations and linguistic theory. In Lyons (1970: 271-286).

Clark, Herbert H. (1973) Space, time, semantics and the child. In Moore (1973: 27-63).

Clark, Herbert H. (1976) Semantics and Comprehension. The Hague. Paris: Mouton.

Clark, Herbert H. and S.K.Card (1969) The role of semantics in remembering comparative sentences. JEP 82.545-553.

Clark, Herbert H. and E.V.Clark (1977) Psychology and Language . An Introduction to Psycholinguistics.New York. Chicago.San Francisco.Atlanta: Harcourt Brace Jovanovich Inc.

Clark, Ruth (1974) Aspects of psycholinguistics in the context of the symposium. Symposium on interactions between linguistics and mathematical education. UNESCO ED-74/ CONF. 808/8.

Coie, J.D, P.R. Constanzo, and D.Farnill (1973) Specific transitions in the development of spatial perspective taking ability. DP 8. 167-177.

Crystal, David (1967) English. In Word Classes. 24-56. Repr. from Lingua vol.17. 1-261.

Culler, Jonathan (1975) Structuralist Poetics: Structuralism Linguistics and the Study of Literature. London and Henley: Routledge and Kegan Paul.

Dato, Daniel P.,ed. (1975) Developmental Psycholinguistics.Theory and Applications.Georgetown University Round Table on Language and Linguistics 1975. Washington D.C.: Georgetown University Press.

* Deese, J. (1962) Form class and the determinants of association. JVLVB 1. 79-84.

Deese, J. (1964) The associative structure of some common English adjectives. JVLVB 3. 347-357.

Deese, J. (1965) The Structure of Associations in Language and Thought. Baltimore: The John Hopkins Press.

De Soto, C.B., M.London and S.Handel (1968) Social reasoning and spatial paralogic. Originally JPSP vol.2 (1965) 513-521. Repr. in Wason, P.C. and P.N.Johnson-Laird (1968 : 1o8 - 123).

Dingman, W. and M.B.Sporn (1964) Molecular theories of memory.Science 144. 26-29.

Dirven, Rene (1976) A redefinition of contrastive linguistics. IRAL XIV/1. 1-14.

Di Vesta, Francis J. (1965) Developmental patterns in the use of modifiers as modes of conceptualization. CD 36. 185-213.

Dodwell, P.C., ed. (1970) Perceptual Learning and Adaptation. Penguin Modern Psychology Readings. Harmondsworth: Penguin Books.

Dodwell, P.C. (1972) New Horizons in Psychology 2. Harmondsworth: Penguin Education.

Doherty, Paul C. and Arthur Schwartz (1967) The syntax of the compared adjective in English. Lg. vol.43.No.4. 903-936.

Donaldson, Margaret (1963) A Study of Children's Thinking. London: Tavistock , 1963.

Donaldson, Margaret (1978) Children's Minds. Glasgow: Fontana/ Collins.

Donaldson, Margaret and George Balfour(1968) Less is more: A study of language comprehension in children. BJP 59,4. 461-471.

* Davies, A. ed.,(1977) Language and Learning in Early Childhood. London: Heinemann, in association with the SSRC and SCRE.

Donaldson, Margaret and James McGarrigle (1974) Some clues to the nature of semantic development. JCL 1.No.2. Nov.1974. 185-194.

Donaldson, Margaret and Roger Wales (1970) On the acquisition of some relational terms. In Hayes, J.R. (1970: 235-267). Repr. in Adams, P. (1972: 79-108).

Drummond, Thomas B., T.M. Williams and L.S. Aiken (1973) Children's use of prototypes in pattern classification. CD 44. 686-688.

Duthie, John (1963) A further study of overlap error in three-term series problems. In Donaldson (1963)

Edmonds, Marilyn H. (1976) New directions in theories of language acquisition. HER vol.46. No.2. 175-198.

Edwards, R.P.A. and Vivian Gibbon (1973) Words Your Children Use. A survey of the words used by children in Infants' Schools with the resultant graded vocabulary. London and Toronto: Burke Books.

Ehri, Linnea C. (1976) Comprehension and production of adjectives and seriation. JCL vol.3. 369-384.

Eilers, Rebecca E., D.Kimbrough Oller and Judy Ellington (1974) The acquisition of word-meaning for dimensional adjectives: the long and the short of it. JCL vol.1.No.2. 195-204.

Eiser, Christine (1976) Questions children ask about spatial arrays: an analysis of the processes involved in co-ordinating perspectives. BJEP 46. 203-211.

Eldred, Carolyn A. (1973) Judgments of right side up and figure rotation by young children. CD 44. 395-399.

Elkind, David (1976) Child Development and Education. New York: OUP.

Elkind, D. and J.Flavell, eds. (1969) Studies in Cognitive Development. London: OUP.

Ervin, S.M. and G. Foster (1960) The development of meaning in children's descriptive terms. JASP 61. 271-275. Repr. in Cecco, de, J.P., ed. The Psychology of language, thought and instruction. New York : Holt, Rinehart and Winston. (1969 : 276-290).

Ervin, Susan (1961) Changes with age in the verbal determinants of word association. AJP 74. 361-72.

Fantz, Robert L. (1967) Visual perception and experience in early infancy: A look at the hidden side of behavior development. In Dodwell, P.C. (1970: 265-297). Excerpted from Stevenson, H.W., E.H. Hess and H.L. Rheingold, eds. Early Behavior: Comparative and Developmental Approaches. Wiley. (1967: 181-224).

Fillenbaum, Samuel and Amnon Rapoport (1971) Structures in the Subjective Lexicon. New York and London: Academic Press.

Fillmore, Charles J. and Terence Langendoen, eds. (1971) Studies in Linguistic Semantics. New York: Holt.

Flores D'Arcais, G.B. (1970) Linguistic structure and focus of comparison in processing comparative sentences. In Flores D'Arcais and Levelt (1970 : 307-321).

Flores D'Arcais, G.B. and Willem J.M. Levelt, eds. (1970) Advances in Psycholinguistics. Research papers presented at the Bressanone Conference on Psycholinguistics, Summer Courses of the University of Padova, July 1969. Amsterdam. London : North Holland Publishing Company.

Fodor, J.A. and J.J. Katz, eds. (1964) The Structure of Language: Readings in the Philosophy of Language. E glewood Cliffs, New Jersey: Prentice-Hall.

Franks, J.J. and J.D. Bransford (1971) Abstraction of visual patterns. JEP 90. 65-74.

Friedman, William J. and Pamela B. Seely (1976) The child's acquisition of spatial and temporal word meanings. CD 47. 1103-1108.

Fries, Charles C. (1957) The Structure of English. London and Harlow: Longmans, Green and Co. Ltd.

Furth, H.G. (1966) Thinking Without Language: the Psychological Implications of Deafness. New York: The Free Press.

Furth, H.G. (1969) Piaget and Knowledge: Theoretical Foundations. New Jersey: Prentice Hall.

Gardner, K.L., J.A. Glenn and A.I.G. Renton, eds. (1973) Children Using Mathematics: A Report of the Mathematics Section, The Association of Teachers in Colleges and Departments of Education. London: OUP.

Garvin, Paul L. ed. (1970) Cognition: A Multiple View. New York. Washington : Spartan Books.

Ghent, L. (1961) Form and its orientation: a child's eye view. AJP 74. 177-190.

Gibson, E.J. (1969) Principles of Perceptual Learning and Perceptual Development. New York: Appleton Century Croft.

Givon, Talmy (1970) Notes on the semantic structure of English adjectives. Lg. vol.46.No.4. 816-837.

Gleason, H.A. Jr. (1961) An Introduction to Descriptive Linguistics. Revised Edition. New York.Chicago. San Francisco: Holt, Rinehart and Winst.

Gleason, H.A. Jr. (1968) Contrastive analysis in discourse structure. In Makkai and Lockwood (1973: 258-276). Repr. from Monograph Series on Language and Linguistics. 21. 39-63. Georgetown University, Institute of Language and Linguistics.

Glendinning, Eric H. (1974) English in Mechanical Engineering. London: OUP.

Glucksberg, Sam, Anne Hay and Joseph H. Danks (1976) Words in utterance contexts: Young children do not confuse the meanings of s a m e and d i f f e r e n t. CD 47. 737-774.

Greenberg, Joseph H. (1966) Language universals. In Sebeok, T.A. (1966: 61-112).

Greenberg, Joseph H. (1963) Universals of Language. Cambridge, Mass.: MIT.

Greene, Judith (1975) Thinking and Language. London: Methuen and Co.

Grice, H.P. (1975) Logic and conversation. In Cole, P. and J.L. Morgan, eds. Speech Acts. Syntax and Semantics 3. New York: Academic Press. 41-58.

Griffiths, Judith A., Carolyn A. Shantz and Irving.E.Sigel (1967) A methodological problem on conservation studies: the use of relational terms. CD 38. 841-848.

Griffiths, Patrick D. (1977) The Ontogenetic Development of Lexical Reference. University of Edinburgh, Scotland: Unpublished Ph.D. thesis.

Halford, Graeme S. (1972) The impact of Piaget on Psychology in the Seventies. In Dodwell, P.C. (1972: 171-196).

Halliday, M.A.K. (1967) Intonation and Grammar in British English. The Hague. Paris: Mouton.

Halliday, M.A.K. (1970) Language structure and language function. In Lyons (1970: 140-165)

Handel, Stephen, C.B. de Soto, and Marvin London (1968) Reasoning and spatial representations. JVLVB 7. 351-357.

Harasym, Carolyn R., F.J. Boersma and T.O. Maguire (1971) Semantic differential analysis of relational terms used in conservation. CD 42 (1). 767-779.

Harris, Zellig S. (1969) The Two Systems of Grammar: Report and Paraphrase. In Harris (1970: 612-692). Repr. from Transformation and Discourse Analysis Papers,79. (1969).

Harris, Zellig S. (1970) Papers in Structural and Transformational Linguistics. Dordrecht,Holland: D.Reidel Publication Co., Formal Linguistics Series. vol.1.

Hasan, Ruqaiya (1971) Syntax and Semantics . In Morton J. (1971)

Hatwell, Y. (1960) Privation Sensorielle et Intelligence. Paris: Presses Universitaires.

Hayes, J.R., ed. (1970) Cognition and the Development of Language. New York: Wiley.

Helmholtz, H. von (1866) Treatise on Physiological Optics. New York: Dover Press,1925) Extracts reprinted in Dodwell,P.C.(1970:15-45).

Henle, M. (1962) On the relation between logic and thinking. In Wason and Johnson-Laird (1968: 93-107). Excerpt from article of same title in PR vol.69 (1962). 366-378.

Higgins, E. Tory (1977) The varying presuppositional nature of comparatives. JPR vol.6.No.3.(1977). 203-222.

Hjelmslev, L. (1953) Prolegomena to a Theory of Language. Translated from Danish (1943) version by F.J.Whitfield. Bloomington,Indiana: Indiana University.

Huddleston, R.D. (1967) More on the English comparative. JL 3. 1967. 91-102.

Huttenlocher, J. and E.T. Higgins(1971) Adjectives, comparatives, and syllogisms. PR 78. 487-504.

Inhelder, B. and B.Matalon (1960). The Study of Problem Solving and Thinking. In Mussen, P.H.,ed. Handbook of research methods in child development. Wiley.(1960: 421-452). Excerpts reproduced in Wason and Johnson-Laird (1968: 364-379).

Jakobson, Roman (1932) Zur Struktur des russischen Verbums. In Charistera Guilelmo Mathesio... Prague. 74-84.

Jakobson, Roman (1957) Shifters, verbal categories and the Russian verb. Cambridge,Mass.: Harv.UP.

Jesperson, O. (1917) — Negation in English and Other Languages. Copenhagen.

Jessen, M.E. (1975) — A Semantic Study of Spatial and Temporal Expressions in English. Unpublished Ph.D. thesis. University of Edinburgh.

Karmiloff-Smith, Annette (1977) — More about the same: children's understanding of post-articles. JCL 4, 3. 377-394.

Karmiloff-Smith, A. and B. Inhelder (1974) — If you want to get ahead, get a theory. Cog. 3. No.3. (1974-75). 195-212.

Katz, J.J. (1964) — Analyticity and contradiction in natural language. In Fodor and Katz (1964).

Katz, J.J. (1966) — The Philosophy of Language. New York: Harper and Row.

Katz, J.J. (1967) — Recent issues in semantic theory. FL 3. 124-194.

Katz, J.J., and J.A. Fodor (1963) — The structure of a semantic theory. Lg. 39. 170-210. Repr. in Fodor and Katz (1964:479-518).

Kavanaugh, Robert D. (1976) — On the synonymity of m o r e and l e s s : comments on a methodology. CD 47. 885-888.

Kempa, R.F. and G.H. Hodgson (1976) — Levels of concept acquisition and concept maturation in students of chemistry. BJEP 46. 253-260.

Kempson, Ruth (1977) — Semantic Theory. Cambridge: CUP.

Key, Mary R. (1975) — Male/Female Language. Metuchen, New Jersey: The Scarecrow Press, Inc.

Kiefer, Ferenc (1978) — Zur Rolle der Pragmatik in der linguistischen Beschreibung. DNS 77, 3/4. 254-268.

Kiefer, F. and N. Ruwet (1973) — Generative Grammar in Europe. Dordrecht, Holland: D.Reidel Publishing Co.

Kimura, Doreen (1973) — The asymmetry of the human brain. Scientific American, March 1973. 70-78.

Klatzky, Roberta L., Eve Clark and Marlys Macken (1973) — Asymmetries in the acquisition of polar adjectives: linguistic or conceptual? JECP 16. 32-46.

Köhler, Wolfgang (1970) — Sensory Organization. Excerpt from W.Köhler Gestalt Psychology Liveright, 1929. 136-172. in Dodwell, P.C. (1970: 46-69).

Kučera, Henry and W.Nelson Francis (1967) Computational Analysis of Present Day American English. Providence,Rhode Island: Brown University Press.

Kuczaj II, A.Stan and Amy R.Lederberg(1977) Height,age, and function: differing influences on children's comprehension of y o u n g e r and o l d e r. JCL 4,3. 395-416.

Kuenne, M.R. (1946) Experimental investigation of the relation of language to transposition behaviour in young children. JEP 36. 471-490.

Lakoff, George (1970) Linguistics and Natural Logic. In Davidson and Harmann Semantics of Natural Language.Dordrecht,Holland: Reidel. 631.

Lakoff, Robin (1970) Another non-source for comparatives. LI 1. 128-129.

Lakoff, Robin (1971) If's, and's and but's about conjunction. In Fillmore and Langendoen (1971:115-5o).

Lakoff, Robin (1975) Language and Woman's Place. New York. London: Harper and Row. Harper Colophon Books.

Lamb , S.M. (1964) The sememic approach to structural semantics.AA 66. 57-78. Repr. in Makkai and Lockwood (1973: 207-228).

Lamb, S.M. (1970) Linguistic and Cognitive Networks. In Makkai and Lockwood (1973: 60-83). Repr. from Garvin, P. (197o: Ch.8).

Langacker, Ronald W.(1976) Semantic representations and the linguistic relativity hypothesis. FL 14. 307-357.

Lavatelli, Celia Stendler, ed. (1972) Language Training in Early Childhood Education.

Leech, Geoffrey N.(1969) Towards a Semantic Description of English.London and Harlow: Longmans,Green and Co. Ltd.

Leech, Geoffrey N.(1974) Semantics. Harmondsworth:Penguin Books.

Leech, Geoffrey N. and Jan Svartvik (1975) A Communicative Grammar of English. London: Longman Group Ltd.

Lees, R.B. (1961) Grammatical analysis of the English comparative construction. Word 17. 171-185.

Lehrer,Adrienne (1974) Semantic Fields and Lexical Structure. North Holland Linguistic Series. eds. S.C.Dik and J.G.Kooij.

Lenneberg, Eric H. (1967) Biological Foundations of Language. New York. London: John Wiley and Sons Inc.

Lenneberg, Eric H. (1969) On explaining language. Science vol.164. No.3880. 635-643.

Levi-Montalcini, Rita and Pietro Calissano (1979) The nerve-growth factor. Scientific American vol.240. No.6. 44-53.

Levi-Strauss, Claude (1962) La Pensee Sauvage. Paris: Plon. Translated Weidenfeld 1966 The Savage Mind. Chicago: University of Chicago Press.

Ljung, Magnus (1974) Some remarks on antonymy. Lg. vol.50. No.1. 74-88.

Lumsden, E.A. and B.W.S. Poteat (1968) The salience of the vertical dimension in the concept b i g g e r in five and six-year-olds. JVLVB 7. 404-408.

Lyons, John (1963) Structural Semantics. Oxford: Blackwell.

Lyons, John (1966) Towards a n o t i o n a l theory of the 'parts of speech'. JL 2. 209-236.

Lyons, John (1968) Introduction to Theoretical Linguistics. Cambridge: CUP.

Lyons, John ed. (1970) New Horizons in Linguistics. Harmondsworth: Pelican Original.

Lyons, John (1977) Semantics: 1. and 2. Cambridge: CUP.

Mach, Ernst (1893) Die Analyse der Empfindungen und das Verhältnis des Physischen zum Psychischen. Jena: Fischer. Published in translation as The Analysis of Sensations. New York: Dover Press. (1959).

Mackay, C.K., Joan Fraser, and Isabel Ross (1970) Matrices, three by three: classification and seriation. CD 41. 787-797.

Macnamara, John (1971) Parsimony and the lexicon. Lg. 47. 359-374.

Macnamara, John (1977) Language Learning and Thought. New York: Academic Press.

Makkai, Adam and D.G. Lockwood, eds. (1973) Readings in Stratificational Linguistics. Alabama: University of Alabama Press.

Malkiel, Yakof (1959) Studies in irreversible binomials. In Blackwell, B. Essays on Linguistic Themes. Oxford (1968: 311-355). Repr. from Lingua 8,2. 113-160.

Mansfield, Annick M. (1977) Semantic organization in the young child: evidence for the development of semantic feature systems. JECP 23. 57-77.

Maratsos, Michael P. (1973) Decrease in the understanding of the word b i g in preschool children. CD 44. 747-752.

Marshall, J. (1969) Psychological linguistics: psychological aspects of semantic structure. In Meethan, A.R.ed. Encyclopedia of Linguistics, Information and Control. London: Pergamon.

McDonald, Geraldine (1976a) An examination of the validity of a componential analysis as a guide to semantic acquisition. Paper delivered at the first New Zealand Linguistics Conference 25-28 August 1976.

McDonald, Geraldine (1976b) Aspects of the Language and Thought of Four-year-old Maori Children: A Study Based on Bierwisch's Componential Analysis of a Set of Adjectives. Unpublished Ph.D.thesis: Victoria University of Wellington, New Zealand.

McGarrigle, James and Margaret Donaldson (1974) Conservation accidents. Cog.3.No.4. 341-350.

McLaughlin, G.H. (1973) Psycho-logic: a possible alternative to Piaget's formulation. BJEP 33. 61-67.

McNally, D.W. (1977) Piaget, Education and Teaching. Hassocks, Sussex: The Harvester Press Ltd.

McNeill, David (1970) The Acquisition of Language. New York, Evanston and London: Harper and Row.

McNeill, David (1971) Explaining linguistic universals. In Morton ed. (1971: 53-60).

McWhirter, Ross and Norris McWhirter (1975) Guinness Book of Records. London: Guinness Superlatives Ltd.

Melkman,Rachel, Asher Koriat, and Karin Pardo (1976) Preference for color and form in preschoolers as related to color and form differentiation. CD 47. 1045-1050.

Members of the Association of Teachers of Mathematics (1969) Notes on Mathematics in Primary Schools. Cambridge: CUP.

Members of the Association of Teachers of Mathematics (1977) Notes on Mathematics for Children. Cambridge: CUP.

Meltzoff, Andrew N. and M.Keith Moore(1977) Imitation of facial and manual gestures by human neonates. Science vol.198. No. 4312. 75-78.

Miller, George, A. (1956) The magical number seven,plus or minus two: some limits on our capacity for processing information. PR vol.63.No.2. 81-96.

Repr. in Miller (1970) The Psychology of Communication, Seven Essays. 21-50. Harmondsworth: Penguin Books.

Miller, George and D.A.Norman (1964) Research on the Use of Formal Languages in the Behavioral Sciences. Semiannual Technical Report, Department of Defense, Advanced Research Projects Agency, January-June 1964. Cambridge, Mass.: Harvard University Center for Cognitive Studies.

Miller, Wick and Susan Ervin (1964) The development of grammar in child language. In Bellugi U. and R. Brown eds. The Acquisition of Language.Monographs of the Society for Research on Child Development. 1964. 29,92. 9-34.

Moore, Timothy E. ed.(1973) Cognitive Development and the Acquisition of Language. New York.London: Academic Press.

Moran, Louis J. (1973) Comparative growth of Japanese and North American cognitive dictionaries. CD 44. 862-865.

Morehead, Donald M. and Ann Morehead (1974) From signal to sign: a Piagetian view of thought and language during the first two years. In Schiefelbusch and Lloyd eds.(1974: 153-190).

Morton, John ed. (1971) Biological and Social Factors in Psycholinguistics. MRC Applied Psychology Unit, Cambridge: Logos Press Ltd.

Morton,John and J.C.Marshall eds.(1977) Psycholinguistics Series 1 Developmental and Pathological. London:Elek Science.

Nelson, Katherine (1976) Some attributes of adjectives used by young children. Cog. 4. 13-30.

Nilsen,Don Lee Fred(1972) English Adverbials.Janua Linguarum The Hague.Paris: Mouton.

Nuffield Foundation (1973) Nuffield Mathematics Teaching Project Decimals 1. Edinburgh.London.New York: W.R.Chambers.John Murray. John Wiley and Sons, Inc.

Nuffield Foundation Nuffield Mathematics Trial Version Problems Red Set. Young secondary 21.

Odom, Richard D. and David W.Corbin (1973) Perceptual salience and children's multidimensional problem solving. CD 44. 425-432.

Ogden, Charles K. (1932) Opposition: A Linguistic and Psychological Analysis. (1967) Bloomington. London: Indiana University Press.

Oléron, P. (1957) Recherches sur le Développement Mental des Sourds-Muets. Paris: Centre Nationale de Recherche Scientifique.

Orton, S.T. (1937) Reading and Writing and Speech Problems in Children. London: Chapman and Hall.

Osgood, Charles E., and M.M.Richards (1973) FROM YANG AND YIN TO and OR but. Lg. vol.49.No.2. 380-412.

Osgood, Charles E., G.I. Suci and P.H.Tannenbaum (1957) The Measurement of Meaning. Urbana, Illinois: University of Illinois Press.

Palermo, David S. (1973) More about less: a study of language comprehension. JVLVB 12. 211-221.

Palermo, David S. and Lewis P.Lipsitt eds. (1963) Research Readings in Child Psychology. New York: Holt, Rinehart and Winston.

Palmer, F.R. (1976) Semantics a new outline. Cambridge: CUP.

Papoušek, H. (1969) Individual variability in learned responses in human infants. In Robinson R.J.ed. Brain and Early Behaviour. London: Academic Press. (1969).

Parisi, Domenico and Francesco Antinucci (1970) Lexical competence. In Flores d'Arcais and Levelt (1970: 196-210).

Pascual-Leone, J. (1970) A mathematical model for the transition rule in Piaget's developmental stages. AP 32. 301-345.

Perfetti, C.A. (1972) Psychosemantics: some cognitive aspects of structural meaning. Psychological Bulletin (78: 241-259).

Peri, S. (1977) The problem of universals and its perceptual correlates. Syn. 35. 447-456.

Pettigrew, Thomas F. (1958) The measurement and correlates of category width as a cognitive variable. Excerpts in Warr P.B. (1970:127-142). Originally JP 26. (1958) 532-544.

Piaget, Jean (1928) Judgment and Reasoning in the Child. New York: Harcourt, Brace.

Piaget, Jean (1936) La Naissance de l'intelligence chez l'enfant. Published as The Origin of Intelligence in the Child. London: Routledge and Kegan Paul (1953). Harmondsworth: Penguin Education (1977).

Piaget, Jean (1952) The Child's Conception of Number. London: Routledge and Kegan Paul.

Piaget, Jean (1962) The stages of the intellectual development of the child. Bulletin of the Menninger Clinic 26. 120-128. Repr. in Wason and Johnson-Laird (1968:355-363).

Piaget, Jean (1968) Le Structuralisme. Paris: Presses Universitaires de France. Translated as Structuralism by Maschler, Chaninah, (1971) London: Routledge and Kegan Paul.

Piaget, Jean (1969) The Mechanisms of Perception. London: Routledge and Kegan Paul.

Piaget, Jean (1971) Structuralism. London: Routledge and Kegan Paul.

Piaget, Jean (1977) Psychology and Epistemology. Harmondsworth: Penguin Books. First published by Editions Gonthier 1970, Paris Psychologie et Epistémologie. Trans. Arnold Rosin for the Viking Press, Inc. 1971. Grossman Publishers. USA.

Piaget, Jean and Bärbel Inhelder (1941) Le développement des quantités physiques chez l'enfant. Paris: Delachaux et Niestlé.

Piaget, Jean and Bärbel Inhelder (1956) The Child's Conception of Space. London: Routledge and Kegan Paul. Trans. by F.J.Langdon and J.L.Lunzer.

Piaget, Jean and Bärbel Inhelder (1969) The Psychology of the Child. New York: Basic Books Inc.

Pilch, Herbert (1965) Comparative constructions in English. Lg. vol.41.no.1.

Plato Collected Works. vols. I-VII. London. Cambridge, Mass. : William Heinemann Ltd. Harvard University Press.

Plato The Republic: A New Translation. By H.D.P.Lee. Harmondsworth: Penguin Classics. (1955).

Postal, Paul M. (1966) Review article: Andre Martinet, Elements of General Linguistics in FL 2.

Povey, Robert M. (1976) Half-baked Piaget. TESS 27.2.1976. 31.

Preece, P.F.W. (1976) Associative structure of science concepts. BJEP 46. 174-183.

Quine, Willard van Orman (1960) Word and Object. Cambridge, Mass.: M.I.T. Press.

Quine, Willard van Orman (1974) Methods of Logic. Third Edition. London: Routledge and Kegan Paul.

Quirk, Randolph and Sidney Greenbaum (1973) A University Grammar of English. 6th impression 1977. London: Longman Group Ltd.

Rank Film Library Willie the Mathematical Worm. Brentford, Middlesex: Rank Audio Visual Ltd.

Reibel, D.A. and S.A.Schane eds. (1968) *Modern Studies in English*. Englewood Cliffs, New Jersey: Prentice Hall.

Ridley, B.K. (1976) *Time,Space and Things*.Harmondsworth: Penguin Books.

Riley, Christine A. and Tom Trabasso (1974) Comparatives, logical structures and encoding in a transitive inference task. *JECP* 17. 187-203.

Rivara, Rene (1975) How many comparatives are there? *Ling.* 163. 35-51.

Rommetveit, Ragnar (1968) *Words, Meanings, and Messages.* Theory and experiments in psycholinguistics. New York and London:Academic Press. Universitetsverlaget Oslo.

Ross, J.R. (1968) A proposed rule for tree-pruning. In Reibel and Schane (1969: 288-289).

Ross, J.R. and D.M.Perlmutter (1970) A non-source for comparatives. *LI* 1. 127-128.

Salapatek, Philip and William Kessen (1966) Visual scanning of triangles by the human newborn. In Dodwell (1970:298-311). Repr. from *JECP* 3 (1966) 155-167.

Sapir, Edward (1949) Grading: a study in semantics. In Mandelbaum D.G. ed.(1949) *Selected Writings in Language, Culture, and Personality*. Berkeley, Cal.: University of California Press. Repr. from *PS* 2 (1944) 93-116.

Saussure F. de (1916) *Cours de Linguistique Générale*.Paris: Payot.

Scherer, W.M. (1878) *Zur Geschichte der deutschen Sprache*. 2nd edition. Berlin: Weidmann.

Schiefelbusch, Richard L. and L.L.Lloyd eds.(1974) *Language Perspectives - Acquisition, Retardation, and Intervention*. London and Basingstoke: Macmillan.

Schlesinger, I.M. (1974) Relational concepts underlying language. In Schiefelbusch and Lloyd (1974:129-51).

Sebeok, Thomas A.,ed.(1966) *Current Trends in Linguistics. III.* The Hague and Paris: Mouton and Co.

Seuren,Pieter A.M. (1973) The comparative. In Kiefer F. and N. Ruwet (1973: 528-564).

Shayer, M., D.E.Küchemann and H.Wylam (1976) The distribution of Piagetian stages of thinking in British middle and secondary school children. *BJEP* 46. 164-73.

Shipley, Elizabeth F. (1975) Comparisons and class inclusions. In Dato, D.P. (1975: 279-288).

Siegel, Sidney (1956) Nonparametric Statistics for the Behavioral Sciences. New York.Toronto. London: McGraw-Hill Book Company, Inc.

Sinclair-de-Zwart, H.(1967) Acquisition du langage et développement de la pensée. Paris: Dunod.

Sinclair-de-Zwart, H.(1969) Developmental Psycholinguistics. In Elkind, D. and J.Flavell (1969:315-336).

Sinclair-de-Zwart, H.(1973) Language Acquisition and Cognitive Development. In Moore, T.E. (1973).

Small, George William (1923) The Comparison of Inequality: The Semantics and Syntax of the Comparative Particle in English. John Hopkins University, Baltimore, MD.Printed: Greifswald Abel(1924).

Smith, Carlota S. (1961) A class of complex modifiers in English. Lg. vol.37.No.3. 342-365.

Smith, Carlota S. (1970) An experimental approach to children's linguistic competence. In Hayes,J.R. (1970)

Spiker, Charles C., Irma R.Gerjuroy and Winifred O. Shepard(1956) Children's concept of middle-sizedness and performance on the intermediate size problem.JCPP 49. 416-419.

Stanley, Richard (1969) The English comparative adjective construction. In Papers from the 5th Regional Meeting of the Chicago Linguistic Society. 287-292.

Stemmer, Nathan (1971) Cognitive aspects of language acquisition. Word 27. 158-169.

Stern, Carolyn and Juanita Bryson (1970) Competence versus performance in young children's use of adjectival comparatives. CD 41. 1197-1201.

Strauss,Sidney and David Stein (1978) U-shaped curves in language acquisition and the learning of physical concepts. DNS 77,3/4. 326-340.

Tajfel, Henri,Alan Richardson and Louis Everstine(1964) Individual consistencies in categorizing. In Warr P.B. (197o) Repr. from JP 32. 9o-108.

Tarde, Gabriel (1897) L'opposition universelle; essai d'une théorie des contraires.Paris: Ancienne Librairie Germer Baillère et Cie.Félix Alcan,editeur.

Tarski,Alfred (1936) Der Wahrheitsbegriff in den formalisierten Sprachen. Studia Philosophica I. 261-405.

Teller, Paul (1969) Some discussion and extension of Manfred Bierwisch's work on German adjectivals. FL 5. 185-217.

Templin, Mildred C. (1957) Certain Language Skills in Children. Their development and interrelationships. Minneapolis: University of Minnesota Press.

Teyssier, J. (1968) Notes on the syntax of the adjective in modern English. Lingua 20. 225-249.

Thorndike, E.L. and I.Lorge (1944) The Teacher's Word Book of 30,000Words. New York: Columbia University Press.

Townsend, David J. (1976) Do children interpret 'marked' comparative adjectives as their opposites? JCL 3. 385-396.

Townsend, David J. and Melinda Erb(1975) Children's strategies for interpreting complex comparative questions. JCL 2,2. 271-277.

Trubetzkoy, N.S. (1931) Die phonologischen Systeme. Travaux du Cercle Linguistique de Prague 4. 96-116.

Trubetzkoy, N.S. (1939) Grundzüge der Phonologie.Prague.

Vendler, Zeno (1963) The transformational grammar of English adjectives. TDAP 52.

Vendler, Zeno (1968) Adjectives and Nominalizations. The Hague.Paris: Mouton.

Vygotsky, L.S. (1962) Thought and Language. Cambridge,Mass.: M.I.T. Press.

Wales, Roger (1971) Comparing and contrasting. In Morton J. (1971: 61-81).

Wales, Roger (1977) Language and Learning. In Davies A.ed. Language and Learning in Early Childhood.London: Heinemann,in association with the SSRC and SCRE.

Wales, R. and R.Campbell (1970) On the development of comparison and the comparison of development. In Flores D'Arcais and Levelt (1970: 373-396).

Wales,R., M.A.G. Garman and Patrick D. Griffiths (1976) More or less the same: a markedly different view of children's comparative judgments in three cultures. In Wales R. and E. Walker (1976: 29-53).

Wales, R. and Edward Walker,eds.(1976) New approaches to language mechanisms. Amsterdam: North-Holland Publishing Company.

Wallach,M.A. and A.J.Caron (1959) Attribute criteriality and sex-linked conservatism as determinants of psychological similarity. JASP, 59. 43-50.

Wallach, Michael A. and Nathan Kogan (1965) Modes of Thinking in Young Children. A Study of the Creativity - Intelligence Distinction. New York: Holt, Rinehart and Winston.

Warr, Peter B., ed., (1970) Thought and Personality. Selected Readings. Harmondsworth: Penguin Books.

Wason, P.C. (1964) The effect of self-contradiction on fallacious reasoning. QJEP 16. 30-34. Repr. in Wason and Johnson-Laird (1968: 124-130).

Wason, P.C. and P.N. Johnson-Laird, eds. (1968) Thinking and Reasoning. Harmondsworth: Penguin Modern Psychology Readings.

Weiner, Susan L. (1974) On the development of m o r e and l e s s . JECP 17. 271-287.

Weinreich, Uriel (1966) Explorations in Semantic Theory. In Sebeok, T.A. (1966: 395-477) and Steinberg, D.D. and Jakobovits Semantics (1971: 395-416). London; New York: CUP.

Wells, Rulon S. (1954) Meaning and use. Word 10. 235-250.

Whorf, Benjamin Lee (1956) Language, Thought and Reality. Cambridge, Mass.: M.I.T. Press.

Williams, Joseph M. (1976) Synaesthetic adjectives: a possible law of semantic change. Lg. 52,2. 461-478.

Wootton, Anthony (1975) Dilemmas of Discourse. Controversies about the sociological interpretation of language. London: George Allen and Unwin Ltd.

Zajonc, Robert A. (1968) Attitudinal effects of mere exposure. JPSP Monograph Supplement vol.9. No.2. Part 2.

Ziff, Paul (1960) Semantic Analysis. Ithaca, New York: Cornell University Press.

Zimmer, K.E. (1964) Affixal negation in English and other languages: an investigation of restricted productivity. Word 20,2. Supplement.

Zipf, G.K. (1949) Human Behaviour and the Principle of Least Effort. Cambridge, Mass.: Addison-Wesley.

Zwicky, Arnold M. (1969) A note on becoming. Papers from the 5th Regional Meeting of the Chicago Linguistic Society. 293-294.

APPENDIX 1

Materials relating to Chapter 3.

Elicitation 1. Cards.

	Alphabetical Order of cards:						
I. HEIGHT.	A	B	D	F	L	S	Z
Order of Presentation:							
1.a. Elephants							
1st. choice							
2nd.							
3rd.							
1.b. Men							
1st. choice							
2nd.							
3rd.							
II. SIZE.	C	D	K	O	P	U	W
Presentation:							
1st. choice							
2nd.							
3rd.							
III. WIDTH.	A	C	D	G	I	M	N
Presentation:							
1st. choice:							
2nd.							
3rd.							
IV. MEASURE.	A	B	C	D	M	P	Q
Presentation:							
1st. choice							
2nd.							
3rd.							
V. DIRTINESS.	L	M	N	Q	S	T	V
Presentation:							
1st. choice							
2nd.							
3rd.							
VI. DEVIANCE.	C	D	F	K	N	P	X
Presentation:							
1st. choice							
2nd.							
3rd.							

Elicitation 1.

Group name: ....

Difference: ....

1. Order of difference: ....
   a. Describe the difference:

Card Letter	Sentence.
	This one is ....
	This one is ....
	This one is ....
	It's a ....one.
	It's a ....one.
	It's a ....one.
	This is a ....
	This is a ....
	This is a ....

2. Order of difference: ....
   a. Describe the difference:

This one is......................

It's a ....one

This is a ....

3. Order of Difference: ....
   a. Describe the difference:

This one is ....

It's a ....one

This is a ....

4. Order of Difference: ....
   a. Describe the Difference:

This one is ....

It's a ....one

This is a ....

5. Order of Difference: ....
   a. Describe the difference:

This one is ....

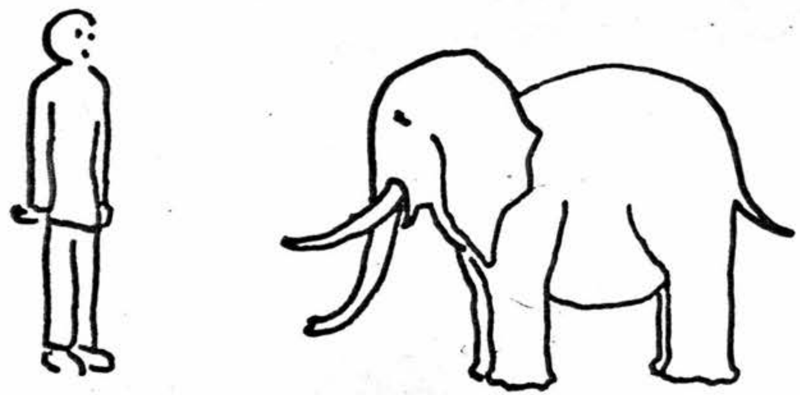
It's a ....one

This is a ....

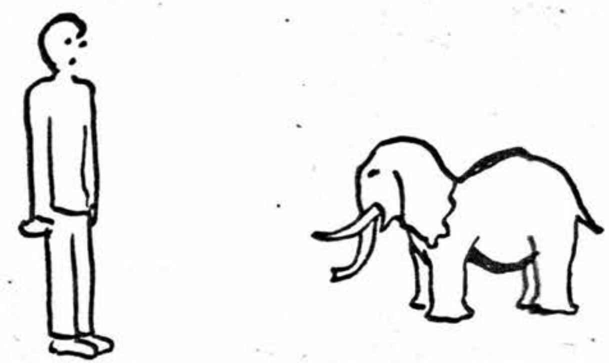
6. Recall the differences:

Card letter	Sentence
	This is a............
	This is a............
	This is a............
	This is a............
	This is a............
	This is a............
	This is a............

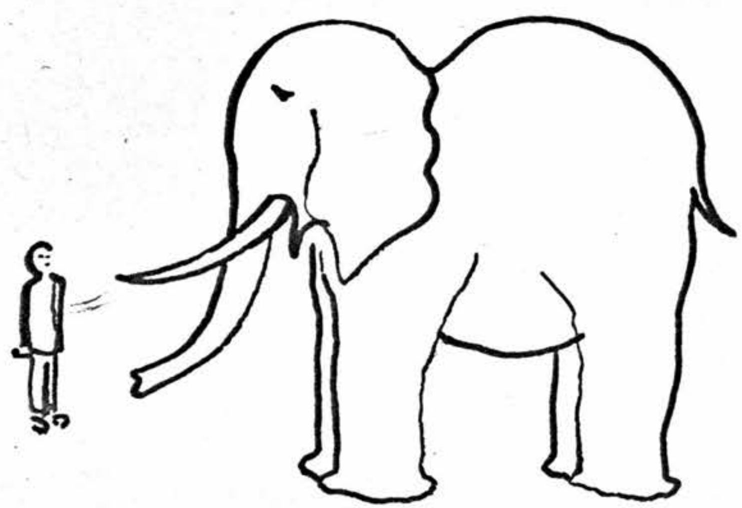
S.



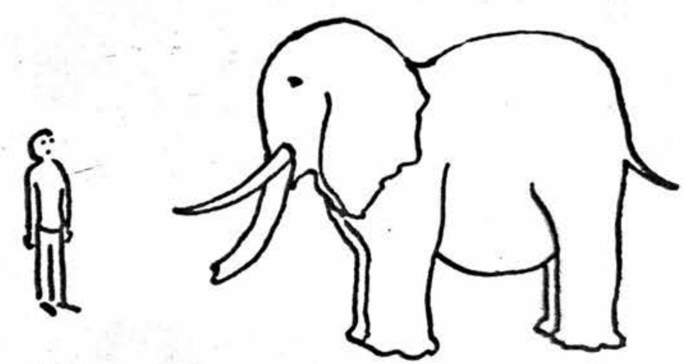
F.



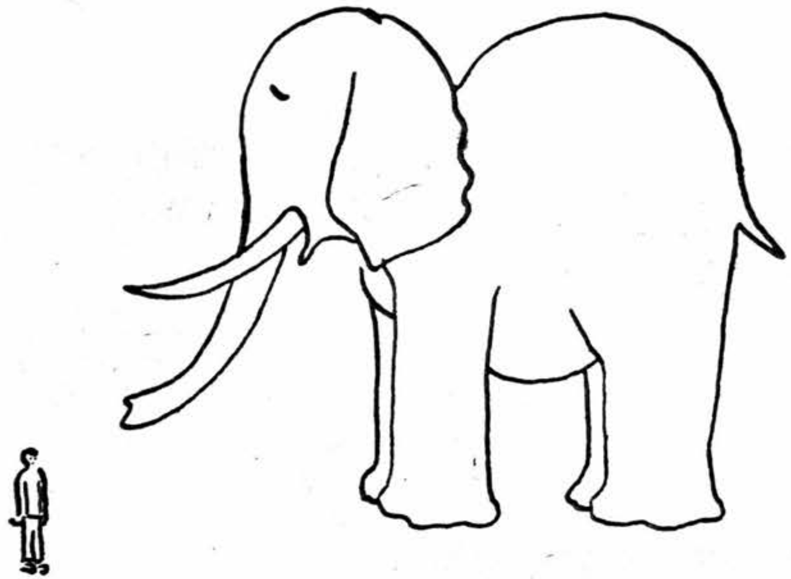
L.



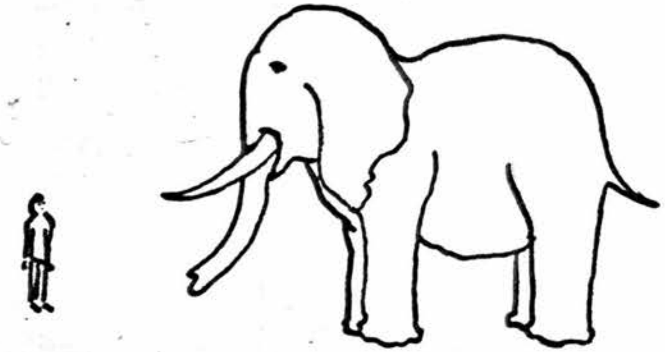
A.



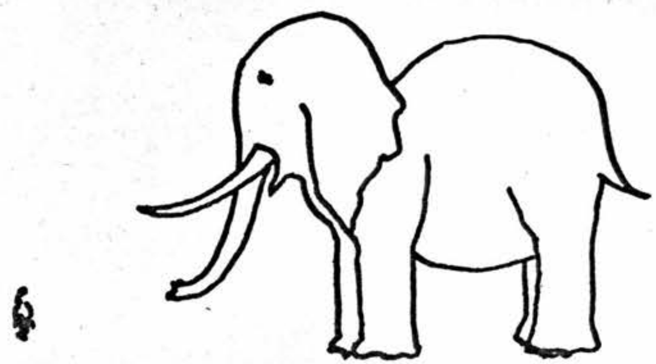
D.



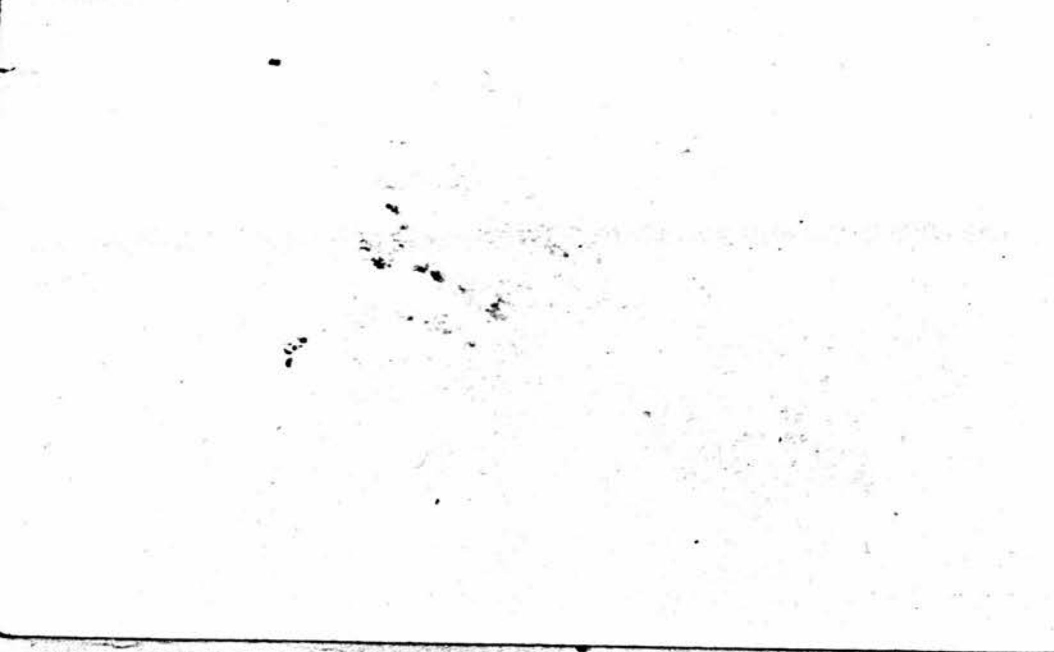
Z.



B.



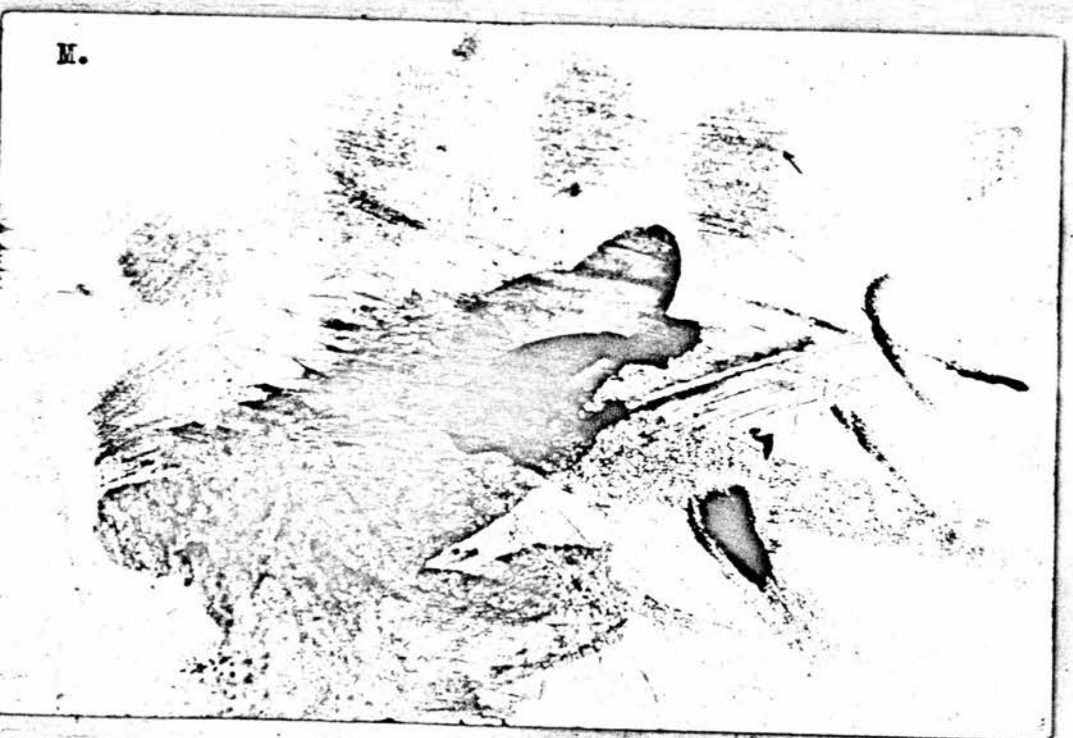
L.



S.

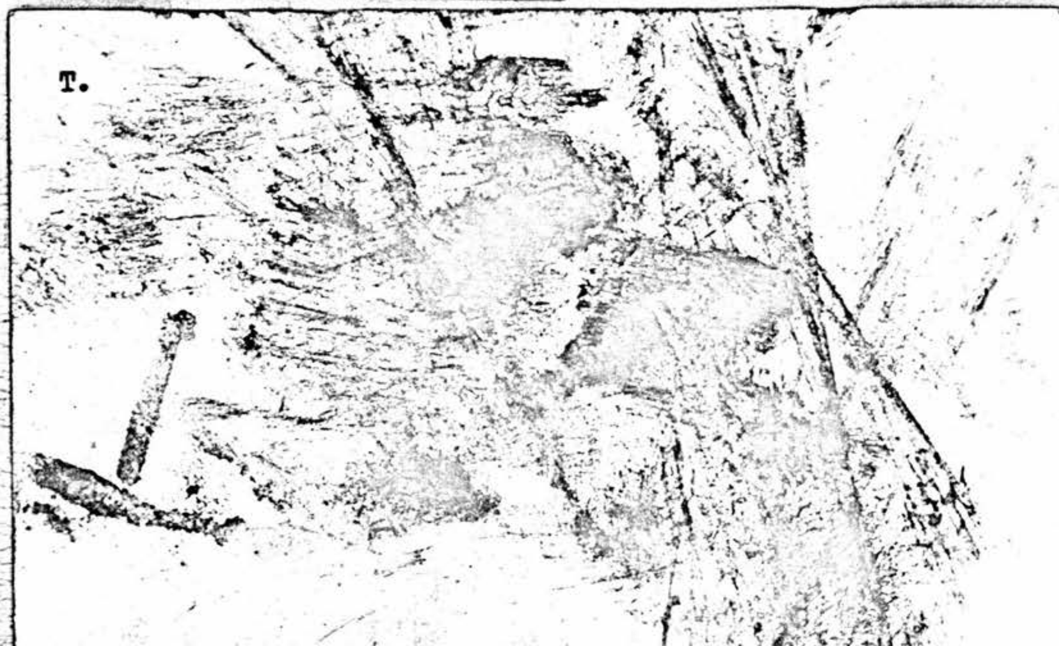
Q.

V.

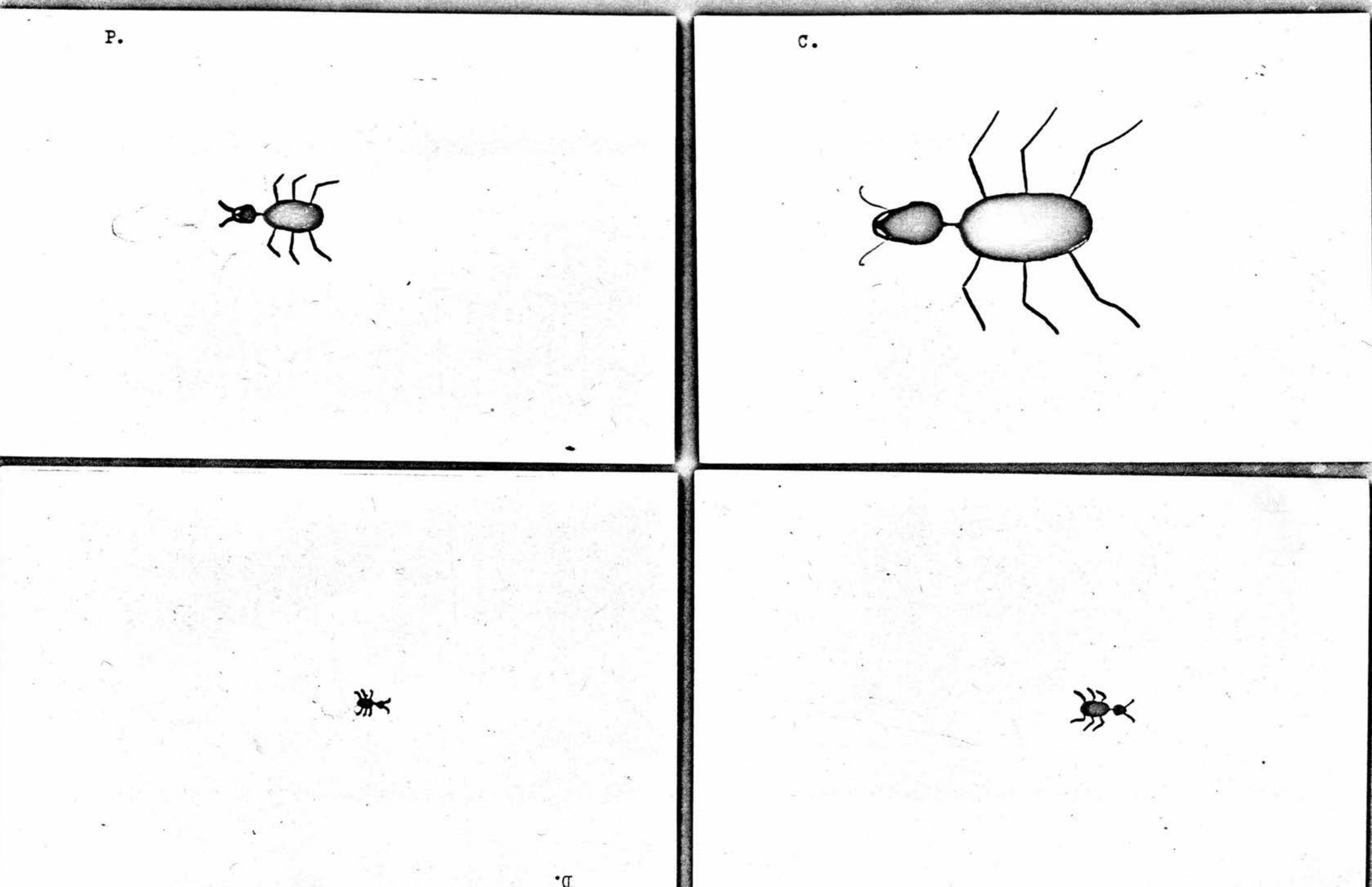


M.

N.



T.

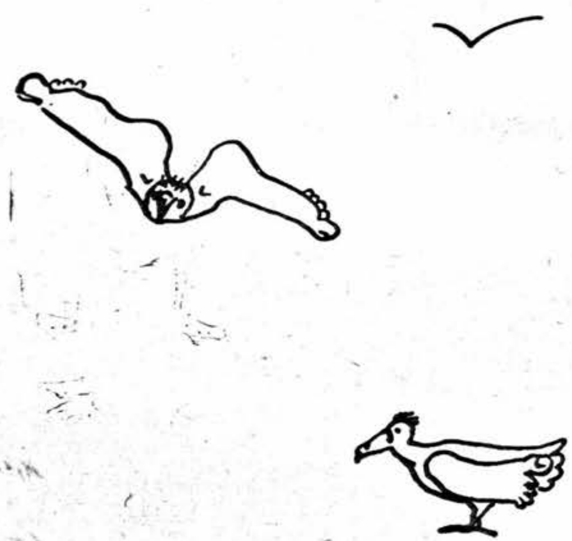

P.
C.
D.

U.

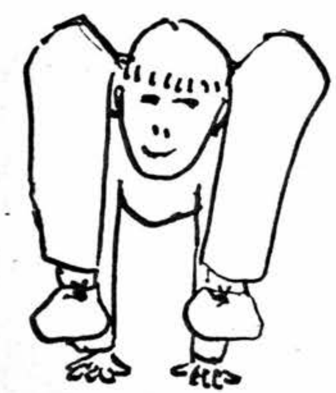
K.

O.

N.

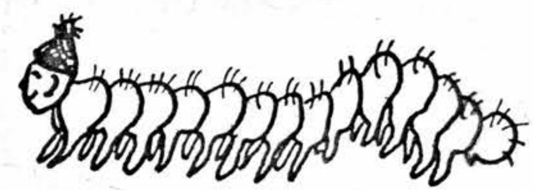


F.

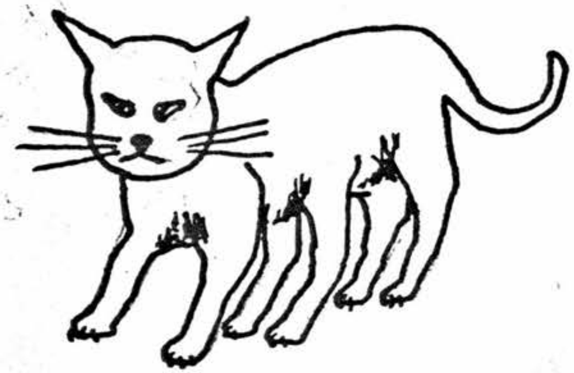


P.

D.

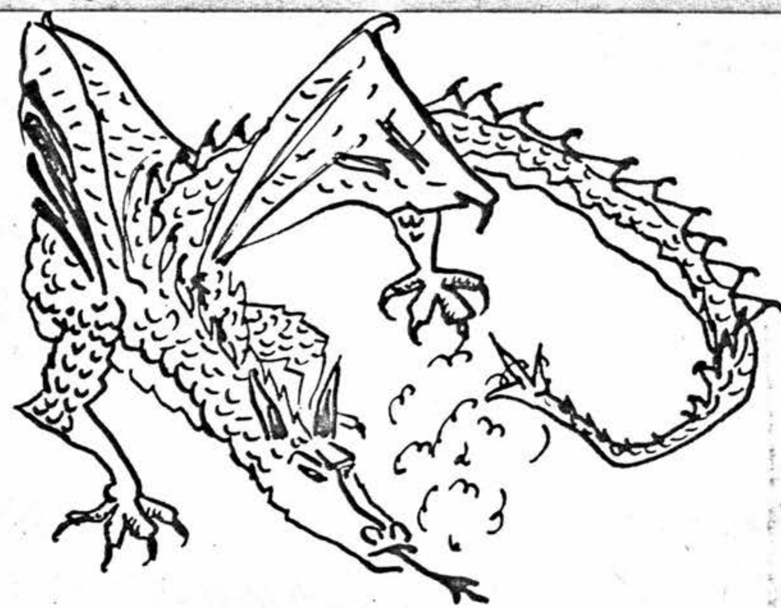


X.



K.

C.

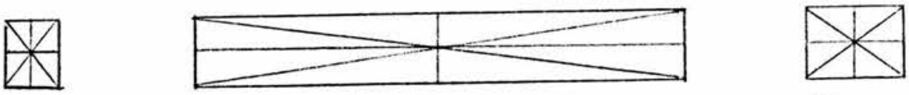


APPENDIX 2.

Questionnaire Materials used for the elicitation described in Chapter 4.

NAME:

These are rectangles.

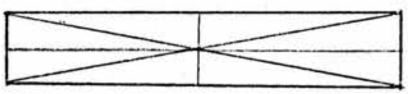


D M X

The order of difference is:

Describe the difference:

Letter	Sentence.
	This rectangle is .... It's a ....rectangle.
	This rectangle is .... It's a ....rectangle.
	This rectangle is .... It's a ....rectangle.



Describe this one:

This rectangle is ....

It's a ....rectangle.

Describe this one:

This rectangle is ....

It's a ....rectangle.

Describe this one:

This rectangle is ....

It's a ....rectangle.

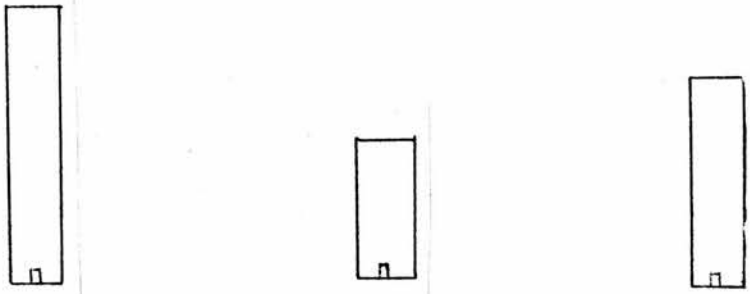
Describe this one:

This rectangle is ....

It's a ....rectangle.

1a
1b
1c
1d
1e
1f
2a
2b
2c
2d
3a
3b
3c
4a
4b
4c
5a
5b
5c

These are buildings.



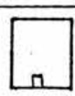
(A.) (O.) (S.)

The order of difference is:

Describe the difference:

Letter	Sentence.
	This building is .... It's a ....building.
	This building is .... It's a ....building.
	This building is .... It's a ....building.

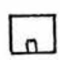
1a
1b
1c
1d
1e
1f

Describe this one: 

This building is ....

It's a ....building.

2a
2b
2c

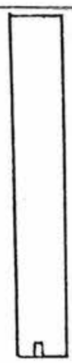


Describe this one:

This building is ....

It's a ....building.

3a
3b
3c

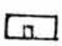


Describe this one:

This building is ....

It's a ....building.

4a
4b
4c



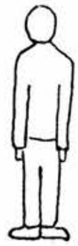
Describe this one:

This building is ....

It's a ....building.

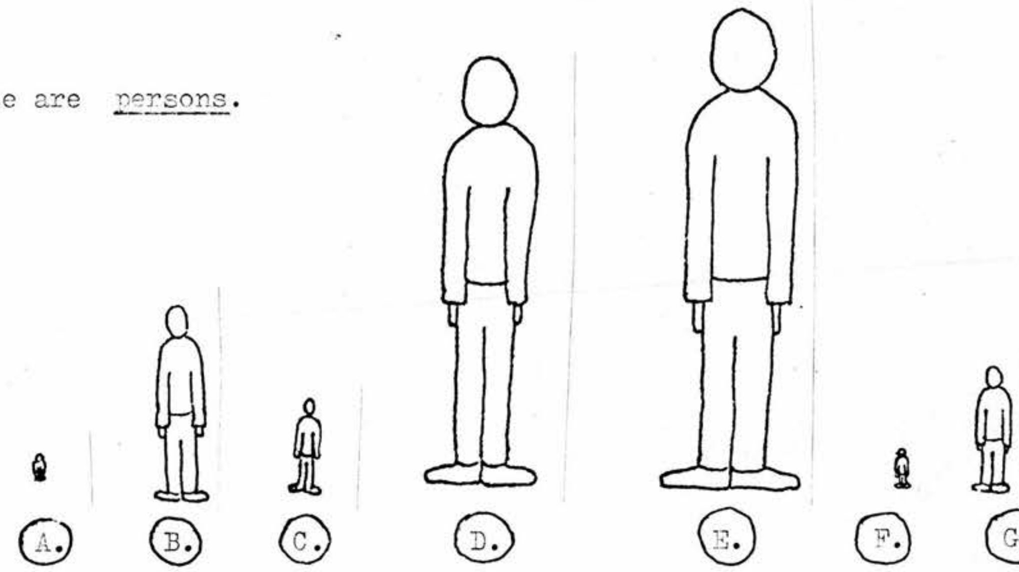
5a
5b
5c

This is Norman:



Norman is exactly like you.

These are persons.



The order of difference is:

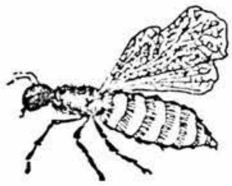
Describe the difference:

Letter.	Sentence.
	This person is .... This is a ....person.
	This person is .... This is a ....person.
	This person is .... This is a ....person.
	This person is .... This is a ....person.
	This person is .... This is a ....person.
	This person is .... This is a ....person.
	This person is .... This is a ....person.

1a
1b
1c
1d
1e
2a
2b
2c
3a
3b
3c
4a
4b
5a
5b
6a
6b
7a
7b

These are bees.

(A.)



(L.)

(O.)

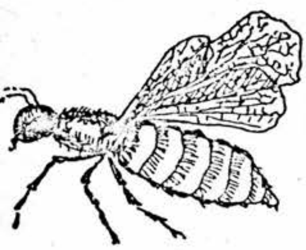
The order of difference is: | | | |

Describe the difference:

Letter	Sentence
	This bee is .... It's a ....bee.
	This bee is .... It's a ....bee.
	This bee is .... It's a ....bee.

1a
1b
1c
1d
1e
1f

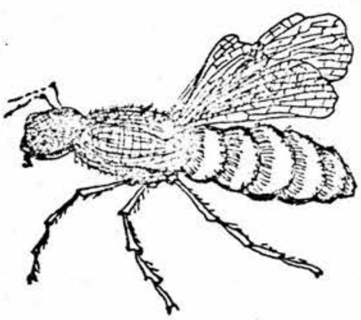
Describe this one.



This bee is..............................
It's a ....bee.

2a
2b
2c

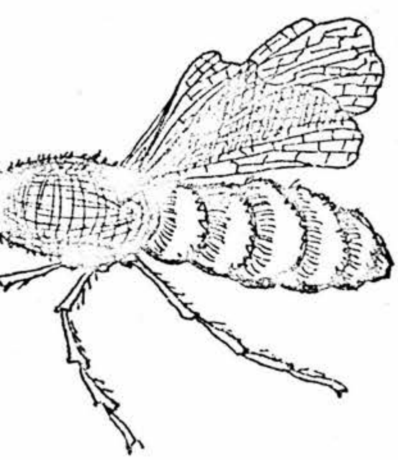
Describe this one.



This bee is ....
It's a ....bee.

3a
3b
3d

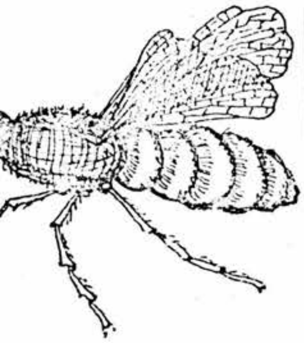
Describe this one.



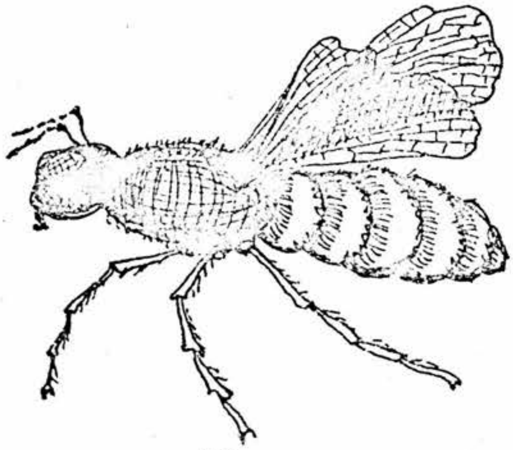
This bee is ....
It's a ....bee.

4a
4b
4c

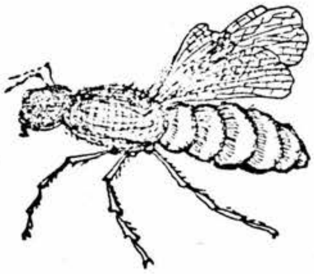
These are bees.



(C)



(F)



(M)

The order of difference is:

Describe the difference:

Letter	Sentence
	This bee is .... It's a ....bee.
	This bee is .... It's a ....bee.
	This bee is .... It's a ....bee.

1a.
1b.
1c.
1d.
1e.
1f.

Describe this one: 

This bee is ....

It's a ....bee.

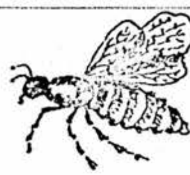
2a.
2b.
2c.

Describe this one:

This bee is ....

It's a ....bee.

3a.
3b.
3c.



Describe this one:

This bee is ....

It's a ....bee.

4a.
4b.
4c.

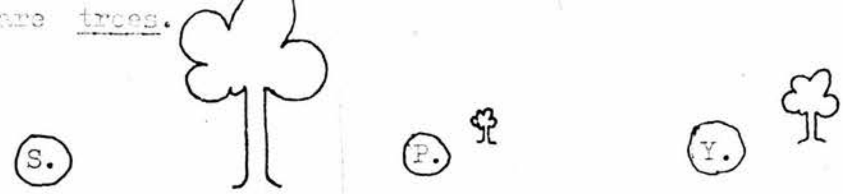
Describe this one:

This bee is ....

It's a ....bee.

5a.
5b.
5c.

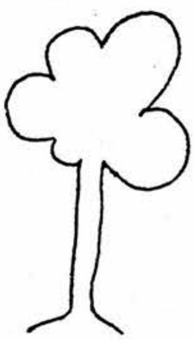
These are trees.



The order of difference is:

Describe the difference:

Letter	Sentence.
	This tree is .... It's a ....tree.
	This tree is .... It's a ....tree.
	This tree is .... It's a ....tree.

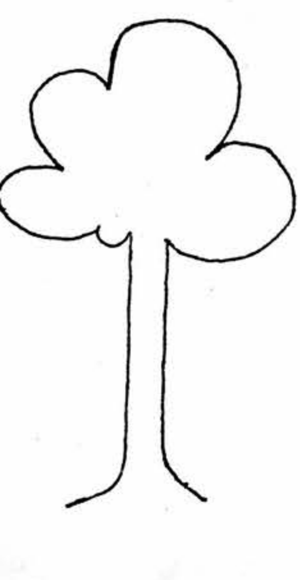


Describe
this
one:

This tree is ....
It's a ....tree.

Describe
this
one:

This tree is ....
It's a ....tree.



Describe
this
one:

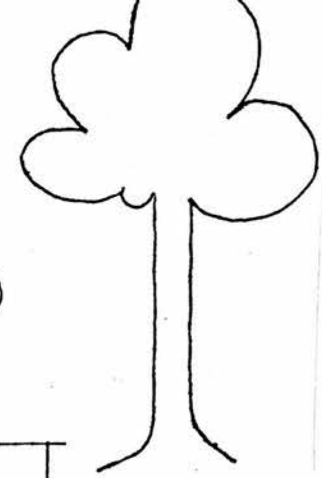
This tree is ....
It's a ....tree.

1a.
1b.
1c.
1d.
1e.
1f.
2a.
2b.
2c.
3a.
3b.
3c.
4a.
4b.
4c.

These are trees.

A. 

C. 

L. 

The order of difference is: | | | |

Describe the difference:

Letter	Sentence.
	This tree is .... It's a ....tree.
	This tree is .... It's a ....tree.
	This tree is .... It's a ....tree.

Describe this one: 

This tree is..................................

It's a ....tree.

Describe this one: 

This tree is..................................

It's a ....tree.

Describe this one: 

This tree is ....

It's a ....tree.

Describe this one: 

This tree is ....

It's a ....tree.

1a
1b
1c
1d
1e
1f
2a
2b
2c
3a
3b
3c
4a
4b
4c
5a
5b
5c

These are bottles.

C. E. N.

1a.
1b.
1c.
1d.
1e.
1f.

The order of difference is: | | | |

1

Describe the difference:

Letter	Sentence.
	This bottle is .... It's a ....bottle.
	This bottle is .... It's a ....bottle.
	This bottle is .... It's a ....bottle.

Describe this one:

2a.
2b.
2c.

This bottle is ....

It's a ....bottle.

Describe this one:

3a.
3b.
3c.

This bottle is ....

It's a ....bottle.

Describe this one:

4a.
4b.
4c.

This bottle is ....

It's a ....bottle.

These are faces.

L.

S.

X.

1a
1b
1c
1d

The order of difference is: | | | | 1e

1f

Describe the difference:

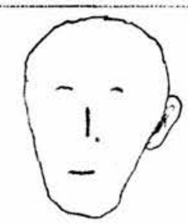
Letter.	Sentence.
	This face is .... It's a ....face.
	This face is .... It's a ....face.
	This face is .... It's a ....face.

Describe this one:

2a

This face is 2b

It's a ....face. 2c



Describe this one:

This face is 3a

It's a ....face. 3b

3c

Describe this one:

This face is 4a

It's a ....face. 4b

4c

Describe this one:

This face is 5a

It's a ....face. 5b

5c

APPENDIX 3

Tabulation of language used in reply to the questionnaire, Chapter 4.

TABLE 4.4.1.2.A.I.

General Adjective Frequencies by Category and Type and Usage.

Page: Rectangles Concept: LENGTH

		GP1 (33)		GP2 (26)		GP3 (23)		GP6 (19)	
i. Comparative		c	a	c	a	c	a	c	a
Global	(G)	8	2	3	0	3	1	8	4
Specific Relevant	(SR)	2	1	-	1	1	-	9	-
Specific Other	(SO)	1	-	-	-	1	1	10	3
	Total f:	11	3	3	1	5	1	27	7
ii. Superlative:									
a. Appropriate	G	5	-	1	-	1	-	2	-
	SR	3	-	1	-	-	1	1	-
	SO	-	-	-	-	-	-	1	1
	Total f:	8	-	2	-	1	1	4	1
b. Inappropriate									
	G	17	1	2	0	2	0	7	1
	SR	-	-	3	-	-	-	2	-
	SO	-	-	-	-	-	-	3	-
	Total f:	17	1	5	-	2	1	12	1
iii. Absolute									
I Single									
a. Appropriate									
	G	42	53	27	38	41	31	13	17
	SR	35	26	22	21	36	31	18	24
	SO	2	6	3	5	10	14	8	9
	Alternative(A)	1	13	2	12	1	6	2	0
	Total f:	80	98	54	76	88	82	41	50
b. Inappropriate									
	G	2	5	0	1	0	0	0	0
	SR	6	2	-	1	1	1	-	1
	SO	9	22	13	23	19	36	8	20
	A	-	1	1	1	-	6	-	3
	Total f:	17	30	14	26	20	43	8	24

TABLE 4.4.1.2.AI (cont'd)

Page: Rectangles   Concept: LENGTH

		GP1 (33)		GP2 (26)		GP3 (23)		GP6 (19)	
iii. Absolute (cont'd)		c	a	c	a	c	a	c	a
II Pairs									
a. Appropriate									
	G + G	8	2	3	4	0	0	0	0
	G + SR	6	3	6	1	-	-	-	-
	G + SO	3	2	6	4	1	1	-	1
	SR + SO	6	2	3	2	2	-	4	1
	Total f:	23	9	18	11	3	1	4	2
b. Inappropriate									
	G + G	0	0	0	0	2	0	0	0
	G + SR	-	1	-	-	-	-	-	-
	G + SO	6	2	5	7	3	1	1	1
	SR + SR	5	3	2	1	1	-	-	-
	SR + SO	14	9	29	26	8	3	8	12
	SO + SO	6	1	12	8	-	-	2	5
	Total f:	31	16	48	42	14	4	12	18
III Multiples									
a. Appropriate	any	1	1	2	0	0	0	1	1
b. Inappropriate	any	3	1	4	-	1	-	4	1
iv. Intermediary									
a. Appropriate									
	Relevant	7	5	4	5	2	3	5	5
	Other	2	5	-	1	-	2	2	5
	Total f:	9	10	4	6	2	5	7	10
b. Inappropriate									
	Relevant	15	7	3	5	3	8	2	5
	Other	-	1	1	-	-	-	2	-
	Total f:	15	8	4	5	3	8	4	5

TABLE 4.4.1.2.A II

General Adjective Frequencies by Category and Type and Usage.

Page: Buildings Concept: HEIGHT

		GP1 (33)		GP2 (26)		GP3 (23)		GP6 (19)	
i. Comparative		c	a	c	a	c	a	c	a
Global	(G)	2	1	1	0	7	2	3	3
Specific, Relevant	(SR)	1	-	1	1	1	1	7	3
Specific, Other	(SO)	1	-	-	-	-	1	2	-
Total f:		4	1	2	1	8	4	12	6
ii. Superlative									
a. Appropriate									
	G	6	1	2	0	0	0	1	0
	SR	3	-	-	-	-	-	3	-
	SO	1	-	-	-	-	-	-	-
Total f:		10	1	2	0	0	0	4	0
b. Inappropriate									
	G	10	0	3	0	1	0	0	0
	SR	3	-	-	-	-	-	2	-
	SO	1	-	-	-	-	-	2	-
Total f:		14	0	3	0	1	0	4	0
iii. Absolute									
I Single									
a. Appropriate									
	G	64	66	29	34	52	36	33	35
	SR	20	18	20	18	28	13	26	36
	SO	20	16	17	18	17	11	6	9
Alternative	(A)	8	18	16	20	12	16	4	10
Total f:		112	118	82	90	109	76	69	90
b. Inappropriate									
	G	0	1	0	0	0	0	0	0
	SR	-	-	-	1	-	-	-	1
	SO	11	34	9	32	8	47	1	4
	A	-	-	-	-	-	-	-	-
Total f:		11	35	9	33	8	47	1	5

TABLE 4.4.1.2.A II (Cont'd)

Page: Buildings   Concept: HEIGHT

	GP1 (33)		GP2 (26)		GP3 (23)		(GP6 (19)	
(iii) Absolute (Cont'd)	c	a	c	a	c	a	c	a
II Pairs								
a. Appropriate								
G+G	1	2	2	2	0	0	0	0
G+SR	2	1	1	1	1	1	-	-
G+SO	5	3	6	3	0	1	6	5
SR+SR	-	-	2	2	-	-	-	-
SR+SO	1	1	1	1	1	4	2	-
SO+SO	-	-	2	0	0	1	1	-
Total f:	9	7	14	9	2	7	9	5
b. Inappropriate:								
G+G	-	-	-	1	-	-	-	-
G+SR	-	-	1	-	-	-	-	-
G+SO	15	2	15	5	6	2	3	1
SR+SR	-	-	3	4	-	-	-	-
SR+SO	15	2	9	4	5	3	3	2
SO+SO	13	3	6	1	1	-	1	-
Total f:	43	7	34	15	11	5	7	3
III Multiples								
a. Appropriate	0	0	3	0	0	0	1	0
b. Inappropriate	2	1	10	-	-	-	-	-
(iv) Intermediary								
a. Appropriate								
Relevant	0	0	1	2	0	2	2	2
Other	-	-	-	-	-	-	1	1
Total f:	-	-	1	2	-	2	3	3
b. Inappropriate								
Relevant	18	11	4	3	10	3	5	6
Other	1	1	2	1	1	1	-	-
Total f:	19	12	6	4	11	4	5	6

TABLE 4.4.1.2.A III

General Adjective Frequencies by Category, Type and Usage

Page: Persons Concept: HEIGHT

	GP1 (32) c	GP1 (32) a	GP2 (25) c	GP2 (25) a	GP3 (23) c	GP3 (23) a	GP6 (19) c	GP6 (19) a
i. Comparative								
Global (G)	30	13	7	2	17	1	13	0
Specific, Relevant (SR)	2	-	-	-	2	2	3	1
Specific, Other (SO)	-	-	-	1	1	-	3	-
Total f:	32	13	7	3	20	3	19	1
ii. Superlative								
a. Appropriate								
G	16	2	1	0	3	0	1	0
SR	5	1	1	-	1	-	2	-
SO	-	-	-	-	-	-	1	-
Total f:	21	3	2	-	4	-	4	-
b. Inappropriate								
G	1	-	-	-	-	-	1	-
SR	-	-	-	-	-	-	-	-
SO	-	-	-	-	-	-	-	-
Total f:	1	-	-	-	-	-	1	-
iii. Absolute								
I Single								
a. Appropriate								
G	94	74	68	78	76	65	56	77
SR	10	8	12	16	27	18	15	22
SO	2	3	2	10	3	3	2	5
Alternative (A)	2	5	3	11	3	20	7	12
Total f:	108	90	85	115	109	106	80	116
b. Inappropriate								
G	1	1	0	0	0	0	0	0
SR	1	1	0	1	-	-	-	-
SO	6	24	4	14	3	33	-	-
A	-	2	-	-	-	-	-	-
Total f:	8	28	4	15	3	33	-	-

TABLE 4.4.1.2.A III (cont'd)

Page: Persons   Concept: HEIGHT

		GP1 (32)		GP2 (25)		GP3 (23)		GP6 (19)	
iii Absolute (cont'd)		c	a	c	a	c	a	c	a
II Pairs									
a. Appropriate									
	G + G	5	8	9	1	0	0	0	0
	G + SR	2	1	5	1	1	-	-	-
	G + SO	1	1	5	-	-	-	-	-
	SR + SO	1	-	2	1	-	-	-	-
	Total f:	9	10	21	3	1	-	-	-
b. Inappropriate									
	G + G	0	0	2	2	0	0	0	0
	G + SR	-	-	2	1	-	-	-	-
	G + SO	4	-	10	6	-	-	-	-
	SR + SO	3	1	3	3	-	-	-	-
	SO + SO	-	-	-	3	-	-	-	-
	Total f:	7	1	17	15	-	-	-	-
III Multiples.									
a. Appropriate		0	0	3	0	0	0	0	0
b. Inappropriate		2	0	3	0	0	0	0	0
iv. Intermediary									
a. Appropriate									
	Relevant	3	2	1	0	1	0	4	9
	Other	-	-	-	-	-	-	1	1
	Total f:	3	2	1	-	1	-	5	10
b. Inappropriate									
	Relevant	9	8	8	11	6	8	0	2
	Other	3	1	-	-	1	-	-	-
	Total f:	12	9	8	11	7	8	-	2

TABLE 4.4.1.2.A. IV

General Adjective Frequencies by Category, Type and Usage.

Page: Big Bees   Concept: SIZE

		GP1A (16)		GP2A (13)		GP3A (12)	
i. Comparative		c	a	c	a	c	a
Global	(G)	6	0	3	1	8	0
Specific, Relevant	(SR)	-	-	-	-	-	-
Specific, Other	(SO)	-	-	-	-	-	-
Total f:		6	-	3	1	8	-
ii. Superlative							
a. Appropriate	G	3	-	4	-	2	-
b. Inappropriate	G	5	-	2	-	-	-
iii. Absolute							
I Single							
a. Appropriate							
	G	46	37	24	27	49	34
	SR	2	4	2	2	-	-
	SO	4	10	-	1	-	14
Alternative	(A)	1	8	2	7	6	5
Total f:		53	59	28	37	55	53
b. Inappropriate							
	G	3	8	2	4	2	1
	SR	-	1	-	-	-	-
	SO	1	5	-	-	2	1
Total f:		4	14	2	4	4	2

TABLE 4.4.1.2.A IV (Cont'd)

Page: Big Bees   Concept: SIZE

		GP1A (16)		GP2A (13)		GP3A (12)	
iii. Absolute (cont'd)		c	a	c	a	c	a
II Pairs							
a. Appropriate							
	G+G	4	1	3	7	0	0
	G+SR	3	-	3	-	-	-
	G+SO	6	4	9	5	1	2
	SR+SO						
	Total f:	13	5	15	12	1	2
b. Inappropriate							
	G+G	1	0	1	0	0	0
	G+SR	-	-	1	-	-	-
	G+SO	6	-	1	1	-	2
	SR+SO	-	-	5	6	-	-
	SO+SO	-	1	-	1	-	-
	Total f:	7	1	8	8	-	2
III Multiples							
a. Appropriate		0	1	3	0	0	0
b. Inappropriate		1	1	2	0	0	0
iv. Intermediary							
a. Appropriate							
	Relevant	3	2	2	2	2	4
	Other	-	-	-	-	-	1
	Total f:	3	2	2	2	2	5
b. Inappropriate							
	Relevant	11	8	2	2	7	3

TABLE 4.4.1.2.A IV (Cont'd)

General Adjective Frequencies by Category, Type and Usage.

Page: Small Bees   Concept: SIZE

		GP1A (16)		GP2A (13)		GP3A (12)	
i. Comparative		c	a	c	a	c	a
Global	(G)	4	1	6	0	4	1
Specific, Relevant	(SR)	-	-	1	-	-	-
Total f:		4	1	7	-	4	1
ii. Superlative							
a. Appropriate							
	G	8	0	2	0	2	0
b. Inappropriate							
	G	10	0	0	0	1	0
iii. Absolute							
I Single							
a. Appropriate							
	G	33	31	30	32	50	42
	SR	4	1	2	2	1	1
Specific, Other	(SO)	5	11	1	5	-	7
Alternative	(A)	-	5	-	7	5	5
Total f:		42	48	33	46	56	55
b. Inappropriate							
	G	2	8	0	2	1	3
	SR	2	-	1	1	-	-
	SO	-	4	2	2	1	3
	A	-	-	-	-	-	-
Total f:		4	12	3	5	2	6

TABLE 4.4.1.2.A IV (Cont'd)

Page: Small Bees **Concept:** SIZE

	GP1A (16)		GP2A (13)		GP3A (12)	
iii. Absolute (Cont'd)	c	a	c	a	c	a
II Pairs						
a. Appropriate						
G+G	5	6	1	2	0	0
G+SR	-	-	4	2	-	-
G+SO	5	-	8	4	-	-
SR+SO	-	-	-	-	-	-
Total f:	10	6	13	8	-	-
b. Inappropriate						
G+G	0	0	0	0	0	0
G+SR	-	-	-	-	-	-
G+SO	1	1	-	-	-	-
SR+SO	2	-	6	-	-	-
SO+SO	3	-	-	-	-	-
Total f:	6	1	6	-	-	-
III Multiples						
a. Appropriate	0	0	2	0	0	0
b. Inappropriate	-	1	3	-	-	-
iv. Intermediary						
a. Appropriate						
Relevant	0	0	2	3	2	2
b. Inappropriate						
Relevant	12	8	3	3	2	2

TABLE 4.4.1.2.A V.

General Adjective Frequencies by Category, Type and Usage.

Page: Big Trees Concept: HEIGHT

	GP1B (17) c	GP1B (17) a	GP2B (12) c	GP2B (12) a	GP3B (11) c	GP3B (11) a	GP6 (19) c	GP6 (19) a
i. Comparative								
Global (G)	5	2	3	2	6	3	16	9
Specific, Relevant (SR)	-	-	-	-	-	-	2	-
Specific, Other (SO)	-	-	-	-	-	-	1	-
Total f:	5	2	3	2	6	3	19	9
ii. Superlative								
a. Appropriate								
G	7	2	3	1	1	-	7	1
SR	1	-	-	-	-	-	2	-
Total f:	8	2	3	1	1	-	9	1
b. Inappropriate								
G	8	1	2	0	3	0	4	0
iii. Absolute								
I Single								
a. Appropriate								
G	46	38	25	30	41	33	66	76
SR	0	7	2	6	3	13	6	14
SO	2	8	3	6	0	4	1	1
Alternative (A)	4	9	7	9	10	10	5	8
Total f:	52	62	37	51	54	60	78	99
b. Inappropriate								
G	4	4	0	4	0	1	0	0
SR	-	2	-	-	-	-	-	-
SO	1	2	2	1	2	2	-	-
A	-	-	-	-	-	1	-	-
Total f:	5	8	2	5	2	4	-	-

TABLE 4.4.1.2.A V (Cont'd)

General Adjective Frequencies.

Page: Big Trees . Concept: HEIGHT

	GP1B (17)		GP2B (12)		GP3B (11)		GP6 (19)	
iii. Absolute (Cont'd)	c	a	c	a	c	a	c	a
II Pairs								
a. Appropriate								
G+G	0	0	3	0	0	0	0	0
G+SR	2	-	-	-	-	-	1	1
G+SO	8	-	9	3	-	-	-	1
SR+SO	3	1	1	1	1	-	-	-
A+A	2	-	1	3	-	-	-	-
Total f:	15	1	14	7	1	-	1	2
b. Inappropriate								
G+G	0	0	1	1	0	0	0	0
G+SR	1	-	-	-	-	-	-	-
G+SO	1	-	5	7	1	-	2	-
SR+SO	1	2	3	3	-	-	2	1
SO+SO	-	1	-	-	-	-	-	-
A+A	-	1	-	-	-	-	1	-
Total f:	3	4	8	11	1	-	5	-
III Multiples								
a. Appropriate	0	0	3	0	0	0	0	0
b. Inappropriate	3	-	2	2	-	-	1	-
iv. Intermediary								
a. Appropriate								
Relevant	3	2	4	1	1	0	5	5
Other	-	-	-	-	1	-	-	1
Total f:	3	2	4	1	2	-	5	6
b. Inappropriate								
Relevant	11	2	1	-	2	1	5	7
Other	-	-	1	-	-	1	1	1
Total f:	11	2	2	-	2	2	6	8

TABLE 4.4.1.2.A.V

General Adjective Frequencies by Category, Type and Usage.

Page: Small Trees   Concept: HEIGHT

	GP1B (16)		GP2B (13)		GP3B (11)		GP6 (19)	
i. Comparative	c	a	c	a	c	a	c	a
Global (G)	1	3	1	0	0	3	10	5
Specific Relevant (SR)	-	-	-	-	-	-	2	1
Specific, Other (SO)	-	-	-	-	1	-	-	-
Total f:	1	3	1	-	1	3	12	6
ii. Superlative								
a. Appropriate								
G	7	1	0	0	1	0	3	0
SR	-	1	-	-	-	-	2	1
Total f:	7	2	-	-	1	-	5	1
b. Inappropriate								
G	5	0	0	0	2	0	1	0
SR	-	1	-	-	-	-	2	1
Total f:	5	1	-	-	2	-	3	1
iii Absolute								
I Single								
a. Appropriate								
G	36	26	34	36	27	18	50	62
SR	3	1	5	5	5	4	7	9
SO	1	14	0	5	0	10	-	2
Alternative (A)	4	12	2	8	9	13	9	9
Total f:	44	53	41	54	41	45	66	82
b. Inappropriate								
G	8	5	3	3	0	3	1	1
SR	2	2	1	1	1	-	-	-
SO	1	2	-	3	2	1	1	-
A	-	-	-	-	-	1	1	1
Total f:	11	9	4	7	3	5	3	2

TABLE 4.4.1.2.A V (Cont'd)

Page: Small Trees   Concept: HEIGHT

	GP1B (16)		GP2B (13)		GP3B (11)		GP6 (19)	
iii. Absolute (Cont'd)	c	a	c	a	c	a	c	a
II Pairs								
a. Appropriate								
G+G	0	0	3	0	0	0	0	0
G+SR	2	-	-	-	2	-	-	-
G+SO	4	1	9	3	-	-	-	-
SR+SO	1	7	1	-	1	1	1	-
A+A	2	0	4	3	-	-	1	2
Total f:	9	8	17	6	3	1	2	2
b. Inappropriate								
G+G	0	0	0	0	0	0	0	0
G+SR	1	-	-	-	-	-	-	-
G+SO	1	-	4	1	-	-	-	-
SR+SO	-	-	-	-	-	-	1	1
SO+SO	-	-	-	1	-	1	-	-
A+A	-	-	-	-	-	-	-	-
Total f:	2	-	4	2	-	1	1	1
III Multiples								
a. Appropriate	0	0	3	0	0	0	0	0
b. Inappropriate	-	-	1	-	-	-	-	-
iv. Intermediary								
a. Appropriate								
Relevant	0	0	1	0	4	2	9	11
Other	-	-	-	-	-	-	1	-
Total f:	-	-	1	-	4	2	10	11
b. Inappropriate								
Relevant	12	5	5	5	2	2	6	5
Other	-	-	-	-	-	1	-	1
Total f:	12	5	5	5	2	3	6	6

TABLE 4.4.1.2.A VI

General Adjective Frequencies by Category and Type and Usage.

Page: Bottles Concept: CONFORMITY

		GP1A (16)		GP2A (13)		GP3A (12)	
		c	a	c	a	c	a
i. Comparative							
Normative	(N)	0	0	0	0	1	0
Aesthetic	(AE)	-	-	1	-	-	-
Shape	(SH)	-	-	-	-	1	-
Total f:		-	-	1	-	2	-
ii. Superlative							
a. Appropriate							
	N	0	0	0	0	0	0
	AE	-	-	-	-	-	-
	SH	2	-	-	-	-	-
Total f:		2	-	-	-	-	-
b. Inappropriate							
	SH	1	-	-	-	-	-
iii. Absolute							
I Single							
a. Appropriate							
	N	10	11	10	7	9	13
	AE	5	12	5	7	2	3
	SH	8	4	7	10	6	7
Orientational	(L)	16	6	9	5	13	6
Extensive	(E)	17	24	8	11	10	11
Other	(O)	-	1	-	1	3	1
Total f:		56	58	39	41	43	41
b. Inappropriate							
	SH	13	7	7	7	15	12
	E	5	4	3	6	3	6
	G	-	-	-	-	1	-
Total f:		18	13	10	13	19	18

TABLE 4.4.1.2.A VI (Cont'd)

Page: Bottles   Concept: CONFORMITY

	GP1A (16)		GP2A (13)		GP3A (12)	
iii. Absolute (cont'd)	c	a	c	a	c	a
II Pairs.						
a. Appropriate						
N+N	2	0	3	4	0	0
N+AE	1	3	-	-	-	-
Any other	12	3	12	7	1	-
Total f:	15	6	15	11	1	-
b. Inappropriate						
Any	1	0	4	2	2	2
III Multiples						
a. Appropriate	0	0	0	0	0	0
b. Inappropriate	-	-	4	-	-	-

TABLE 4.4.1.2.A VI (Cont'd)

General Adjective Frequencies by Category, Type and Usage.

Page: Faces   Concept: CONFORMITY

	GP1B (17)		GP2B (13)		GP3B (11)		GP6 (19)	
(i) Comparative	c	a	c	a	c	a	c	a
Normative (N)	0	0	0	0	2	1	1	0
Other (O)	-	-	-	-	1	1	-	-
Total f:	-	-	-	-	3	2	1	-
(ii) Superlative								
a. Appropriate								
(N)	2	0	0	0	1	0	0	0
Aesthetic (AE)	1	-	-	-	-	-	-	-
Total f:	3		-	-	1	-	-	-

b. Inappropriate none

	GP1B c	GP1B a	GP2B c	GP2B a	GP3B c	GP3B a	GP6 c	GP6 a
(iii) Absolute								
I Single								
a. Appropriate								
N	14	12	23	19	13	8	43	42
AE	25	20	16	22	10	21	10	11
Shape (SH)	3	2	4	5	15	5	23	26
Affective (A)	16	14	3	14	8	8	5	6
Extensive (E)	5	12	11	10	9	9	2	1
Other (O)	26	21	14	7	15	18	23	25
Total f:	89	81	71	77	70	69	106	111
b. Inappropriate								
N	0	0	0	0	0	0	3	4
AE	-	-	-	-	-	-	-	1
SH	-	-	-	-	2	2	1	1
E	-	1	-	-	-	-	-	-
O	-	-	-	-	-	-	2	-
Total f:	-	1	-	-	2	2	6	6

TABLE 4.4.1.2.A VI (Cont'd)

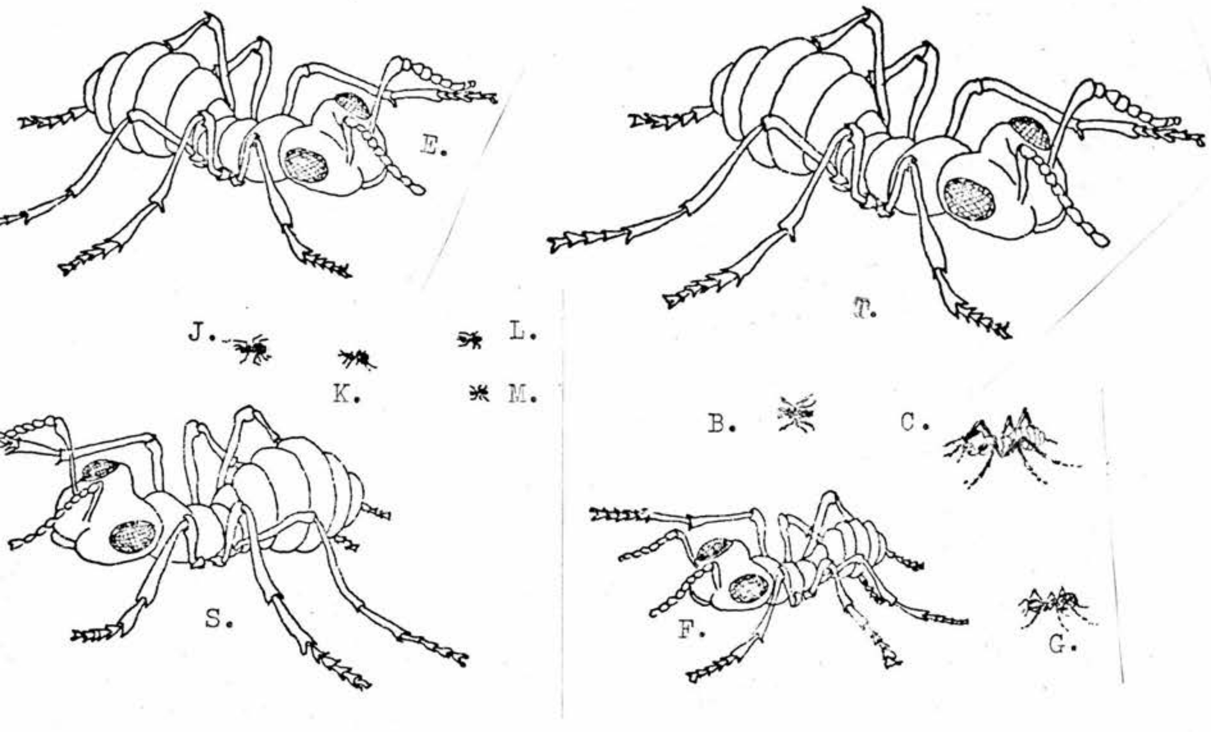
Page: Faces   Concept: CONFORMITY

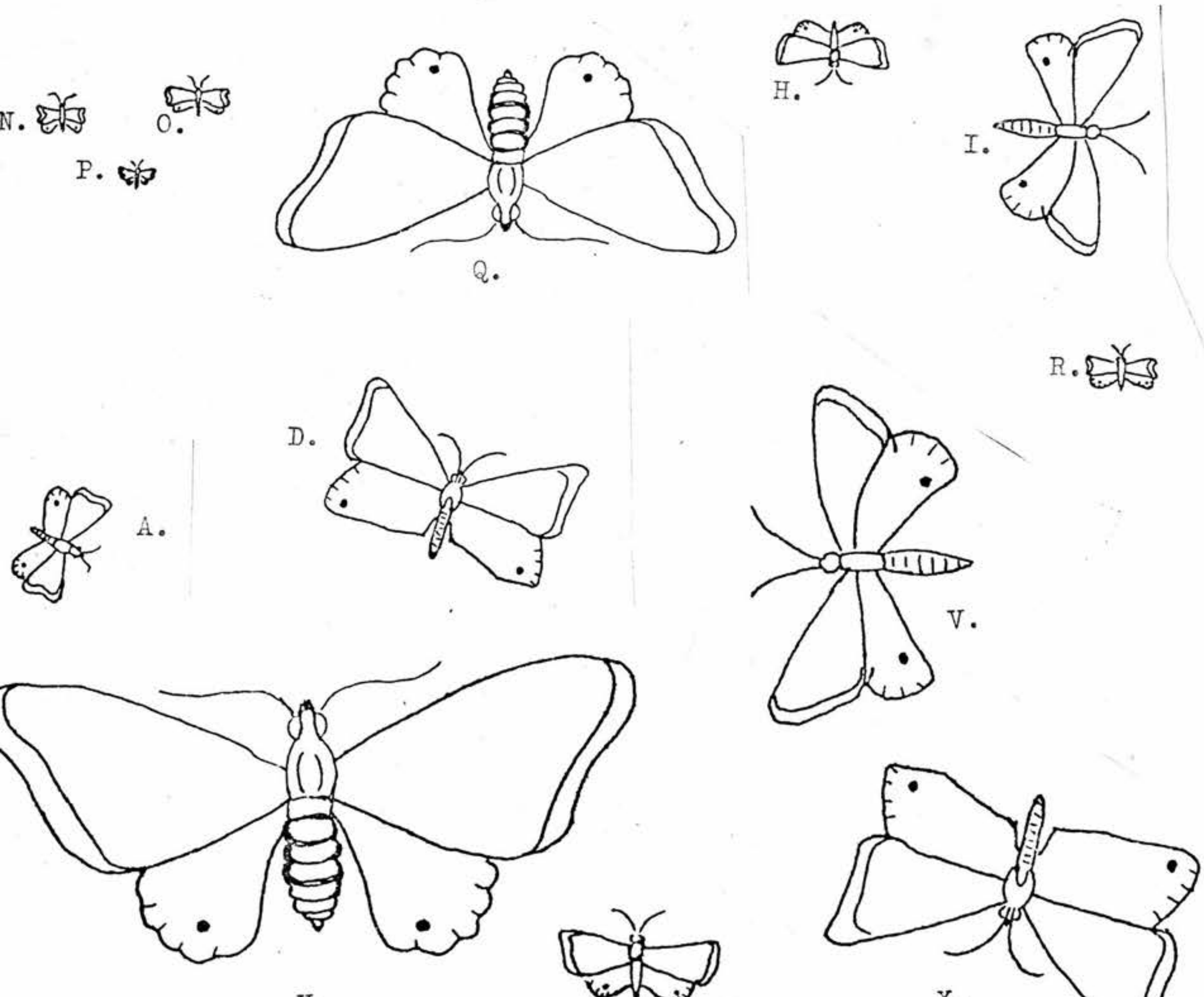
	GP1B (17)		GP2B (13)		GP3B (11)		GP6 (19)	
iii. Absolute (Cont'd)	c	a	c	a	c	a	c	a
II Pairs								
a. Appropriate								
N+N	2	2	1	0	0	0	4	2
N+AE	-	-	-	-	-	-	1	1
Any Other	9	3	8	4	-	-	6	3
Total f:	11	5	9	4	-	-	11	6
b. Inappropriate								
Any	1	1	0	0	1	1	0	1
III. Multiples								
a. Appropriate	3	0	4	0	0	1	2	0
b. Inappropriate	0	0	6	0	0	0	0	0

APPENDIX 4A

Materials used in the experiment descibed in Chapter 5.

NAME.





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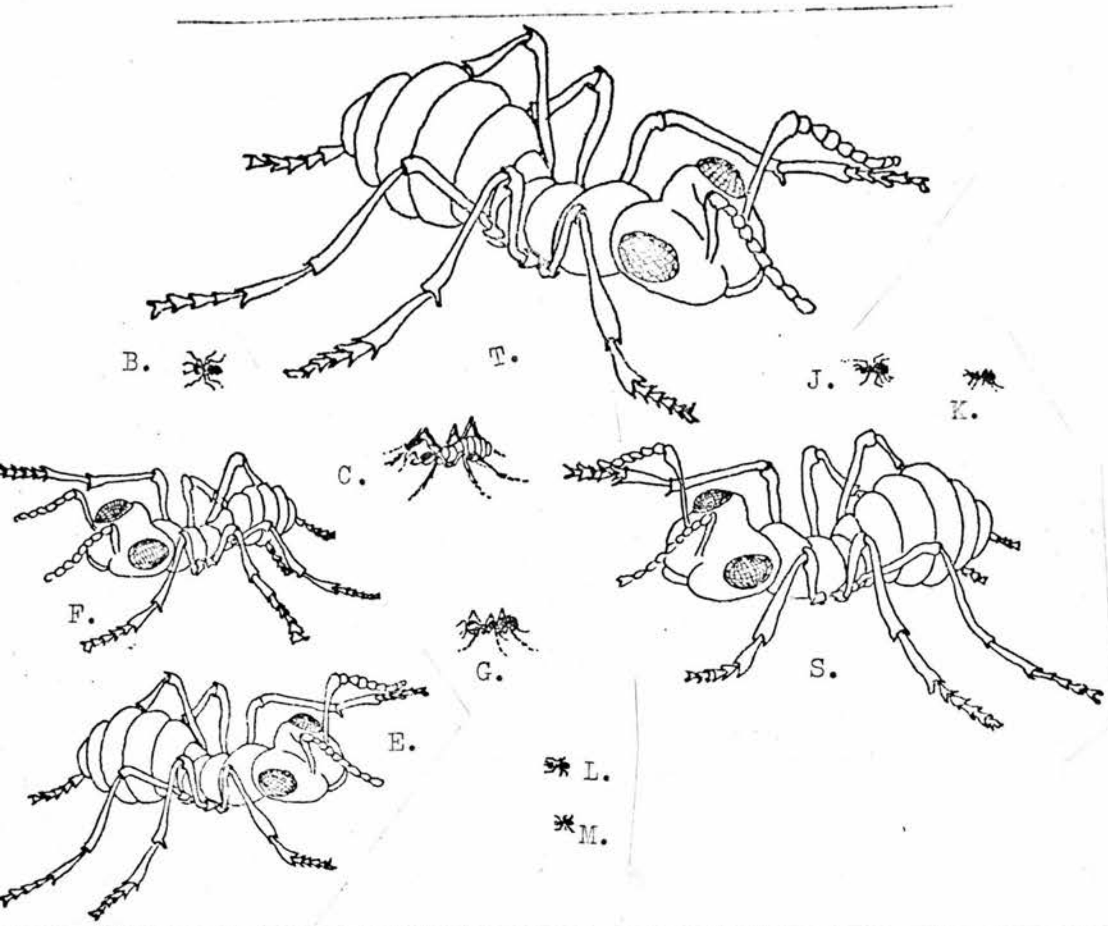

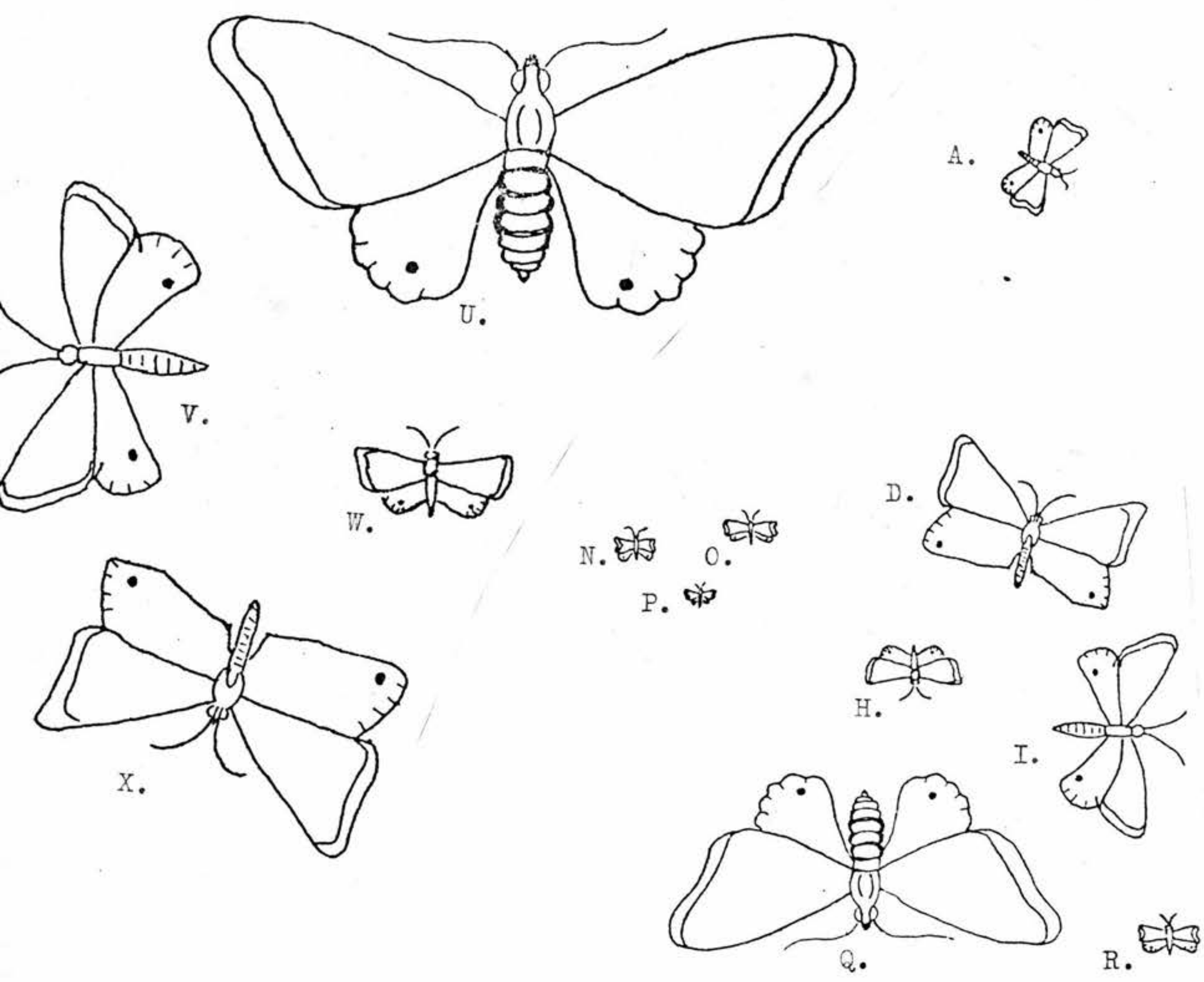

APPENDIX 4.B.

Frequencies and distribution of Category Relation Value combinations resulting from judgements made on Forms A and B (Cf. section 5.3.5.2.). The combinations are arranged according to the combined values found for Category Relations III and IV (big-small and not big - not small), which are in turn ordered to approximate the evolution of complementarity followed by antonymy. Total complementarity is marked by *, and total antonymy by **.

Values, for Relations I - VI	Form A males GP: 1	2	3	4	5	6	Form A females 1	2	3	4	5	6	Form B males 1	2	3	4	5	6	Form B females 1	2	3	4	5	6
c f i k o r													1											
b f i k n r																			2	2	1			
c d i k o p													1			1								
a f i k m r	1																							
c e i k o q	2					1	1						1											
Σf:	3					1	1						3			1			2	2	1			
c f i l m p	1														1									
c e i l o p														1						1				
c f i l n p	1																							
c f i l n r											1													
b f i l m r															1								1	
c f i l n q							1				2				1				2					
c f i l o q													1											
Σf:	2						1				3		1	1	3				2	1			1	
c f i j o r													1											
c e i j o r																			1					
b f i j o r														1										
a f i j n r																					1			
b d i j o r													1											
a f i j o r																1								
a e i j o r																1								
c d i j o q		1																						
b e i j o r															1				1	1	1	1		
Σf:		1											2	1	1	2			2	1	2	1		
a f h j m r			1																					
a d h j o r													1			1			1			2		
b d h j o q															1	2			1	1			1	
a e h j n r		1											2						2	1	5			
b e h j n r									1															
Σf:		1	1						1				3		1	3			4	2	5	2	1	

APPENDIX 4.B. (cont'd)

Values, for Relations I - VI	Form A												Form B												
	males						females						males						females						
	GP:1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6	
c d h l o p	-		-		-		-		-		-		1		-		-		-		-		-		
c f h l m p		-		1		-		-		-		-	1	-		-		-		-		-		-	
c e h l n p	-	1	-	1	-		1		-	2	-		-		-		-	1	-	1		-		-	
b f h l m q	1	2	4	2		-	3	1	1	1	2	1		2	1	-	1	-	2	1	1		-		
Σf:	1	3	4	4	-	-	4	1	1	3	2	1	2	2	1	-	1	1	2	2	1	-	-	-	
a f h k m r	-		-		-		-	1	-	2	1	-	-		-		-		-		-		-		
c d h k o p		1		1		-		-		-		-		-		-				-		-		-	
* b e h k n q	4	3	6	9	1	-	7	10	7	4	3	3	1	-	3	4	1	-	3	1	1	3	2	-	*
Σf:	4	4	6	10	1		7	11	7	6	4	3	1	-	3	4	1	-	3	1	1	3	2	-	
a e g j m r	-		-		-		-		-		-		-	1	-		-		-		-		-		
a d g j o r		-		-		-		-		-		-		-		-		-		-		1		-	
a d g j n q	-		-	1	-		-		-		-		1	1	-	1	3		1		-		1		
a d g j o q		-		-		-		-		-		-		1		-		-		-		-		-	
a d g j m q	-		-		-		-		-	1	-		-		-		2		-		-	1	-		
a d g j n p		-		-	1	-		-		-		-		-		-	2	-		-		1		2	
a d g j n r	-		-		-		-		-		-		-		-		-		-		-	2	-		
a d g j o p		-		-	1	-		-		-		-		-		-		-		-		-		-	
a d g j m p	-		-		1		-		-		-		-		-	1	-		-		-		-	1	
a f g j m r		-		-		-		-		-		-		1		2		-		-		-		-	
b d g j o p	-		-		-		-		-		-		-		-		-		1	1	-		-		
Σf:	-	-	-	1	3	-	-	-	-	1	-	-	1	4	-	4	7	-	2	1	-	5	1	3	
a e g k m q	3		-	2	1		4		2		-	1	-		-	2	1		-		-	2	2	1	
a d g k m p		-		1		-		-		-		-		-	1	1	2	2		-		-		2	
b d g k n p	-		-		3		-		-	2	-	1	-	1	1		-		-	1	-		-	1	
Σf:	3	-	-	3	4	-	4	-	2	2	-	2	-	1	2	3	3	2	-	1	-	2	2	4	
c d g l m p	-		-		-		-		-		-		-		-		-		-		1		-		
c e g l m p		-		-	2	-		-		-		1		-		-		-		-		-	1	-	
a f g l m p	-		-		-		-		-		-		-		-	1	-		-		-		-		
a e g l m p		-		-		-		-		-		1		-		1		-		-		-		2	
** b e g l m p	-		-		1	1	2		1		-	1	-		-		1		-	1	-		-	1	**
a d g l m p		-		-	1	-		-		-		-		-		-		-		-		-		1	
b d g l m p	-	1	-		-	1	-		-		-	1	-		-		-		1		-		-	1	
a f g l m q		-		1		-		-		-		-		1		-		-		-		-	1	-	
c d g l n p	-		-		1		-		-		-	1	-		-		-		1		-		-		
c d g l o p		-		-		-		-		-		1		-		-		-		-		-		-	
Σf:	-	1	-	1	5	2	2	-	1	-	-	6	-	1	-	2	1	-	2	1	1	-	2	5	

APPENDIX 4.C.

Contingency table of value combinations for Category Relations III and IV on Form A with the associated Form B combinations. To save space, each subject's combination is entered as his age-group identity number, and underlined if it came from a male, in the body of the table.

Form B values	Form A values: ik	il	ij	hj	hl	hk	gj	gk	gl	Group Totals: 1	2	3	4	5	6
ik	1	1			11	1 22		3	4	m 3 f 2 T:5	– 2 2	– 1 1	1 – 1	– – –	– – –
il	1 1				2 33	2 3 5			1	m 1 f 2 T: 3	1 1 2	3 – 3	– – –	– – –	– 1 1
ij		1		4	2 4	3 1 4 2 33		1 1		m 2 f 2 T: 4	1 1 2	1 2 3	2 1 3	– – –	– – –
hj		1 5			4 4	11 11 22 333333 444		1 1		m 3 f 4 T: 7	– 2 2	1 5 6	3 2 5	– 1 1	– – –
hl	1				3 1	1 1 22 22		3	5 6	m 2 f 2 T: 4	2 2 4	1 1 2	– – –	1 – 1	1 – 1
hk					1 3 5	33 1 2 444444 5		1 4 5	1 3	m 1 f 3 T: 4	– 1 1	3 1 4	4 3 7	1 2 3	– – –
gj		5	2	2	2 4	2 1 2 44 44 6	4 5	1 1 444 55	5555 66	m 1 f 2 T: 3	4 1 5	– – –	4 5 9	7 1 8	– 3 3
gk	6			3	44 4 6	3 2 5 4 55	55	4	2 6666	m – f – T: –	1 1 2	2 – 2	3 2 5	3 2 5	2 4 6
gl		5			1 2 3 5	1 2 4 66	4	5 66	6	m – f 2 T: 2	1 1 2	– 1 1	2 – 2	1 2 3	– 5 5

Total:	ik m	ik f	il m	il f	ij m	hj m f	hl m	hl f	hk m	hk f	gj m	gj f	gk m	gk f	gl m	gl f
Group 1	3	1	2	1		--	1	4	4	7	-	-	3	4	-	2
2	-	-	-	-	1	1	3	1	4	11	-	-	-	-	1	-
3	-	-	-	-	-	1-	4	1	6	7	-	-	-	2	-	1
4	-	-	-	-	-	-1	4	3	10	6	1	1	3	2	1	-
5	-	-	-	3	-	--	-	2	1	4	3	-	4	-	5	-
6	1	-	-	-	-	—	-	1	-	3	-	-	-	2	2	6

Total: 130

145