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THE USE OF SELF-MODELLING IN CHANGING
EATING, SMOKING AND EYEBLINKING BEHAVIOURS

by

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A Doctoral Thesis

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requirements for the award of

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ABSTRACT

The project considers two main aspects of self-modelling: (a) the use of self-modelling in laboratory and field settings; (b) a theoretical framework, based on both cognitive and behavioural factors, which attempts to explain self-modelling phenomena. Five studies are described, each of which contributes directly or indirectly to the proposition that cognitive factors may be involved in self-modelling. In each study, self-modelling is compared with a control condition(s). In the self-modelling condition the subject watches his/her own behaviour (and/or its consequences) directly as it happens (or as it is) by means of a mirror, a mirror-room or through a video system. Each study involves a socially (and physically) maladaptive behaviour. Of the five studies, three involve cigarette smoking behaviour; one involves overeating (or overweight); and another involves eyeblinking behaviour. In each instance, the subject's cognitions about the behaviour concerned (and/or its consequences) are taken as central to understanding self-modelling. In one of the studies involving cigarette smoking behaviour, the subjects' cognitions about the habit were directly manipulated by exposing them to information that was either consistent or inconsistent with their existing attitudes to cigarette smoking. The overweight study involved female subjects who were all members of a private slimming club so that their cognitions would tend to be anti-fatness. The eyeblink study involved the extinction of conditioned eyeblink response. In each study, it was found that self-modelling reduced the behaviour concerned relative to the control condition(s). Evidence from the existing literature is considered in relation to the new findings; and of particular concern is the role of cognitive factors in self-modelling.

The present research provides evidence that (1) self-modelling can be used to influence human behaviour; and (2) that cognitive processes mediate self-modelling phenomena.

PREFACE

There exists burgeoning literature on behaviour modification techniques. However, virtually all of these techniques have neglected the importance of the client's cognitions about his behaviour as well as himself in any treatment programme. Instead, the primary concern has been the manipulation of his external environment. The neglect of the client's cognitive variables may largely be attributed to the environmentalistic or behaviouristic nature of existing behaviour modification procedures. These procedures are essentially an extension of general experimental psychology, so that the tendency has been towards a search for and manipulation of external contingencies for the modification of undesirable behaviours.

Procedures based upon behaviouristic principles generally do not consider the client's cognitions about not only himself or his behaviour, but also about the treatment programme itself as of any importance in behaviour change. That is to say, such procedures do not take into account the manner in which the person so manipulated perceives himself, his behaviour, or indeed, the controlling variables; neither do they acknowledge the person's reasons for the change (or no change) in his behaviour. Nonetheless, there is reason to believe that consideration of the client's cognitions is likely to lead to fuller understanding of behaviour in general, and also the development of more effective treatment techniques.

Of major concern in this project is the development and use of self-modelling as a behaviour modification technique. This technique,

heretofore virtually unapplied, derives from modelling principles, and is offered as an alternative to traditional behavioural methods such as aversive or operant procedures. Self-modelling takes the person's awareness of his undesirable behaviour (and/or its consequences) and his negative emotional evaluation of the behaviour as a predictor of success. Thus, in self-modelling, special emphasis is placed upon the person's cognitions about his behaviour as well as himself. This is because, in behaviour change, the person's conception of his behaviour or himself (or both) is presumed to be a more influential factor than external variables. This means that cognitive factors must form an integral part of any treatment programme. Self-modelling attempts to achieve this by arranging the client's environment such that the behaviour concerned (and/or its consequences) is made (perceptually) salient to him. In other words, unlike traditional behavioural procedures, self-modelling aims at manipulating the client's cognitive processes, as opposed to his external environment, in order to alter his behaviour in the desired direction. The procedure exploits the client's own behaviour to produce cognitive orientation. Thus it is reasonable to postulate that behaviour change through self-modelling is likely to be maintained over time.

Although self-modelling is a new behaviour modification technique, it is likely to take an important place in clinical practice in view of its apparent usefulness, and its simplicity and economy. These benefits, and others, are clearly demonstrated by the five studies described in chapters three to six of this project.

The present author's interest in self-modelling and its clinical application originated in a case study in which he used 'non-directive'

contingent imitation to modify a severe self-mutilating behaviour in a severely mentally sub-normal girl. This study is described in detail below.

CONTINGENT IMITATION AS AN ON-WARD BEHAVIOUR MODIFICATION TECHNIQUE:
A CASE STUDY

Contingent imitation and self-modelling are two of the recent developments in the concept of imitation. Both concepts derive from Bandura's (1969, 1971, 1977) social learning theory, and are being increasingly investigated as behaviour modification techniques.

Contingent imitation (or being imitated) has been employed to alter the behaviours of mentally sub-normal individuals. For instance, Kauffman et al (1975, 1976, 1977, 1978) have reported the successful use of this procedure in the modification of such undesirable behaviours as tongue protrusion, spelling errors, and sloppy eating in mentally retarded children. Similarly, Wheman (1976) has employed this technique as a self-help skills training programme with mentally retarded adults.

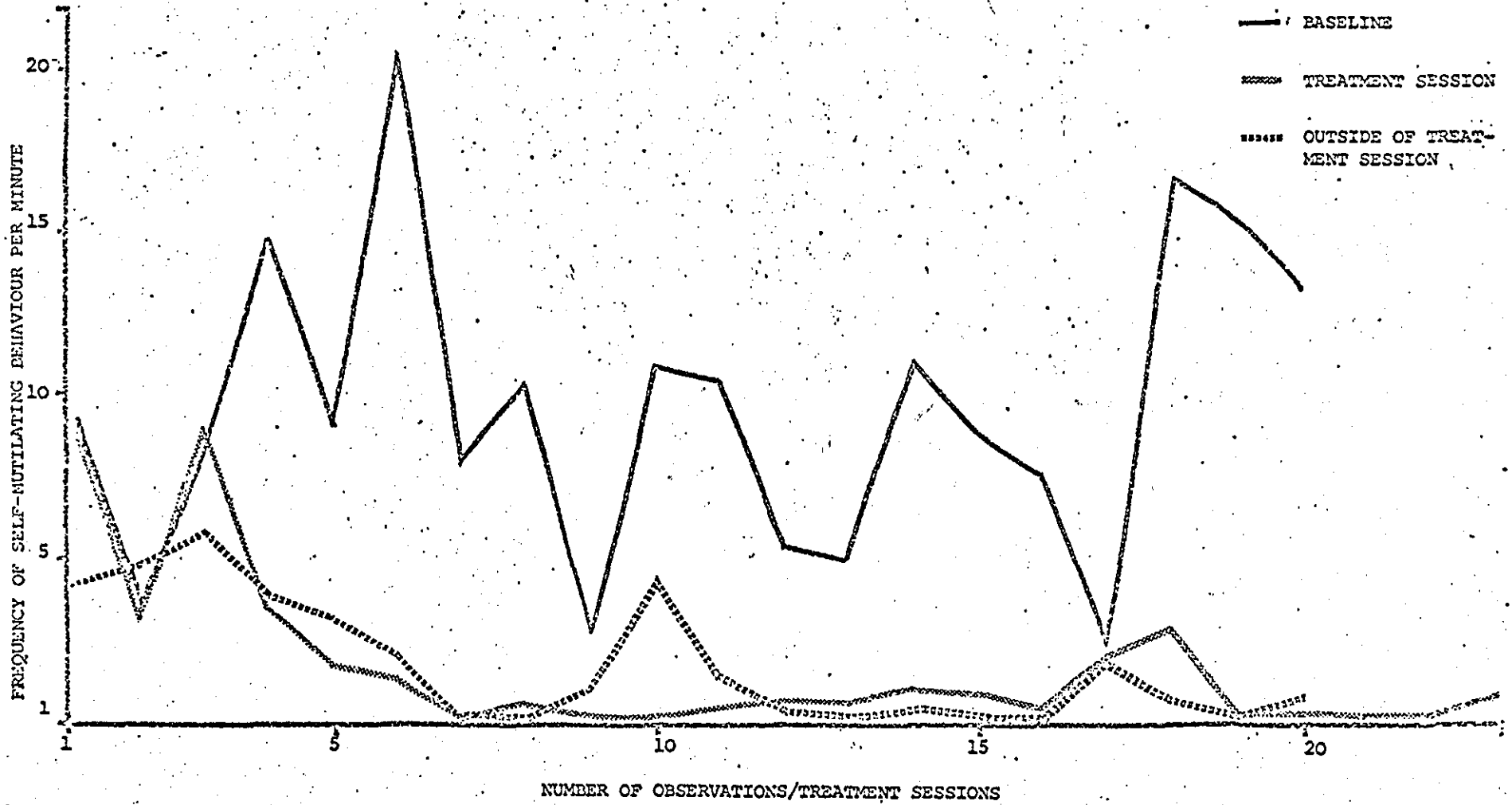
The present report describes briefly an investigation into the use of 'non-directive' contingent imitation in the modification of self-mutilating behaviour. This type of behaviour is fairly common amongst mentally sub-normal individuals (especially children). The difficulties posed by this kind of behaviour problem for the people involved in the care, training and treatment of such individuals cannot be overestimated.

This study involved a nine-year-old institutionalised severely mentally sub-normal girl (Marie). Marie's self-mutilating behaviour consisted of banging her head as hard as possible on the floor, against the wall or

any available hard object such as furniture; and hitting her face or stomach with her fists. Baseline observations revealed that on the whole Marie spent about 75-80% of her waking time in self-mutilating behaviour. The behaviour was so severe that she had to wear protective clothes even in bed. Without these protective measures, she could open large areas of her face and bruise her already hardened knuckles. When the study began Marie had been in the institution for about 2½ years. During this period, all attempts to control her self-mutilating behaviour including drugs and various behaviour modification procedures had apparently failed to alter her behaviour in any significant manner. In spite of all the protective measures taken, Marie's face and other parts of her body were badly disfigured (scarred) and her knuckles hardened as a consequence of her severe self-mutilating behaviour.

The study was carried out on the ward (or villa) where Marie was a resident. It involved the nurse imitating Marie's self-mutilating behaviour as closely as possible (i.e. hitting his face with his fists, banging his head on the floor, etc.) but without actually hurting himself. During a treatment session, the imitator maintained as much eye-contact as possible with Marie (even while imitating her), but avoided any form of tactile contact with her. Marie's self-mutilating behaviour during treatment sessions was recorded. Treatment consisted of twenty 30-minute sessions spread over a period of 27 days. A record of Marie's self-mutilating behaviour outside of sessions (i.e. at other periods of the day) was also kept over a period of 22 days. These observations, made by the imitator and independent observers (inter-observer reliability = 85%), were carried out in the same manner as baseline observations (i.e. 15-minute random observations). Twenty such observations were made daily (see Graph I over page).

GRAPH 1

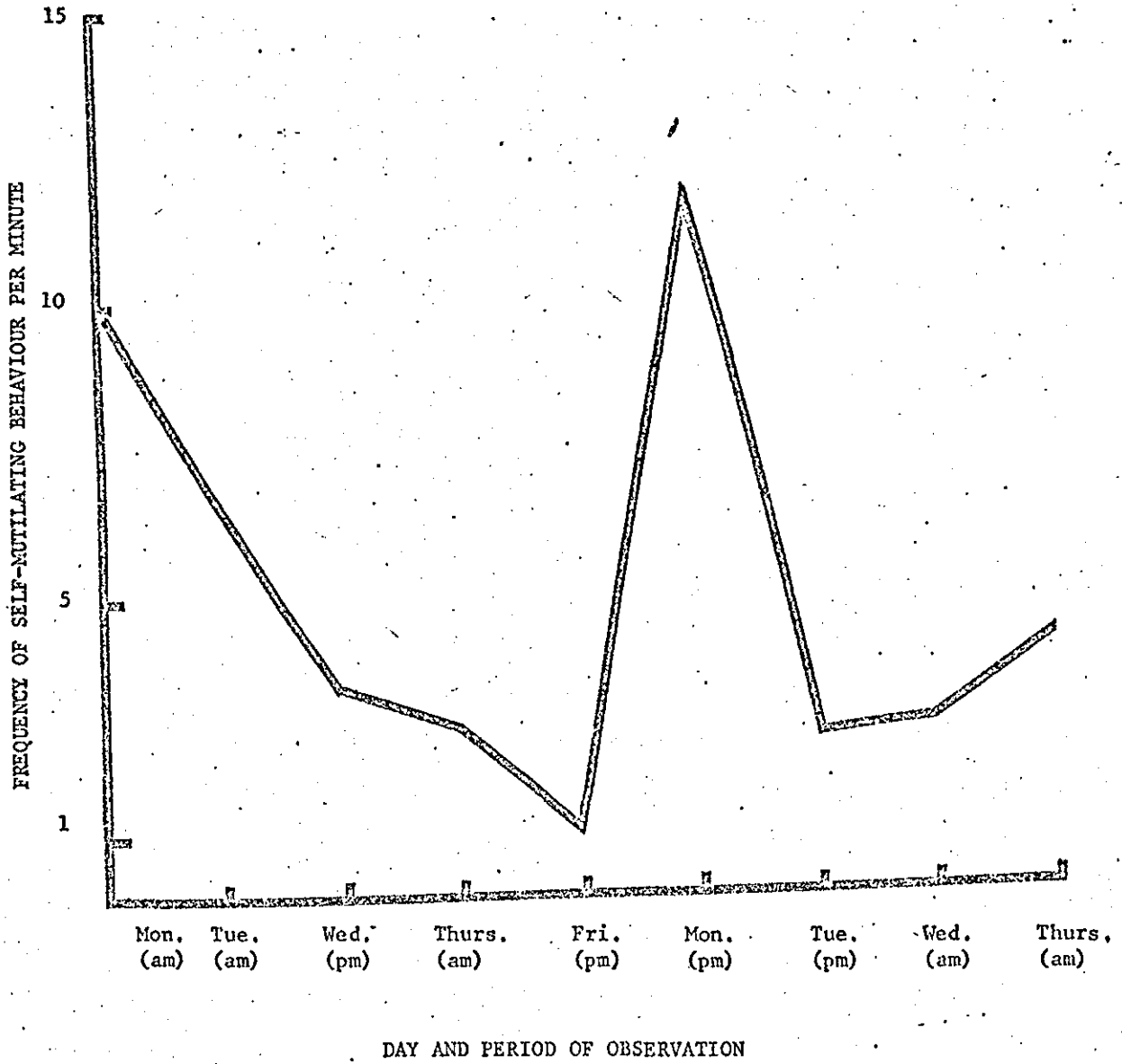


Graph I represents Marie's self-mutilating behaviour per minute observed during baseline period, treatment sessions and outside of treatment sessions. As indicated by this graph, not only was Marie's self-mutilating behaviour excessively high in frequency during the baseline period, but it also fluctuated a great deal, ranging between 2.20 and 20.60 self-mutilating behaviour per minute. However, it began to decline steadily from the fourth session of treatment onwards. During sessions 7-16 inclusive, virtually no self-mutilating behaviour occurred. However, during sessions 17 and 18 the mean frequency of self-mutilating behaviour per minute was 2.06 and 2.80 respectively; but this dropped to zero during the last three treatment sessions. The decline in Marie's self-mutilating behaviour during treatment sessions was apparent in other situations during the same period as indicated by the graph.

By the end of the study all the wounds and scars on Marie's face had almost disappeared completely; and temperamentally she was more cheerful and friendly towards the imitator and other staff on the ward than she was during the baseline period, and at the beginning of the treatment.

Follow-up observations of Marie's self-mutilating behaviour were carried out by an independent observer eight weeks after treatment. Nine 15-minute observations were made over a period of eleven days. These observations were carried out at different periods of the day (as shown in Graph II over page) and across situations.

Graph II: Follow-up observations of Marie's self-mutilation behaviour, by day and period of observations.

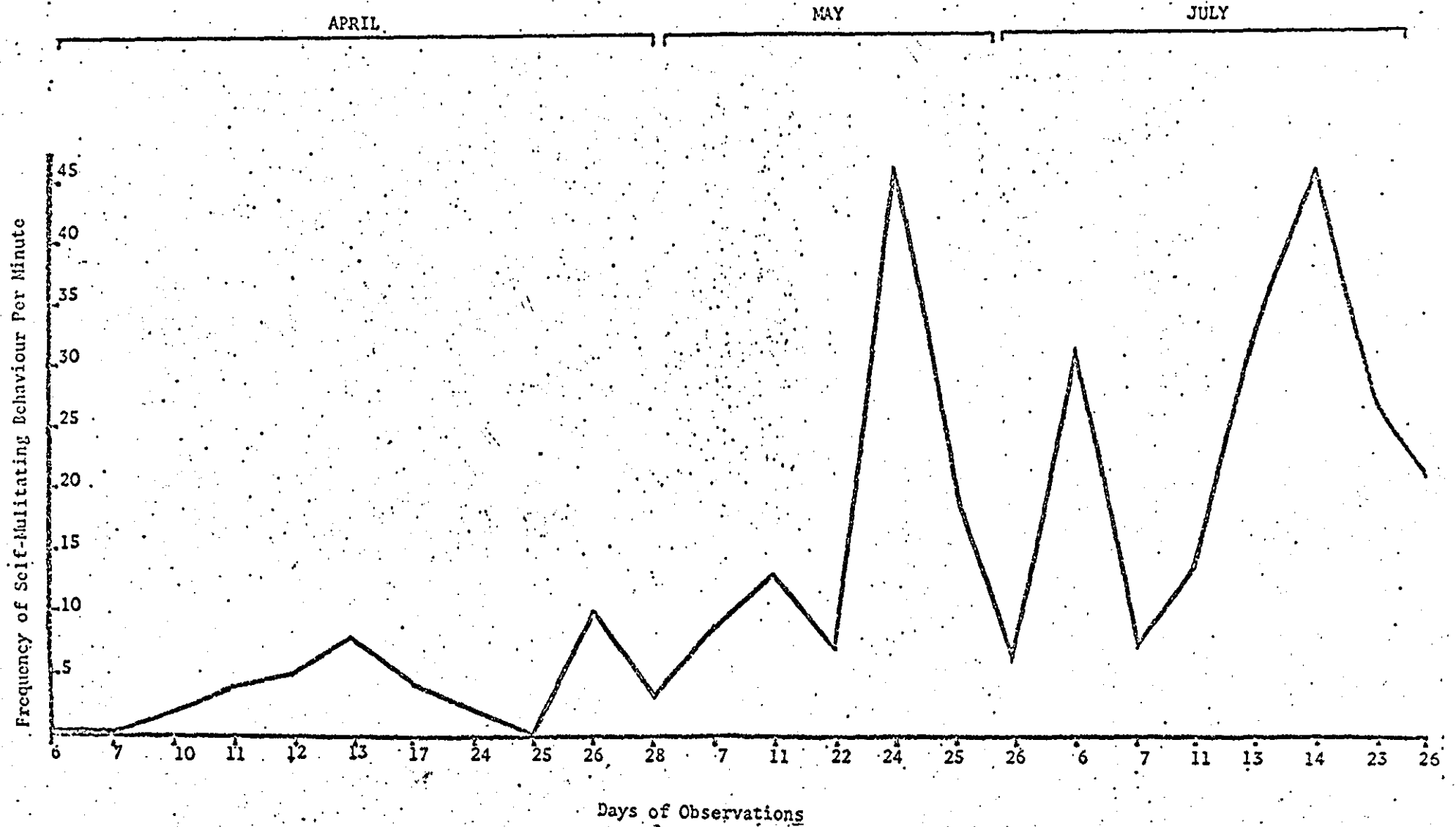


Graph II indicates that during this period, the frequency of Marie's self-mutilating behaviour had increased (and fluctuated) considerably relative to the treatment period. Nonetheless, it was still lower during this period, even though treatment had discontinued. Comparison between Graph I and Graph II indicates the mean frequency of Marie's self-mutilating behaviour during the following periods: (a) baseline period; (b) treatment period; and (c) follow-up period to be 9.6; 1.7; and 5 respectively. This means that at follow-up (i.e. eight weeks after treatment) the frequency of Marie's self-mutilating behaviour was still significantly (about 50%) lower than during the baseline period.

In order to determine the relative long-term effect of contingent imitation on Marie's behaviour, longitudinal follow-up observations of her self-mutilating behaviour were carried out. In all 24 15-minute observations, spread over a period of four months, were made by independent observers; and as in Graph II, these observations were made at different periods of the day. However, because of the extreme fluctuations in Marie's self-mutilating behaviour (as indicated by baseline data) and also because these fluctuations seemed to be unrelated to any clear external contingencies, these observations, unlike the eight-week follow-up observations (Graph II), were confined to a relatively controlled situation. That is, Marie was observed only when she was in her Group-Room with other children and staff in her Group (The Bambis). The rationale for this was relative ease and reliability of the observations, in that it eliminated the problems of following Marie around the ward in order to observe her behaviour. The results of these observations are shown in Graph III (see over page).

GRAPH III:

FOLLOW-UP OBSERVATIONS OF MARIE'S SELF-MUTILATING BEHAVIOUR, BY MONTH AND DAY OF OBSERVATIONS.



Graph III indicates that the effect of the treatment was clearly apparent throughout the month following treatment. However, after the initial low levels of self-mutilating behaviour during this period, the rate of Marie's self-mutilation began to rise and fluctuate sharply. It can be seen that the mean frequency of her self-mutilating behaviour rose from zero to 47 per minute during the four-month period. The mean frequency of self-mutilation was 3.5, 15.3 and 26 per minute for April, May and July respectively. Thus, during this period (April-July), Marie's mean frequency of self-mutilating behaviour in the group situation rose from 3.5 to 26 per minute. This is far above the baseline level of 9.6 per minute and represents an increase of over 100%.

As mentioned previously, Marie's self-mutilating behaviour had proved resistant to all the behavioural procedures (and drugs) which had been used in attempts to control it. However, contingent imitation appeared to have been relatively effective in reducing that behaviour. Comparisons between Graphs I, II and III reveal that Marie's behaviour improved significantly during the treatment period. This change in her behaviour was still apparent during the first month after treatment. Similarly, data from eight-week follow-up observations in different situations (Graph II) indicate that, overall, the level of Marie's self-mutilation was significantly lower during that period than during the baseline period. Thus, in the circumstances of this study, contingent imitation appeared to have been a useful treatment technique at least in the short term. Perhaps if the treatment had been carried out for a longer period of time its long term efficacy might have been realised.

The findings of this preliminary investigation indicate that contingent imitation (or being imitated) can be used as a technique for the

treatment of self-mutilating behaviour (as well as other maladaptive behaviours) in mentally sub-normal individuals where traditional treatment procedures are undesirable (e.g. aversive procedures) or have failed or have achieved only a limited success (e.g. operant techniques).

This procedure would seem to warrant further systematic investigations considering its benefits both in terms of economy and ease of application. In other words, the technique is simple and can easily be acquired and applied by parents, nurses, teachers and anyone involved in the training and care of mentally sub-normal individuals without the involvement of expensive paramedical personnel or apparatus. As such it may have a place in behaviour modification alongside self-modelling which also is a continuously modelled individual centred modelling approach. The present project is a modification and extension of this procedure to other forms of maladaptive behaviours in 'normal' adults, and an attempt to place this technique within various theoretical perspectives.

CHAPTER ONE

IMITATION AND SELF-MODELLING: AN OVERVIEW

SUMMARY

The chapter discusses developments in the concept of imitation, mainly over the past 40 years. The literature highlights the processes through which imitation has passed both in terms of its definition and effects. Even though there is now less concern about its definition considerable efforts are being made towards understanding of its effects and their interpretations. The current trend has been for greater emphasis on the practical application of imitation as a treatment as well as a training technique. Consequently a variety of terms and procedures have derived from the concept. This emphasis serves as a useful guide to contemporary investigations into human imitation. Classifications of theoretical conceptualisations of imitation are discussed, and the difficulties inherent in such theoretical propositions are emphasised. This chapter examines in some depth those theoretical positions which are pertinent to the present project, and also offers appraisal of particular instances. Taking as its starting point the 'nature-nurture' debate, the chapter proceeds on to describe other important historical perspectives, and finally considers contemporary theories of imitation. These include Piagetian theory, reinforcement theory, affective theory and social learning theory. All these theoretical positions are noted for their emphasis on the role of the model in an imitation situation and his/her effects on the observer. Their apparent failure to recognise the use of the model as the observer of his/her own behaviour is emphasised; so is their failure to accord cognitive factors their due role in the

effects of imitation on both the model and the observer. Recent developments in imitation including such concepts as 'being imitated' and 'self-modelling' are also discussed.

1.1 INTRODUCTION

Imitation as a psychological phenomenon has had a long and controversial history. Historically, the controversy was over whether or not imitative behaviour is an innate propensity. However, a number of explanations have developed over the past century to account for imitation both in men and animals. This chapter traces the history of imitation and describes some of the major theories or explanations (both historical and contemporary) that have been put forward in attempts to understand the phenomenon - imitation.

While many historical approaches to imitation were mainly biological in nature, contemporary theorists have addressed themselves to various aspects of imitation. Basically, these concern (1) the relative importance of externally administered reinforcement in human imitative behaviour (e.g. Miller & Dollard, 1941), (2) the importance of the role of the relationship existing between the model and the observer in imitation (Mowrer, 1950, 1960), (3) the importance of cognitive level of the observer in imitation (Piaget, 1962), and (4) the relevance of the distinction between acquisition and performance (Bandura, 1969, 1971). These theoretical approaches will be detailed later.

However, important as they are in understanding imitation as a relatively multifacet psychological phenomenon, these approaches tend to overlook one important aspect of imitation. In other words, as it will become clear later in this chapter, these theorists and their followers tend to depict imitation as a one-way process. In other words, in their various attempts to explain the dynamics of imitation, they tend to concentrate chiefly on the observer to the almost complete exclusion of the model. It appears that these theorists and investigators do not give due consideration to the effects imitation may have on the (human) model. This aspect of imitation and its theoretical explanation are the major purpose of this project. However, while most theorists and investigators stress the facilitatory or disinhibitory effects of imitation (usually on the observer), this project will examine the inhibitory effects of imitation on the behaviour of the 'imitated', namely, the model.

1.2 NATIVISTIC THEORY

Early attempts to account for the occurrence of imitative behaviour in man generally attributed such actions to innate factors. This nativistic conceptualisation assumes that humans imitate because it is their biological nature to do so. For instance, Compayré (1896) described imitation as: "A kind of natural hypnotism which irresistibly suggests imitative movements. ... it attracts and seduces the mature man and with even greater reason the child. ... imitation is really nothing more than the tendency to welcome the suggestions of others" (in Guilleume, 1971, p. 62). This view of imitation as the result of innate propensity was shared by theorists such as Morgan (1896), Tarde (1903), and McDougall (1908).

Tarde (1903) for instance, also claimed that all human beings possess a strong and natural predisposition to emulate the actions of others. He further believed that prolonged interaction between two people would lead to increasing reciprocal imitation. This kind of imitative influence even extends to nations. He regarded imitation as playing a crucial role in the transmission of culture and knowledge between generations and societies - "society is imitation" (p. 74).

Most theorists reject the nativistic explanation of imitation for the following reasons: (1) it ignores the commonplace fact that exposure to the actions of others often leads us to avoid rather than emulate them; for instance, witnesses to horrific murders or accidents often avoid situations which are likely to remind them of such experiences let alone emulate the murderers or the victims; (2) the innate approach provides no information about variables such as reinforcement (which might influence the occurrence of imitation), the manner in which a particular model is chosen for emulation, and the type of behaviour which an individual will actually imitate. As Piaget (1962) has pointed out, nativistic approaches fail to understand that imitation is merely a process, and not in itself a motivating state.

1.3 ASSOCIATIVE CLASSICAL CONDITIONING THEORIES

Around the second decade of the century, other theorists put forward alternative explanations, the 'associative classical conditioning theories' (e.g. Humphrey, 1921; Allport, 1924; and Holt, 1931). These attempted to explain imitative behaviour in terms of associative learning principles. In the associative conditioning formulation, the temporal association between modelled stimuli and the observer's

matching response was considered to be a sufficient condition for the occurrence of imitation.

In Holt's (1931) formulation, for instance, when an adult copies the response of a child (e.g. cooing) the latter tends to repeat the reiterated behaviour. As this circular associative sequence continues, the adult's behaviour becomes an increasingly effective eliciting stimulus for the child's response. Thus if the adult performs a response that is novel for the child, the child will tend to copy it. This view, as we shall see soon, is similar not only to the secondary reinforcement concept of relatively more modern 'affective theories' (e.g. Mowrer, 1950, 1960; Aronfreed, 1969), but also to Piaget's (1962) description of imitation process as one in which the observer's (a child's) spontaneous behaviours serve initially as stimuli for matching responses by the model (an adult) in alternating imitative sequences.

The associative learning approach viewed imitation as a learning process instead of an innate propensity. However, besides being circular, it fails to explain adequately the psychological dynamics governing the acquisition of novel responses during the model-observer interaction. Also it does not explain why the observer does not imitate every response or act made by the model during the interaction. Nonetheless, as mentioned already, it appears that the associative classical conditioning theories underlie a number of modern theories of imitation, since modern explanations of imitation are inclined to depict it as a learning process.

1.4 MODERN APPROACHES TO IMITATION

Some modern writers seem to believe that the potential to imitate is acquired through the process of instrumental learning instead of classical conditioning (e.g. Miller & Dollard, 1941 ; Mowrer, 1950, 1960; Guillaume, 1971). Others such as Piaget (1962), Scott (1968) tend to adopt an eclectic position and hold the view that both genetic make-up and learning may combine to determine the individual's general ability to imitate.

Expectedly, the lack of concensus among early theorists as well as among modern writers about the nature and mechanisms of imitation has given rise to a number of terms and concepts in attempts to account for imitative behaviour both in men and animals. They include such terms as "copying" or "matched-dependent" behaviour (Miller & Dollard, 1941), "identification" (Mowrer, 1950), "social facilitation", "behavioural contagion", "allelomimesis" (Thorpe, 1956; Zajonc, 1965; Scott, 1968), "modelling" or "observational learning" (Bandura & Walters, 1963; Bandura, 1969). Although all these terms attempt seemingly to describe the same phenomenon (imitation) they differ somehow in content: namely, each appears to account for a different kind of imitative behaviour. However, they all imply either motoric or verbal performance of specific acts or sounds that are similar to those performed previously by a model.

As far as human imitative behaviour is concerned, four major theoretical propositions account for the different types of imitative behaviour: Piagetian, reinforcement, affective, and social learning. Table 1 summarises their essential features but these will be discussed in more detail.

TABLE 1

A Summary of Current Imitation Theories

THEORETICAL POSITION	GENERAL PROPOSITION
1. Piagetian/ developmental	Stresses the importance of the interaction between level of cognitive development and imitation.
2. Reinforcement (e.g. Miller & Dollard)	Conceptualises imitation (mainly motoric) as being contingent upon rewards and punishments.
3. Affective (e.g. Mowrer)	Stresses the important role emotional attachment plays in imitative behaviour, especially in children (and even in animals such as talking birds).
4. Social Learning (e.g. Bandura)	<p>Emphasises the distinction between acquisition and performance in imitative behaviour; while acquisition - symbolic representation of the modelled behaviour - is independent of reinforcement, performance of the behaviour is contingent upon reinforcement.</p> <p>It also distinguishes between different effects of imitation:</p> <ul style="list-style-type: none"> (i) inhibitory/disinhibitory effects; (ii) response facilitating effects; and (iii) observational learning effects.

1.5 PIAGETIAN APPROACH TO IMITATION

Piaget (1962) approaches the problem of imitation from a cognitive developmental perspective, and emphasises cognitive developmental factors. Intelligence is regarded as an adaptive process in which the child must constantly respond to new events in a fashion made possible by his existing cognitive structures or schemata. Because cognitive schemata are a result of the child's changing environment, conflict is eminent. To resolve it, the child must either modify his cognitive structures (or schemata), or else modify the new events (or stimuli) that his environment impinges upon him. Piaget uses the term 'accommodation' to describe this process of reshuffling (or changing) cognitive structures; and he depicts imitation as accommodation in its purest form. The complementary process in this framework, 'assimilation', refers to the changing of external stimuli or events in order to match the existing schemata (or cognitive structures). Thus, for Piaget, 'assimilation' in its purest form is play. Further, according to Piaget, an intelligent (or stable) balance between assimilation and accommodation results in adaptation. However, he claims that if there is a primacy of accommodation over assimilation, the activity (of the child) tends to become imitation. Thus, imitation, as viewed by Piaget, is simply a continuation of the effort at accommodation which is closely linked with the act of intelligence.

Piaget makes it quite clear that the problem of imitation is closely connected with that of 'cognitive representation' which involves the image or the internal representation of objects or acts. The basic theme of Piaget's theory of imitation is that the kinds of external events (or acts) that result in accommodation differ with age (or

cognitive level); thus the kinds of acts or responses a child is capable of imitating, as well as the kinds of rewards and incentives the child will respond to, depend largely (if not wholly) on the level of his cognitive development: namely, a child cannot imitate, at least not successfully, what he cannot comprehend. However, Piaget has offered a caveat that: " ... although imitation always depends on intelligence it is in no way identical with it" (1962, p. 85).

1.6 CONTINGENT REINFORCEMENT THEORIES AND IMITATION

A large body of research on imitation has been conducted along the theoretical guidelines of operant conditioning principles (e.g. Miller & Dollard, 1941; Skinner, 1957; Lovaas et al, 1966; Lovaas & Newsom, 1976; Resenbaum & Arenson, 1968; Gewirtz, 1971). These theories assume that the occurrence of imitation is contingent upon reinforcement of imitative behaviour. Miller & Dollard were the leading exponents of this view. According to Miller & Dollard, the necessary conditions for learning through imitation include a motivated subject who is positively reinforced for matching the correct responses of a model during a series of initially random trial-and-error responses. Within this framework, imitation is conceptualised as the consequence of external rewards or punishments; in other words, whether or not a certain response is imitated is dependent upon the likelihood of the reward or punishment following the response. If the response is externally reinforced (if the behaviour is followed by rewards), the behaviour is said to be of a high probability of being imitated by an observer. Reinforcement studies based on operant principles such as those of Miller & Dollard and their followers do not give enough consideration to affective, cognitive, or competence (or intrinsic) factors in their account of

imitative behaviour in humans. Instead, they tend to follow the classical $R^1 \rightarrow S \rightarrow R^2$ paradigm: where R^1 denotes response (or random imitation) and S denotes reinforcement for R^1 , while R^2 denotes further imitative behaviour resulting from S .

Miller & Dollard's (1941) work has been a major influence on reinforcement theory interpretation of imitative behaviour. The basic assumption of these theorists' work is that imitation is purely an instrumental means of obtaining external rewards. However, a more recent revision of Miller & Dollard's view (e.g. Gewirtz & Stingle, 1968; Gewirtz, 1971) considers imitative behaviour to be a simple discrimination learning phenomenon. That is, the observer learns from the model what responses are likely to lead to rewards and what are likely to incur punishments, thus using the model's behaviour to guide his own subsequent behaviour.

1.7 AFFECTIVE THEORY OF IMITATION

Mowrer (1950, 1960) has put forward explanations of imitation which suggest that an essential motive for imitation is to regain or re-establish emotional reinforcement contingencies that were salient during the original exposure to the model. According to Mowrer, two forms of imitative learning are distinguished in terms of whether the observer is reinforced directly or vicariously. In the former case, the model performs a response and at the same time rewards the observer. Through contiguous association of the model's behaviour with rewarding experiences, the responses gradually acquire positive value for the observer; stimulus generalisation enables the observer to later produce self-rewarding feedback experiences simply by reproducing, as closely

as possible, the model's positively valenced behaviour. The model not only exhibits the response, but also experiences the reinforcing consequences. In this later formulation of imitation, it is assumed that the observer, in turn, experiences vicariously the sensory concomitants of the model's behaviour and also imitates his gratification or discomfort. As a consequence of this 'higher-order' vicarious conditioning, the observer will be predisposed to reproduce the matching responses for the attendant positive sensory feedback.

Mowrer's secondary reinforcement formulation of imitation has much in common with Miller & Dollard's (1941) interpretation of imitation. However, Aronfreed (1969) has advanced an affective theory which shares some common elements with Bandura's social learning theory (and Piagetian theory). According to Aronfreed, for observational learning to occur, cognitive representation on the part of the observer during the period of observation or exposure is a necessary prerequisite. This is similar to Bandura's (1977) notion of 'attention' as one of the main processes through which 'acquisition' (and performance) occurs.

Mowrer's secondary reinforcement approach suggests that reinforcing models should be imitated more than non-reinforcing models, and that rewarded responses by models should be imitated more than non-rewarded responses. Even though the affective theory has guided a number of studies (e.g. Hewett, 1965; Lovaas et al, 1966; Lovaas & Newsom, 1976; Paskal, 1969), other investigators have expressed some misgivings about the importance of affect in the acquisition of imitative behaviour. Foss (1964) in a study with myna birds found no evidence to support the affective interpretation of imitation. Similarly, findings of

curare-conditioning experiments in which animals are skeletally immobilised during aversive conditioning or extinction seem to contradict the affective interpretation of imitation. For instance, Black (1958) and Solomon & Turner (1962) have demonstrated the occurrence of learning phenomena in the absence of skeletal responding and its correlated proprioceptive feedback. Furthermore, results of deafferentation studies (Taub et al, 1965) also show that responses can be acquired, performed discriminately and extinguished even though sensory somatic feedback is surgically abolished by limb deafferentation. Such studies would seem to suggest that acquisition, integration and inhibition of responses can be achieved through central mechanisms independently of peripheral sensory feedback. Hence, from animal studies, it would appear that affect, at best, be only regarded as a facilitative rather than a necessary condition for imitation. This is not necessarily the case in human imitation. Evidence suggests that in humans there exists a positive relationship between attraction between two people and their reciprocal imitation (e.g. Baron, 1970; Byrne, 1961, 1971; Kauffman et al, 1979; Roberts et al, 1981; Tiegerman & Primavera, 1981).

Aronfreed's (1969) position is that observational learning, or learning of model's responses, does not take place in an emotional vacuum, but rather the learning of such responses and their subsequent reproduction by the observer are influenced by the emotional circumstances in which the responses are initially performed. In other words, responses which have a positive emotional value for the observer are more likely to be imitated. One of the major contributions made by affective theories such as Mowrer's and Aronfreed's towards our understanding of imitation, at least in humans, is the fact that they place special importance on the role affective or cognitive factors play in imitation.

1.8 SOCIAL LEARNING INTERPRETATION OF IMITATION

One of the major theoretical contributions to understanding of imitative behaviour in humans, especially in 3 to 5 year old children, is Bandura's "social learning theory" (Bandura, 1962, 1965, 1969, 1971a, 1971b, 1973, 1977). Like Aronfreed's (1969) affective theory, social learning theory considers that cognitive (or symbolic) factors play a paramount role in imitation. Its major theoretical significance is the clear distinction it makes between 'acquisition' and 'performance'. Bandura (1969) describes 'acquisition' (or learning) as the symbolic encoding or representation of modelled response, and performance as being the actual motoric reproduction of the modelled act, and considers the main vehicles of the former to be language (or verbal encoding) and visual imagery.

Traditionally, as mentioned previously, imitation has been viewed as involving at least two individuals: a model and an observer. According to this view, an individual (an observer) observes the responses or behaviour of another person (a model) and learns or copies the behaviour of that other. Whether or not the observer interiorises or reproduces the model's behaviour is dependent upon the reinforcement contingencies associated with that behaviour.

However, unlike the reinforcement theories and the affective theories described above, Bandura believes that acquisition and performance are governed by different sets of variables. Acquisition is considered to be influenced by such factors as temporal contiguity (between the model's response and the observer's perception of the response), such observer-characteristics as attention, motivation, perceptual ability :

and retention. It is not necessarily dependent upon the reinforcement contingencies operating during exposure to the model. Performance, on the other hand, is believed to be under the control of environmental reinforcement contingencies (such as rewards or punishments). The reproduction of a modelled act is never perfect since the observer selects, in the acquisition phase, only certain aspects of the modelled act. The observer's selection from the modelled act is determined by the level of his motivation, attention, and so forth. Similarly, how close imitation is to the modelled act depends principally on the degree of retention of the stimulus sequences by the observer. However, once acquired, the cognitive representation of the modelled act can be retrieved later to guide the reproduction of the original act. Thus, according to Bandura (1969), acquisition is a necessary but not a sufficient condition for the occurrence of imitation (or performance); and 'acquisition' and 'performance' are governed separately by two distinct sets of variables.

Bandura distinguishes amongst different kinds of modelling influences: (1) 'observational (or vicarious)' learning effects; (2) 'inhibition' and 'disinhibition' effects; and (3) 'social facilitation' effects. He uses the term 'observational' or 'vicarious learning' to refer to situations where the observer acquires novel responses which were not already in the observer's behaviour repertoire. This is somehow akin to Miller & Dollard's (1941) 'matched-dependent learning'. On the other hand, the other two modelling effects ('inhibition'/'disinhibition' and 'social facilitation') become important only insofar as the necessary responses are already in the observer's behaviour repertoire. Thus inhibition occurs as a result of witnessing the modelled behaviour punished. In contrast, disinhibition occurs when the modelled act is

rewarded or passes with impunity although the act is usually punished.

Bandura (1977) outlined four main processes through which 'acquisition' and 'performance' occur: (1) attention, (2) retention, (3) motor reproduction, and (4) motivation. He considers attention as a crucial factor in acquisition, in that the observer must attend to the modelled responses in order to differentiate the distinctive sequences or features of the modelled behaviour. Attention itself is influenced by such stimulus characteristics as intensity, vividness, and novelty, and such characteristics of the model as sex, age, social status, attractiveness, and competence. Observer characteristics such as self-esteem, sex, age, dependency, social status and reinforcement history are also involved. As far as retention is concerned, Bandura (1969) lays special emphasis on two symbolic mechanisms: verbal coding and visual imagery. Motor reproduction is important in his later formulation because physical capabilities are required of the observer in order to perform a modelled act. Important as this may be in the imitation of motor responses, it is not necessary for the imitation of such cognitive phenomena as beliefs, attitudes and ideas.

In the social learning framework, rewards or punishments are presumed to be important factors affecting motivation. However, the role of reinforcement contingencies is not as simple as in the 'reinforcement' conceptualisation of imitation (e.g. Miller & Dollard, 1941; Skinner, 1957). Bandura recognises self-reinforcement and intrinsic rewards (or 'competence') as playing a crucial role in imitation.

1.9 SOME THEORETICAL IMPLICATIONS

This section compares the major modern theories described above:

(a) Piagetian, (b) reinforcement, (c) affective, and (d) social learning. Four main issues of disagreement among these theories have been briefly mentioned already: to recapitulate, these concern (1) the importance of cognitive level of the observer in imitation; (2) the relative importance of externally administered reinforcement and intrinsic or self-reinforcement in human imitative behaviour; (3) the importance of the model-observer relationship; and (4) the relevance of the distinction between acquisition and performance.

(a) Cognitive (Developmental) Level and Imitation

Naturally, a person's physical abilities determine what (motor) acts he can perform. However, the importance of cognitive sophistication in imitation has been an issue for disagreement. Piagetian theory postulates that a child's existing schemata play an important role in determining the extent of responses he is capable of imitating. Although this may seem obvious at face value, social learning theory (Bandura, 1971a), in contrast, stresses the effects of modelling on the type of cognitive functioning often described by Piagetian theorists.

In spite of these two seemingly opposite views about the nature of the relationship between cognitive level and imitation, evidence from animal studies as well as human infants seems to suggest the existence of a relationship between the observer's capabilities and the complexity of his imitative behaviour. For instance, the higher the observer's ability to form an internal representation either in the form of language

or visual imagery, the higher his ability for delayed imitation or observational learning would be.

Aronfreed (1969) in his review on imitation concluded that: "there does not appear to be a clear demonstration of true observational learning among rats" (p. 237). However, other investigators suggest that delayed imitation may be found in cats (e.g. Herbert and Harsh, 1944; John et al, 1968). Yet others have clearly demonstrated the existence of the ability for observational learning in higher primates (e.g. Hayes & Hayes, 1952; Kohler, 1925; Harlow, 1959; Gardner & Gardner, 1969). This ability has also been reported to exist in dolphins (Tayler & Saayman, 1973).

Human infants during the first few months of life, lack the cognitive abilities necessary for true observational learning or delayed imitation even though they are capable of reflex immediate imitation (Guillaume, 1971; Valentine, 1930; Piaget, 1962; Parton, 1976). For instance Valentine (1930) and Piaget (1962) observed that there is clear evidence of specific forms of imitation before 2 months of life; the earliest being imitation of sound making developing into more and more close imitation of the actual words spoken. They also observed that smiles and laughter are imitated before 3 months of life. It would appear that a major important change in human imitation involves the transition from the ability to engage in only simple (or reflex) immediate forms of imitation to the cognitive ability for delayed imitation. Developmental evidence suggests that this transition is completed by the second year of life (Piaget, 1962). That there exists a relationship between the level of cognitive development and the type or quality of imitative behaviour an organism is capable of is attested

by such workers as Bruner (1964), Fenson & Ramsay (1981). Besides, Bandura's (1969, 1977) own emphasis on the importance of attention and symbolic encoding for the acquisition of complex (modelled) responses gives further support to the role cognitive level plays in imitation. The more sophisticated an organism's coding mechanisms - language or imagery - the greater his capacity for the imitation of complex responses would be. Thus, the disagreement between Piagetian theory and social learning theory on the cognitive level - imitation relationship may, at best, be described as academic.

(b) Contingent Reinforcement and Imitation

Operant conditioning theorists such as Miller & Dollard (1941), Skinner (1957), Lovaas et al (1966), Gewirtz & Slingle (1968), Gewirtz (1971) place more importance on the influence of contingent reinforcement on imitative behaviour than any other theorists. They claim that even in the absence of overt external reward for imitation, the sheer similarity to a model or his mere presence becomes a secondary reinforcer eliciting imitative behaviour in the observer. However, as already discussed, although social learning theory agrees with the reinforcement theorists' viewpoint that performance (or overt imitative response) is influenced directly or indirectly by reinforcement contingencies (which may be immediate or anticipated), there is disagreement between the two theories on the role of contingent reinforcement in acquisition. Social learning theory sees contingent reinforcement only in a directive role in that it merely heightens the observer's attention to those features of the modelled act that have a high probability of leading to rewards. Affective theorists such as Mowrer (1960) and Aronfreed (1968) differ from the contingent reinforcement theorists in this respect. They tend to regard

the secondary reinforcement potential of the affective relationship between the observer and the model as the most influential factor in imitation.

Of all the modern theories of imitation, competence theories seem to hold the most contradictory view on the reinforcement issue. Evidence provided by such investigators as Butler (1958), Kohlberg (1969) and Bruner (1972) all suggest that a substantial part of imitation is due to intrinsic motivation. Competence theorists argue that it is naive to try to offer external reinforcement principle as a be-all-and-end-all explanation for all types of imitative behaviour, or for imitation in all kinds of organisms. In other words, the importance of reinforcement in imitative behaviour will vary from one individual to another, and even for the same individual, from one activity to another.

(c) Affective Model-Observer Relationship

Affective theories regard the emotional relationship between the model and the observer as of paramount importance for the occurrence of imitation. As previously mentioned, Mowrer (1960) advanced a general theory in which affect mediates imitative learning. And following Mowrer, Aronfreed (1969) has suggested that responses which have positive emotional value for the observer are more likely to be imitated. This theory has stimulated various research (e.g. Aronfreed, 1968; Baron, 1970; Fouts, 1975; Thelen et al, 1975). Such studies have generally reported, for instance, that observer's attraction for the model tended to increase imitation, and also that similarity between the model and the observer led to an increase in imitation. In a study based on Byrne's (1971) theory of attraction, Thelen et al (1975)

reported that adult confederates who imitated the subjects (children) were preferred (by the subjects) over their non-imitating counterparts. In other words, being imitated increased attraction towards the imitator. They also reported that being imitated resulted in reciprocal imitation. Such effects have also been found in adult subjects. A number of similar studies support these findings (e.g. Bates, 1975; Thelen et al, 1976, 1977; Kauffman et al, 1978; Roberts et al, 1981).

The basic concept underlying affective theories is the psychoanalytic concept of 'identification'. This concept implies the existence of a special form of imitation rooted in significant others in the life of the imitator (child). However, some theorists have argued that imitation and identification, like Bandura's acquisition-performance distinction, be separated. Parsons (1951) and Kohlberg (1963) claim that different motives govern imitation and identification. They define imitation as isolated and distinctive units of matching responses, and identification as the internalisation of model's actions or attitudes. Thus, these theorists consider imitation as instrumental, as governed by extrinsic motives, and identification as influenced by intrinsic motives.

Affective theories of imitation are difficult to refute or support wholly on empirical grounds because of the many variables that can interact with affect and imitation. As Bandura (1969) has argued, there are many methodological flaws in many of the identification studies. For instance, degrees of parent-child similarity have widely been employed, even though such responses are notoriously susceptible to biases and therefore may seriously lack validity in descriptions of actual behaviour. Bandura further raises the objection that the actual parental child rearing behaviour is seldom directly assessed, rather it is often inferred

from retrospective reports or questionnaires. Another serious implication for affective theory as far as human imitative behaviour is concerned is to do with the fact that some investigators have reported identification with the aggressor (Bettelheim, 1943; Hetherington, 1967; Howitt & Cumberbatch, 1975). Such mixed findings indicate a need for a closer look at the model-observer relationship.

(d) The Acquisition-Performance Distinction

Theories of imitation vary substantially with regard to their stand on the significance of the distinction between acquisition and performance. Bandura considers such a distinction as crucial to our understanding of imitation. In contrast, other theorists consider this distinction as unnecessary (e.g. Gewirtz & Stingle, 1968; Kuhn, 1973). The importance of the distinction for Bandura lies in the fact that according to him different sets of variables govern acquisition and performance: "the acquisition of imitative responses ... appears to be accounted for more adequately by a contiguity theory of observational learning; the performance of modelled responses, on the other hand, is more under the influence of reinforcement contingencies" (Bandura, 1971a, p. 114).

The major objection to cognitive mediational variables as basis for the distinction between acquisition and performance comes largely from operant theorists. For instance, Gewirtz & Stingle (1968) claim that acquisition, as described by Bandura, is an unobservable phenomenon, and that it can be more satisfactorily accounted for by reference to reinforcement principles. Another objection, from the Piagetian school, is that acquisition is essentially the interiorisation of modelled responses (Kuhn, 1973) thus both acquisition and performance are part and parcel of the accommodation process.

Theoretically useful as these criticisms may be, it is important to appreciate the distinction suggested by Bandura. The historical significance of this goes back to 1948 when Tolman (1948, 1949) proposed such a distinction between learning and overt behaviour. His main proposition was that organisms (human and otherwise) form 'cognitive maps' (or cognitive representation) and that sign learning (or perceptual learning) is essentially different from place learning. Similarly, the social learning proposition that learning may occur simply through close temporal association of events is an echo of Guthrie's (1952, 1959) 'contiguity learning theory'. Again, historically, the social learning viewpoint places special emphasis on perceptual contiguity (or attention) in imitative learning, and so is not very different from the associative classical conditioning theories discussed above.

Another of Bandura's major contributions towards our understanding of imitation is, like Tolman, his demonstration that direct reinforcement is not a necessary nor a sufficient condition for the acquisition of modelled responses, as reinforcement theorists would have us believe, even though it may be an influential factor in determining whether or not the observer will perform the learned act. This observation, vicarious learning, helps towards further understanding of how novel responses come to be acquired than reinforcement theories do. For instance, in the operant conditioning framework, reinforcement is contingent upon the person performing the response in the first place. Thus the person does not get reinforced for a particular response if he does not already possess the response in his behaviour repertoire. Furthermore, by bringing such factors as attention and motivation into the consideration of the mechanisms of imitation, Bandura has portrayed the observer as an active and selectively perceptual organism, as

opposed to a passive one. A further contribution by Bandura is the notion that not only motor responses, but also emotions can be learned through the process of imitation - vicariously (Bandura, 1965).

1.10 SUMMARY

A number of theories of imitation and their relative merits have been discussed. Despite the divergent views each attempts to present, they all share at least two common elements. First of all, they all attempt to explain imitation as a psychological phenomenon. Secondly, and more importantly, they all explicitly or implicitly describe imitation as a behaviour facilitator, as mentioned earlier. And with regard to the influence of reinforcement, all the theories, perhaps with the exception of social learning theory, seem to regard imitation not only as a means of obtaining rewards by the observer, but also as being reinforcing in itself for both the model and the observer irrespective of the behaviour concerned. Cognitive involvement, not in one's ability to imitate, but rather in imitative behaviour itself, is also not given any prominence in these theories (social learning theory, again, being the only exception). And finally, all the theories examined above assume that for the effects of imitation to occur, at least two individuals - a model and an observer - are required. As Flanders (1968) in his review of research on imitative behaviour has noted: "... the study of imitative behaviour is concerned with causal relationships between M's behaviour (or alleged behaviour) and O's behaviour" (p. 316). However, recent developments in imitation research guided by social learning theory (modelling) indicate that this is not always necessary.

1.11 SOME RECENT DEVELOPMENTS IN IMITATION

Imitation studies have largely concentrated on the modelling of certain types of behaviour to be copied or learned by the observer. However, it is equally possible to use the imitation of the subject's own behaviour by a model to change or modify the subject's behaviour. In recent years, some investigators have concerned themselves with this aspect of modelling: namely the effects of being imitated on the subject's behaviour.

(i) Modelling

The concept of 'modelling' essentially develops from the tradition of imitation. Traditionally in modelling, in order to influence the behaviour of a person (an observer) it is necessary to have a second person acting as a model for the observer. The application of modelling techniques have been fairly wide and apparently successful. Apart from the studies mentioned already, Bandura and his associates, and other investigators, have employed these techniques in the modification of a wide range of behaviours such as dog-phobia, snake-phobia, aggressive behaviour, moral behaviour, delinquency, and so forth (e.g. Bandura & McDonald, 1963; Bandura et al, 1967; Davis, 1979; Somervill et al, 1981; Sarason & Sarason, 1981).

Clearly modelling shows promise as a practical technique, but equally clearly it has the drawback of requiring a second party to act as a model. However, a wide range of techniques and their application have derived from Bandura and his associates' theory and research. These include such techniques (and concepts) as 'being imitated', 'self-modelling' and 'self-imitation'.

(ii) Being Imitated

'Being imitated' derives from Bandura's concept of modelling, and refers to a situation in which a second person imitates the subject's behaviour, and this imitation is in turn observed by the subject.

As mentioned earlier, most theories of imitation tend to assume, for instance, that parents themselves take an active role in unfolding the imitative potential in their children, and that they find their infants' imitation of their own responses gratifying. In other words, imitation is a big 'parent-child game'. Piaget (1962), for instance, has reported that one of the most effective means of eliciting imitative behaviour from an infant is to imitate what the infant is doing. He has further observed that this usually precipitates an interaction in which the infant and the adult take turns, with increasing intensity, in imitating each other for their mutual gratifying experience. This is not very dissimilar from Holt's (1931) 'circular' approach to imitation (p.16).

In recent years, enough evidence has been gathered which seems to demonstrate that both adults and children, in fact, derive satisfaction from mutual imitation (e.g. Bates, 1975; Fouts, 1972, 1975; Thelen et al, 1975, 1976; Roberts, 1978, 1980). Thelen et al (1975), echoing Piaget (1962), reported: "being imitated increased the subject's attraction towards the person who imitated him and increased the subject's subsequent imitation of the person who imitated him" (p. 471). Baron (1970), Thelen et al (1976, 1977), Hallahan et al (1977) and Roberts et al (1981) in their studies with children have reported similar findings. However, these workers interpret their findings in terms of Byrne's (1961, 1971) attraction model, except for Hallahan et al (1977) who interpret their findings in learning principle terms.

On the effects of being imitated on adults, Bates (1975), for instance, found that all the adult subjects involved in the study were more favourably predisposed towards the children who imitated them than non-imitative children. Similarly, for infants, some investigators have found pleasurable emotional manifestations in them such as cooing, smiling, and so forth, as a consequence of being imitated (Piaget, 1962; Huagen & McIntyre, 1972; McCall, 1975). Even though such recent studies have reported that infants as well as children increase their imitative responses following being imitated, as far back as 1930, Valentine observed that counter-imitation suppressed his infant's cry: " ... through circular reaction, a whimpering which usually preceded tears. I imitated him just at the moment when the whimpering turned into crying. He stopped crying, and resumed the earlier sound" (p. 108).

Recent studies on the effects of being imitated constitute a shift of focus from traditional studies which focused solely on the effects of imitation on the observer. However, they suffer the same drawback as their traditional counterparts in that they tend to examine only the positive (or rewarding) aspects of imitation. Hence they tend to couch their explanations mainly in terms of reward or reinforcement principles. Also, like their predecessors, they tend to see the effects of imitation as arising mainly out of an interaction between a model and an observer. This presumed prerequisite (model-observer interaction), as already mentioned, is not always necessary for imitation to be effective; similarly, being imitated can, in certain circumstances, also have negative (or unrewarding) effects on the imitated, as indicated by reports by such workers as Cullinan et al (1975); Kauffman et al (1975, 1976, 1977); Fouts et al (1976) and Miller & Morris (1974). Such unrewarding effects of imitation on the imitated warrant further investigations.

(iii) Negative Effects of 'Being Imitated'

If 'being imitated' can act as a positive reinforcement for certain types of behaviour and increase subsequent imitative behaviour as well as attraction between the imitator and the imitated, it can equally be assumed that it will have the opposite effect in certain situations. There is some evidence that this, indeed, is the case. According to the literature on imitation, Valentine (1930) was the first writer to report the 'inhibition' effect of being imitated. Regretably, he made this observation on one of his children (as an infant) but failed to carry out a systematic study of this seemingly paradoxical effect of imitation.

Systematic studies carried out recently by various investigators have provided evidence which indicates that 'being imitated' can in fact suppress or inhibit the behaviour of the model - the person being imitated. Kauffman et al (1977) have reported that contingent imitation of tongue protrusion suppressed tongue protrusion in a mongol child. Similarly, Cullinan et al (1975) extending this field of research to the educational field, have reported marked improvements in children's spelling, and have emphasised its implications for special education, that is the benefits of counter-imitation in education, especially in the training of educationally retarded children. The clinical application of this technique is exemplified by the case study described in the preface to this project.

In terms of attraction, evidence exists that suggests that contrary to previous reports, and popular opinion, counter-imitation in certain circumstances can be negatively valenced by the person being imitated. Thelen & Kirkland (1976) have reported that children who were imitated by an older child manifested increased attraction towards the imitator,

but did not develop attraction towards younger imitators. Likewise, Fein (1973) has suggested that in classroom settings, children regard imitation as immoral (as cheating).

It appears, therefore, that the effects of imitation, either on the imitator or the imitated, depend heavily on the circumstances surrounding the act. The factors which determine whether the effects will be positive or negative for either of the parties concerned will include the valence of the act that is being performed, "imitator-imitated" characteristics, and the conditions in which the act takes place.

These reported paradoxical effects of imitation, to date, have not been satisfactorily explained, at least as far as the present author is concerned. Namely, most of the investigators mentioned above have tended to interpret their findings in terms of reinforcement principles, that is, in terms of reward or punishment principles. They believe, for instance, that counter-imitation acts as a punishment or an aversive stimulus when it leads to extinction or suppression of the imitated behaviour (e.g. Miller & Morris, 1974; Cullinan et al, 1975; Fouts, 1976; Kauffman et al, 1975, 1976, 1977). In one's opinion, for such results to be adequately explained, the subject's cognitive factors have to be brought into the picture. For instance, for a subject to consider being imitated as aversive, the behaviour in question must first of all entail some negative emotional connotations for him.

Nevertheless, following Kauffman et al's (1975) and Cullinan et al's (1975) suggestions, 'being imitated' and its derivative (self-modelling) have been employed as a therapeutic technique for the modification of undesirable behaviours. For instance, Davis (1979) has used

self-modelling in school settings to alter classroom disruptive behaviours. Similarly, Wheman (1976) has employed self-modelling in the training of self-help skills in mentally retarded adults. Such studies have yielded results which indicate that 'being imitated' or 'self-modelling' possesses a therapeutic potential. However, these studies have largely been directive, that is they have included instructions on how the subject's behaviour might be modified or how to deal with similar situations in the future. Such experimental designs which confound the effects of imitation and instructions make the interpretation of these results problematic; namely, it is difficult to assess whether the effects were due to counter-imitation (or self-modelling) or to the instructions given, or indeed a combination of both. If the effects are due to a combination of both, quantifying the relative contribution of each becomes even more problematic.

Apart from these obvious methodological flaws inherent in these studies their findings have not been theoretically adequately explained. As already mentioned, these findings have generally been explained in learning theory terms. Of course it is very difficult to explain the inhibition or suppression of behaviour through being imitated unless it is accepted that there is a certain amount of cognitive involvement in the process. That is to say, there has to be some sort of positive or negative connotations attached to the behaviour in question in order to make it possible to explain either facilitation or inhibition of behaviour through being imitated (or modelling). Hence, it is essential to incorporate such cognitive factors in any discussion of the effects of modelling as well as counter-imitation. 'Self-imitation' or 'self-modelling' incorporates such cognitive factors. Hence, it is being postulated that understanding the cognitive factors which mediate such

imitation processes as 'modelling', 'self-modelling', 'self-imitation' and 'counter-imitation' may lead to a better understanding of the theoretical basis of these processes.

(iv) Self-Modelling

'Self-modelling' refers to any modelling situation in which the subject serves in a dual capacity as a model and an observer; in other words, the subject serves both as a model and an observer of his own behaviour. In statistical terminology the independent variable is at the same time the dependent variable. 'Self-modelling' has been defined by Creer & Micklich (1970, 1977) as a modelling situation in which the subject engages in a behaviour while being video-taped and later on watches himself in that situation on video. However, the delay between the enactment of the behaviour and its feedback to the subject is not always necessary. In other words, the subject can observe his own behaviour directly by the use of mirrors, mirror-rooms, or simultaneously displayed through a video system. In such a situation, the subject observes his own behaviour as it actually happens - there is no time lapse between the execution and the observation of the behaviour.

In this type of self-modelling (where the subject observes his/her own behaviour as it actually happens), unlike traditional modelling situations, the subject observes his own behaviour not as copied by a second party but directly. Clearly this self-modelling technique has a number of advantages over second-party self-modelling (being imitated) and traditional modelling. These include the fact that the modelled behaviour is a perfect representation of the subject's behaviour, the economic advantage of not requiring a second-party model, the adverse

model-observer characteristics are eliminated from the situation.

However, the major advantage of this form of self-modelling over both second-party self-modelling (being imitated) and self-modelling as defined by Creer and Micklich (1970, 1977) is that the observation (or feedback) is immediate, and it is difficult for the subject to deny that he had performed the modelled behaviour; or to rationalise away his behaviour, if it happens to be undesirable, because of the immediacy of the feedback he receives.

CHAPTER TWO

A COGNITIVE-BEHAVIOURAL MODEL OF BEHAVIOUR CHANGE

SUMMARY

This chapter is concerned with the cognitive processes which mediate imitation phenomena. Thus a cognitive theoretical model of behaviour change has been proposed as an alternative to learning principle interpretations of the inhibitory as well as facilitatory effects of human imitation in general, and self-modelling in particular. The model proposes that for self-modelling, or indeed modelling, to have inhibitory effects on a person's behaviour, the behaviour in question must entail some negative emotional connotations for the individual. Hence, for such effects to be theoretically adequately explained, the involvement of cognitive factors has to be seriously considered. The model proposes that some of the cognitive factors involved in the effects of modelling (inhibitory or facilitatory) are the person's 'objective' awareness (or perception) of the behaviour in question and his/her subsequent evaluation of that behaviour. To the extent that the behaviour deviates from the person's 'ideal' behaviour or 'self' or standard, and to the extent that the person is aware of the mismatch between his/her 'ideal' behaviour and his/her actual behaviour, the model further proposes that s/he will evaluate the behaviour in a negatively affective manner. The model also assumes that such a negative evaluation often gives rise to psychological discomfort with the consequence that the person will try to reduce this discomfort, in appropriate circumstances, by altering the behaviour concerned. This model has implications for other theories and some of these are also briefly examined.

2.1 INTRODUCTION

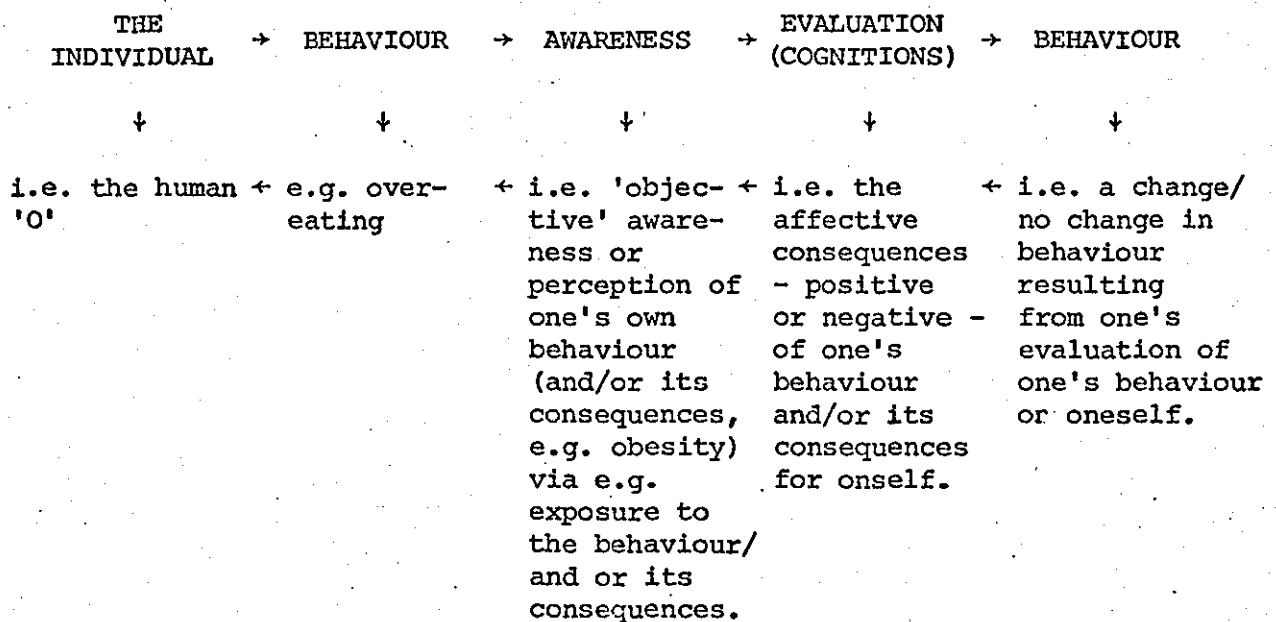
In an attempt towards a better understanding of the mechanisms which mediate the effects of imitation on the model (the person being imitated) an exploratory model has been formulated concerned with the individual's cognitive processes. That is, the model relates to the individual's awareness of his behaviour and/or its consequences and his cognitions (or evaluation) of that behaviour and/or its consequences. The basic assumption of the model is that an individual's awareness of his behaviour (and/or its consequences) and his subsequent evaluation of the behaviour (and/or its consequences), which may be positive or negative, will determine the direction of that behaviour in later situations. In the rest of this chapter an attempt will be made to explain how such cognitive processes mediate the effects of modelling in general, and self-modelling in particular.

2.2 THE MODEL

The model proposes that in order for self-modelling to be effective in modifying a person's behaviour the person must be 'objectively' aware of the existence of inconsistency between the cognitive elements involved, and he must further evaluate either the behaviour or himself (or indeed both) in terms of his 'ideal' self or behaviour. The model bears a close resemblance to any other theory of cognitive activity. However, an emphasis is placed on the 'objective' awareness of an imbalance between

the person's cognitions. The significance of this emphasis is that the model assumes that such awareness serves as a feedback system which motivates the person to evaluate his cognitions and to alter or modify one or other of the elements that are in a dissonant relation (to use Festinger's, 1957, terminology), for instance, his behaviour or his attitude towards that behaviour, to align with his 'internal representation' of his 'ideal self' or 'ideal behaviour'. Viewed in this light, a person's 'objective' awareness of himself or his behaviour and his evaluation of one or the other (or both) must take a prominent place in an explanation of behaviour change.

A Schematic Representation of Cognitive-Behavioural
Model of Behaviour Change



This cognitive model of behaviour change takes the individual and his behaviour as the starting point in the analysis of behaviour change.

This is in contrast to traditional behaviouristic (or behavioural) approach which would take the stimulus rather than the subjects' response

as its point of reference (e.g. Skinner, 1953; Ferster & Skinner, 1957) or the traditional psychoanalytic approach which would take the underlying personality defects in the individual as its frame of reference (e.g. Freud, 1929; Horney, 1945; Stein, 1961). According to the present theoretical model, the individual must first act, he must engage in a certain behaviour. The individual having acted, the next concern is whether the behaviour corresponds to his 'ideal' behaviour; that is if he perceives his behaviour as objectively as others perceive it. It is assumed here that an individual's 'ideal' behaviour or 'ideal self' corresponds to the 'ideal' as defined by society or his social milieu which is accepted by him. 'Objective' awareness ('objective' perception) of one's own behaviour and/or its consequences may be facilitated by exposing one to oneself or to one's own ongoing behaviour. This may be achieved, for instance, by placing the person in front of a large mirror, by imitating his behaviour contingently or by showing him a video recording of himself actually engaging in that behaviour, or by verbally pointing out to him that he behaves or is behaving in a certain manner.

The model further assumes that objective awareness of one's behaviour (and/or its consequences) often serves as a motivating factor which causes the person to evaluate himself as well as his behaviour. However, this assumption may not apply in the case of a well established skill such as typing. Whether the person modifies his behaviour or not will be determined by the nature of the evaluation he makes of himself or the behaviour concerned. It is assumed that if the person evaluates his behaviour in negative terms, he will experience negative affect or dissonance as a consequence of the existence of inconsistency between the behaviour and his cognition or conception of himself. Thus, just

as by dissonance theory (Festinger, 1957), this model predicts that if the environmental constraints should preclude the person from avoiding or escaping from the situation, one would expect him to change or modify his behaviour to accord with his self-concept or 'ideal self' in order to reduce or minimise the experienced subjective discomfort. In contrast, however, if the person should evaluate his behaviour and/or its consequences positively, that is, if he should perceive his behaviour as being consistent with his 'personal cognition' (i.e. his self-concept) then, by the same token, one should expect the behaviour to remain unchanged. In certain circumstances, such as the learning of a new skill, he may in fact increase the incidence of that behaviour. This is particularly true of professional impressionists who spend a large amount of time in front of mirrors perfecting their acts. Thus in the case of modelling, this model would postulate that whether or not a person alters his behaviour as a result of 'being imitated' will be a function of his evaluation, positive or negative, of that behaviour and the circumstances under which it takes place.

Implicit in this theoretical model is the fact that, if the person attempts to modify or change his behaviour as a result of his awareness of it and/or its consequences, subsequent exposure to or awareness of that behaviour (or the change) will further facilitate the modification of the behaviour concerned. This is possible because of the feedback nature of the awareness or exposure. In this respect, cognitive-behavioural model of behaviour change may also be viewed not only as a feedback system but also as a "cyclic" model of behaviour change. The 'feedback' or 'cyclic' nature of the model is well illustrated in the schematic representation outlined above. For instance, let us take an hypothetical individual (female) who is a compulsive eater. Let us

further assume that for some reason, for instance on viewing herself in the nude in front of a full-length mirror, she sees all the girth around every part of her body - she has become 'objectively' aware that she is 'fat'! Now, for confirmation or disconfirmation of her fatness, she jumps onto a scale; to her horror, the scale tells her that she is not fat, but rather grossly obese (or overweight). She accepts this fact and without consulting her family doctor, she attributes her obesity to her gluttony. The process does not stop there. Her cognitive mechanisms are set in motion. She goes on to weigh the social as well as the medical pros against the cons of obesity. To be brief, our hypothetical obese female views obesity not only as a social stigma, but also as (medically) dangerous to her health. That is, she has evaluated her behaviour (overeating) and its consequences (obesity) negatively. Consequently, she takes a positive decision to reduce her weight to an acceptable (social or medical) standard and starts eating not only reasonable amounts of food (in terms of calories) but also health foods. Within a few months, this woman has achieved her goal (desired body weight) and has already begun to enjoy both the physical and social benefits of not being overweight or obese; for example, she has now become more physically and socially active and is also receiving more attention from the opposite sex.

The feedback (or 'cyclic') potential of the model resides in the fact that now our hypothetical subject feels proud of herself every time she views her body either in the nude or in fashionable clothes. In other words, she evaluates the change and consequences of her behaviour (not overeating and being fashionable) positively. Hence she should be expected to view herself more often the nearer she is to her goal. Another consequence of this positive evaluation of the change in her

behaviour, as the model would predict, is that our subject will possess a mental picture of her obese state and will not want to see herself like that (a 'fatty') again. Thus, she will strive to maintain her weight loss. She can achieve this not only by reducing her calorie intake, but also by expending energy, for instance by taking up physical exercises, or indeed by a combination of both. Our subject's awareness and her positive evaluation of the change in her behaviour and its consequences, as we can see, in turn motivate her to strive for a greater change in the desired direction or at least to maintain the change (weight loss) already achieved, as the case may be. In other words, our subject's ubiquitous mental picture of her old body image (a 'fatty') and her new body image ('slim'), as the model would predict, should both serve as motivating factors influencing her efforts at weight reduction or to maintain her weight loss. The professional impressionist uses the same kind of mental picture, acquired through rehearsals in front of a mirror or by means of a video system, to impersonate his/her model(s) on stage.

(i) 'Objective Awareness'

The concept, 'objective awareness' implies the existence of at least two forms of awareness; these are: 'objective awareness' and 'subjective awareness'. Thus when a person is not 'objectively aware' of his behaviour and/or its consequences, he is perceiving it and/or its consequences in a subjective manner.

In this framework of cognitive-behavioural change, the distinction between 'objective awareness' and 'subjective awareness' of one's own behaviour is not just the meaning imputed to the behaviour, but rather

the actual perception (visual or auditory) of the behaviour concerned. 'Objective awareness' of an act is the act as physically perceived (or seen or heard) by an observer or a number of observers. In contrast, 'subjective awareness' (or perception) of an act is the act as perceived by the actor. In some instances, both the actor and the observer(s) perceive the act in the same light; for example, a handshake, or when a person is running to catch a train because he is late. In such cases, the perception or awareness of one's own act is 'objective' because there is an agreement between the parties concerned - the actor and the observer(s). Thus objective awareness is both physical and consensual (this will be clarified later).

However in other instances, the actor is unable to perceive his own act (e.g. visually) and the only perception of his action is of a proprioceptive nature. For instance, when a person blinks his eyes the observer(s) can see the person's eyelids actually shut and open, but the person himself obtains this knowledge through the proprioceptive feedback he obtains from his eyes and face muscles. Other such instances include speech perception, overlearned behaviours (or habits) and mannerisms, for example cigarette smoking, a tic, or tongue protrusion. To the heavy cigarette smoker, smoking is just an automatic response: he does not see his hands oscillating up and down between his mouth and the torso, or his lips pursing against the cigarette, neither does he see the cigarette smoke being exhaled out of his nostrils as the non-smoker observer does; the heavy smoker perceives all these actions only proprioceptively. In any of these instances, the actor's perception or awareness of his behaviour or act is of a subjective nature, it does not correspond to the observer's perception (or awareness) of the same behaviour.

As mentioned earlier, conditions that generate objective perception of a person's own behaviour are nothing more than stimuli that draw the person's attention to himself or his behaviour; that is, situations which provide the person with objective evidence of his behaviour. In this respect, objective awareness may be described as a heightened state of awareness. The conditions that give rise to this form of awareness can be personal or impersonal. Personal conditions are situations in which other people serve as a source of objective perception. For example, another person can point out the actor's behaviour to him or may serve contingently as a model for the actor's own behaviour (as in 'being imitated' paradigms). Impersonal conditions that lead to objective perception of one's own behaviour include looking in a large mirror, hearing one's own tape-recorded voice, or watching a video-recorded film of oneself or one's behaviour. Any setting where a manifestation or reflection of the person or his behaviour is external to himself and can be (objectively) perceived by him is likely to lead to objective awareness.

(ii) Objective Awareness (Perception) and Behaviour

The motivational consequences of objective awareness of one's behaviour, like the motivational consequences of cognitive dissonance, depend upon the postulate that a person's awareness of inconsistency between his actual 'self' or behaviour and his 'ideal' self or behaviour mobilises his cognitive mechanisms towards the re-establishment of consistency. Namely, awareness of the existence of such inconsistency leads the person to evaluate himself or his behaviour. Thus the motivational consequences of awareness of the existence of inconsistency between a person's 'ideal' self or 'ideal' behaviour and his actual self or

behaviour, according to cognitive-behavioural model of behaviour change, will depend largely upon the person's evaluation (or cognitions) of the behaviour in question or himself (or in fact both). If the person evaluates the behaviour in negative terms, the model would hypothesise that the individual will experience negative affect and will try to change or modify that behaviour, thereby avoiding or minimising the negative affect, provided that the appropriate conditions are met:

(1) the person is 'objectively' aware of the inconsistency between his 'ideal' and actual behaviour; (2) the mismatch is of an already motivated state of affairs.

According to the theoretical propositions advanced here, just as 'cognitive dissonance' propositions, there are two ways in which a person may avoid or reduce the psychological discomfort arising out of a negative evaluation of oneself or one's behaviour (or two dissonant cognitions). Firstly, when the mismatch is of an already motivated state of affairs the person may accomplish this by reducing the mismatch. However, since a person's 'ideal' (i.e. his 'ideal' self or behaviour) is a relatively static element, reducing the inconsistency would, of necessity, entail the person's modification of his actual behaviour. Hence, cognitive-behavioural model of behaviour change would predict that an individual who is, or has been made, objectively aware of his behaviour which deviates from his 'ideal' behaviour would be motivated or forced to alter the behaviour concerned to accord with his 'ideal' behaviour. Secondly, an equally feasible method for reducing the discomfort is that not only must there exist inconsistency between 'ideal' and 'actual' behaviour, but also, and equally importantly, the inconsistency must be negatively (or positively) evaluated, otherwise no impelling motivational forces will arise out

of the inconsistency, despite the fact that inconsistency might exist. Consequently, if subjective discomfort ensues as a result of a negative evaluation of the inconsistency, and if the former mode of reducing the discomfort is not feasible, the person might avoid the stimulus or the situation which generates objective awareness of the behaviour concerned and/or its consequences. A positively valued inconsistency, on the other hand, is likely to facilitate the behaviour.

Thus, taking our hypothetical 'fat' woman as an example, inconsistency existed between her actual physical state (being obese) and her 'ideal' physical state (a 'shapely figure'). The inconsistency was made salient by her objective awareness of her physical state - looking at herself in the nude in a full-length mirror and weighing herself. She was motivated to reduce her weight because she negatively evaluated the inconsistency or mismatch between the two cognitions - being overweight and having a desire for a slim figure. Our hypothetical subject chose to reduce her weight in order to avoid the subjective discomfort generated by the mismatch. However, according to the model, just as dissonance theory would predict, she could have achieved the same end - reduction of subjective discomfort - by avoiding the situations which gave rise to the discomfort. In this particular case, she could avoid both mirrors and scales in future, or people who are likely to make her objectively aware of her obesity. However, if she is placed in a situation where reducing subjective discomfort by means of avoidance of the stimuli or escape from the situation is impossible, then the only option left is a change in behaviour. Having opted for a change in behaviour, and having achieved her 'ideal' physical state (slim figure) as a consequence, this same individual, according to the propositions of the model, is more likely to expose herself to these very situations for further motivation to strive for, or to maintain, her 'ideal' state.

(iii) Evaluation

Cognitive-behavioural model of behaviour change proposes that if, and when, an individual perceives his own behaviour objectively, he will not merely react to it impartially or in a neutral manner, but rather his cognitive mechanisms pertinent to the behaviour will be set in motion; namely, he will come to evaluate the behaviour and/or its consequences, and that the motivational consequences of the evaluation will be determined by the affective direction of the evaluation - positive or negative - which in turn will be a function of the importance of the behaviour. The findings of studies to be reported indicate that this is often the case. The notion of evaluation, as used in this framework, is assumed on the basis of the existence of a psychological system or 'internal representation' (an 'ideal') which is purported to be possessed by each human being who is in contact with reality.

(iv) The 'Ideal'

This concept has so far loomed pretty large in this discussion, and hence warrants some elaboration. In this cognitive-behavioural change framework, the concept 'ideal' is defined as a 'cognitive map (or picture)' or 'mental representation' of what constitutes or is believed by the person to be correct or acceptable behaviour, attitudes, opinions, beliefs, personal characteristics, and so forth. For instance, an 'ideal' social behaviour would meet such social requirements as appropriate ways of comporting oneself in a mixed company, a palatable dinner table conversation with the local priest or vicar, and protocol at, for example, a funeral. In brief, an 'ideal' social behaviour is behaviour guided by internalised social norms. In the case of

personal characteristics or traits, the average socialised individual would possess certain mental representations of ideal personality characteristics such as intelligence, sociability, generosity, thoughtfulness, morality, and so forth. All such characteristics or behaviours considered together constitute what an 'ideal' person or an 'ideal' behaviour is.

Thus, a person uses his 'ideal' as a standard by which he evaluates his behaviour and/or its consequences. However, the evaluation may be made along a number of possible social or ideological dimensions. For instance, a person who regards himself as religious and God-fearing will evaluate his behaviour, in the presence of his local priest or vicar, according to the disparity between his actual behaviour and the behaviour he aspires to as a good Christian (his 'ideal' Christian). According to inconsistency theories, for example dissonance theory as postulated by Festinger (1957), the greater the disparity between a person's 'ideal' and actual behaviour (for instance, if our Christian friend should use an obscene language in the presence of his priest) the more negative his evaluation of his behaviour will be, and hence, the greater the dissonance experienced, and consequently the greater the efforts to reduce dissonance. However, from cognitive-behavioural change viewpoint, there is no reason why a smaller gap between a person's 'ideal' and his 'actual' should not be the most motivating. Thus, we should expect our hypothetical subject (obese woman) to strive harder to lose half a stone difference between her actual weight and 'ideal' weight in order to achieve her goal than, for instance, her initial ten stone difference between her actual weight of twenty stone and her ideal weight of, say, ten stone. This is equivalent to the 'goal gradient' phenomenon demonstrated by Hull (1934). However, the precise

shape of a graph linking inconsistency and motivation would require careful researching.

(v) Sources of the 'Ideal'

The sources of a person's 'ideal' (i.e. 'ideal' self or behaviour) include his own personal judgements about his physical environment founded upon his perceptual processes and, more importantly, through the process of socialisation. As many theorists of the 'self concept' claim, a person acquires his 'ideal' behaviour or 'self' from the standards of those around him. The standards or 'ideals' of others often define, to a large extent, what an 'ideal' person (or behaviour) ought to be.

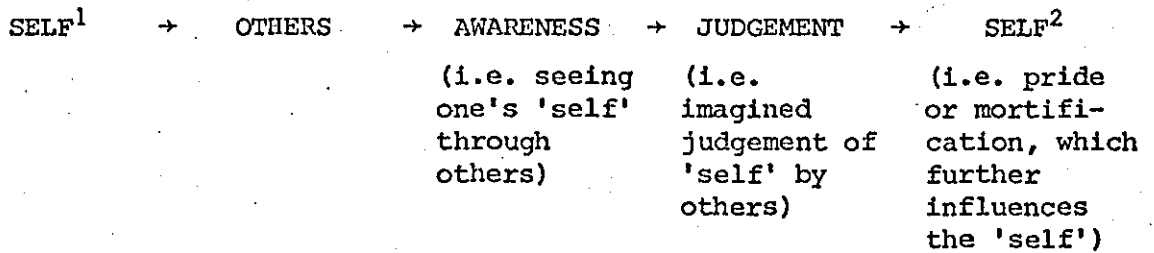
Mead (1934) holds the view that a person develops the concept of 'self' by taking the point of view of another person, thereby leaving himself experientially and viewing himself (or his own 'self') as though it were an object. Thus the 'self' is seen in terms of cognition or knowledge gained through the process of self-examination or introspection from the point of view of another person(s). This is not very different from the evaluation process proposed by cognitive-behavioural change model described above. This notion of knowledge gained through the point of view of another person(s) as proposed by Mead is also similar to Piaget's (1954) concept of 'perspective ability' - that is, the child's ability to step out of his 'egocentric' world and take the point of view of another person. The similarity between the above three frameworks, is the fact that they all regard social interaction as the basis upon which a person's 'self concept' - 'ideal' or standards - is founded.

However, of all the theories of the 'self' as the yardstick with which a person judges, and is judged by, others, Cooley's (1902) concept of the 'looking glass self' seems the most pertinent to 'cognitive-behavioural model of behaviour change'. Cooley emphasized the importance of subjectively interpreted feedback from others as a major bank of data about the self (or one's 'ideal'). This means that one's 'self concept' (or 'ideal') is significantly influenced by what the person believes others think of him. One of the major implications of Cooley's concept of 'the looking glass self' is that there is a close link between 'self awareness' and the subjective opinions of others about one. "As we see ... our face, figure, ... in the glass, and are ... pleased or otherwise with them according as they do or do not answer to what we should like them to be; so in imagination, we perceive in another's mind some thought of our appearance, manners, aims, deeds, character ... and so on, and are variously affected by it. A self-idea of this sort seems to have three principal elements: the imagination of our appearance to the other person; the imagination of his judgement of that appearance; and some sort of self-feeling, such as pride or mortification ..." (in Burns, 1979, p. 14).

Both Cooley and Mead saw society as the birthplace for 'self' (or the 'ideal'). Namely the 'ideal' of any individual develops as a result of his relations to the processes of social activity and experience and to other individuals within those processes. In short, the source of a person's 'ideal' is to be found in his socialisation processes.

The parallel between Cooley's 'looking glass' concept and cognitive-behavioural model of behaviour change is quite obvious. A schematic representation of Cooley's concept may best illustrate the parallel.

A Schematic Representation of Cooley's 'Looking Glass' Concept



In the above representation of 'the looking glass' concept of the 'self', if we substitute SELF¹ for 'the individual' and SELF² for behaviour, the similarity between cognitive-behavioural model of behaviour change and Cooley's theory of the 'self' becomes more striking. It is not far fetched to make these substitutions. After all, as many psychologists as well as sociologists would agree, it is difficult (if indeed possible) to divorce a person's 'self' from his behaviour. The most striking similarity between the two formulations lies in the fact that both emphasize the important role an individual's cognitive factors - 'awareness' and 'evaluation' (or judgement) - play in determining his behaviour or 'self'. Clearly, these two theoretical frameworks mirror each other, as it were.

2.3 RELATED THEORIES

(i) Introduction

The 'cognitive-behavioural model of behaviour change' is an attempt to explain a psychological phenomenon: imitation ('self-modelling'). However, since two or more theories may be (more) helpful in accounting for the same psychological event, as pointed out by Kaufmann (1973), this theoretical model (cognitive-behavioural model) will be related to

other theories which may be considered as capable of explaining the experimental data that have been gathered under the guidelines of the present model. Such theories include: (1) cognitive dissonance theory, (2) social comparison theory, (3) attribution theory, the 'internal-external' locus of control notion, (4) self-perception theory, and (5) objective self-awareness theory.

(ii) Cognitive-Behavioural Change and Cognitive Consistency Theories

The present formulation of cognitive-behavioural model of behaviour change may appear to be yet another off-shoot or conglomeration of balance theories or a derivation of the propositions put forward by such theorists as Osgood and Tannenbaum (1955), Festinger (1954; 1957), and Heider (1958). There appears to be a consensus among consistency theorists on the nature or definition of cognitive inconsistency. Broadly speaking, according to these theories cognitive imbalance is characterised by a 'logical' inconsistency, or a contradiction between at least two cognitions or elements of cognition. However, there may be some circumstances in which inconsistency or 'cognitive disequilibrium' is not conspicuously illogical. This apparent paradox arises simply because the underlying elements of the inconsistency are latent, that is, they have not been properly identified. Thus the present model regards the 'awareness' rather than the 'logic' of inconsistency as the crucial factor in determining a person's efforts at balance restoration.

The cognitive-behavioural model presented here differs somehow from the typical cognitive imbalance framework in other ways. The model assumes that for cognitive inconsistency to occur, at least two theoretical prerequisites need to be fulfilled: firstly the person must perceive

his own behaviour as objectively as possible; and, secondly, the behaviour must deviate from his 'ideal' behaviour (or a socially 'ideal' behaviour accepted by him). It is the assumption of the model that awareness of such a deviation will consequently invoke the individual's cognitions (or self-evaluation) pertaining to his actual behaviour. The ways in which these two requirements may be met have already been examined in our discussion of the model.

However, one of the major differences between consistency theories and cognitive behavioural change is that in neither of the consistency propositions is it stated that the individual's 'objective awareness' (or objective perception) of his behaviour plays a causal role in the mobilisation of his cognitive mechanisms pertinent to the behaviour (i.e. his evaluation of his behaviour) towards behaviour change. In contrast, cognitive-behavioural model stipulates that 'cognitive equilibrium restoration' via behaviour change becomes possible only when the motivational mechanisms - objective perception of the individual's own behaviour and its concomitant evaluation - are created. With this distinction, we should be able to consider more closely the theoretical propositions of behaviour change through 'objective awareness' of one's behaviour in relation to one specific consistency theory: "a theory of cognitive dissonance" (Festinger, 1957).

(iii) Cognitive-Behavioural Change vs. Dissonance Theory

Festinger (1957) has pointed out that: "... cognitions that represent knowledge of a person's own actions are, in a sense, the easiest kinds of cognitive elements to change since this can be accomplished by merely changing the behaviour involved ... Consequently, it is clear

that one would expect appropriate modification of behaviours to be a frequent reaction to the existence of dissonance" (p. 276). Thus, in accordance with Festinger's suggestion, cognitive-behavioural model of behaviour change would predict a change in behaviour in such circumstances provided that the necessary conditions (objective awareness and evaluation of the inconsistency) are met. In this respect, the present model bears a close relationship with dissonance theory, that is as far as Festinger's suggestion and the prediction based on it are concerned.

It would not be unfair to dissonance investigators, and consistency theorists in general, to say that they have been unreasonably preoccupied with such characteristics of their subjects as their attitudes, opinions, and beliefs to the almost complete exclusion of their behaviours. For instance, the history of dissonance research indicates that it is always a change in attitude, an opinion or belief that has moved towards dissonance reduction or consonance restoration. Subjects have been induced or asked to lie to others, misrepresenting what they actually perceived to be correct (e.g. Festinger & Carlsmith, 1959; Carlsmith et al, 1966); they have recorded or written contradictory statements to their own (personal) convictions (e.g. Cohen, 1959; Helmreich & Collins, 1968; Sherman, 1970); they have been induced to endure consequences that are against their own value systems (e.g. Brehm, 1959; Yaryan & Festinger, 1961); they have been induced to suffer or endure physiologically uncomfortable states or tension such as hunger, thirst, pain, or emotional states such as guilt resulting from the administration of electric shocks to others (e.g. Brehm, 1962; Brock & Buss, 1962; Glass, 1964; Green, 1974).

In all such studies, it is attitude that has been reported to move towards dissonance reduction or consonance restoration. These examples seem to suggest that behaviour does not change in the presence of dissonance or inconsistency. However, it is one's belief that behaviour change is simply not measured in such studies; and that behaviour, in the presence of dissonance or cognitive inconsistency, is just as amendable as attitudes, opinions or beliefs. After all, Festinger (1957) has again pointed out that the cognitive elements that will change when dissonance is aroused are those least resistant to change. It follows, therefore, that if dissonance is aroused in a situation in which behaviour becomes the least resistant to change of the elements involved, for instance in a 'self-modelling' situation in which conditions are arranged such that not only can the subject not deny or rationalise the behaviour, but also cannot escape from the situation (as in the case of our hypothetical obese subject described earlier), it is behaviour that will obviously change. 'Self-modelling' studies conducted by the present author tend to support this view. These studies and their findings are detailed below.

Whether one sees more similarities or dissimilarities than vice-versa between consistency theories, especially dissonance theory, and the cognitive-behavioural framework presented here will largely be determined by one's theoretical frame of reference. Nonetheless, within the present framework, there is an explicit model of human being. Namely, for subjective discomfort to be experienced, and hence to be reduced, involves cognitive processes and reorganisation on the part of the afflicted individual. In this very respect, cognitive-behavioural model of behaviour change resembles any other theory of cognitive activity, including dissonance theory.

(iv) Cognitive-Behavioural Change vs. Social Comparison Theory

'Cognitive-behavioural' change has implications for social comparison theory also. Nevertheless, since cognitive dissonance somehow derives from social comparison theory, and the former has been examined at some great length already, only a brief examination of the latter theory will be given here.

The gist of social comparison theory, as formulated by Festinger (1954) is the assumption that humans have a basic drive to evaluate themselves - their opinions, abilities as well as their behaviours - against those of others. Festinger (1954) has further suggested that a person's cognitions - opinions, abilities or behaviour - are consistent with his self-evaluation only to the extent that others (or those around him) share those cognitions. Thus, social comparison theory concurs with the present model that a person's concept of what constitutes, say, a 'correct' (or 'ideal') behaviour is determined by his social environment. This implies that the existence of inconsistency or dissonance between a person's cognitive elements is determined by social norms. However, it must be emphasized that this is true only insofar as at least one necessary condition is fulfilled: the person must accept or internalise those norms. This is achieved through a process of evaluation of one's abilities, opinions, behaviour, and so forth, with those of others.

The apparent parallel between social comparison theory and cognitive-behavioural change model is the notion of 'evaluation'. The basic premise of both formulations is the assumption that a person constantly engages in a process of evaluation of himself as well as his behaviour; and that this evaluation is always against others' concepts or

expectations of the individual and his behaviour. These concepts (or expectations) are in turn, determined by a set of social rules or norms (or 'ideals'). Thus, regarding behaviour change, both formulations would suggest that this is possible to the extent that the individual recognises and accepts that his behaviour contravenes the social norms governing that behaviour and others' expectations of him.

The foregoing account of social comparison theory and cognitive-behavioural change framework suggests that the experience of dissonance (and its reduction) derives from a learning process which is universal, as pointed out by Rosenberg (1968). For instance, inconsistency between a person's overt behaviour and his private conviction, competence or interest, will often lead to social deprecation. Since social deprecation is a powerful negative reinforcer, one of the ultimate effects of frequent repetition of such behaviour is that the person alters his behaviour (or an element of his cognitions); failing this, he will acquire a conditioned avoidance orientation towards situations in which such inconsistencies or 'dissonances' are likely to be encountered. Hence, his efforts to reduce such 'dissonances', whether by altering his behaviour or other of his cognitive elements, can be viewed as ultimately deriving from his need for social approval. Both social comparison theory and the present model agree with self-concept theories (e.g. Cooley, 1902; Mead, 1934; Burns, 1979) that people often acquire their 'ideal' self or behaviour from the standards of those around them - their significant others.

(v) Cognitive-Behavioural Change vs. Attribution Theory

Unlike aforementioned consistency theories, for instance dissonance theory, cognitive-behavioural change formulation implies the concept

of 'causal attribution'. Thus in this part of the discussion, a comparison between causal attribution theory and cognitive-behavioural model of behaviour change will be made.

Kelly (1967, 1973) has described 'attribution' as: "... how people make causal explanations. ... It deals with the information they use in making causal inferences, and what they do with this information to answer causal questions" (Kelly, 1973, p. 107). Since the theory of causal attribution deals also with 'self-perception' (Kelly, 1973) and the present notion of behavioural change also deals with 'self-observation' (observation of one's behaviour), it is perfectly legitimate to consider both together (albeit briefly). Both frameworks suggest that, for instance, in a case of behaviour change, attribution of causality of the change will be largely determined by the direction of the person's perception or his focus of attention. This further suggests that if the person focuses attention to himself or his behaviour rather than the external environment, he is more likely to attribute the cause of the change in his behaviour to himself than to the external environment; on the other hand, if his attention is directed more towards the external environment, he will likewise be more likely to attribute this change in behaviour to some environmental agent(s) rather than to himself. This suggestion forms one of the fundamental bases upon which cognitive-behavioural change is founded. Cognitive-behavioural change demands the manipulation of a person's awareness (towards his behaviour) in order to modify or alter his behaviour in the desired direction; any increase in the person's awareness towards his behaviour will tend to encourage him to attribute its causality to himself and this will contribute towards the achievement of this objective. If we cast our minds back to our hypothetical obese subject, the relationship between

cognitive-behavioural model of behaviour change and attribution theory becomes apparent.

The obvious (salient) similarity between both Kelly's attribution theory and cognitive-behavioural change, as far as a change in behaviour is concerned, lies in the fact that both postulate that an individual's direction of awareness (or perception) or locus of attention is a principal determinant of his attribution of causality of a change in his behaviour. This leads on to a comparison between cognitive-behavioural change and Rotter's (1966) notion of 'locus of control'.

(vi) Cognitive-Behavioural Change vs. Internal-External Locus of Control

Implied in the foregoing comparison between cognitive-behavioural change and causal attribution theory is a relationship between the former's formulation and Rotter's (1966) dichotomy between the type of control an individual possesses over his interaction with his environment, or more specifically, over his pursuit of rewards.

To give only an upshot of Rotter's formulation, Rotter believes that people can be dichotomised into two broad categories: 'internal' and 'external' locus of control categories. An 'internal controller', in Rotter's conceptualisation, is a person who when, in the course of his interaction with his environment, his behaviour or action results in a reward, attributes the cause of the occurrence of the reward solely to himself; that is, he attributes rewards contingent upon his actions or behaviour to his behaviour or other of his characteristics, such as intelligence, sociability, and so forth. Such an individual has no, or very little, belief in such concepts as luck, chance, or fate. In

contrast, the person who believes in 'external control' is more likely to attribute any reward contingent upon his behaviour or action to some external agent(s). Such a person is likely to place considerable weight in the concept of luck, chance, or fate. Rotter suggests that the type of 'control' a person believes in is learned.

Although, as can be seen, the 'internal'-'external' locus of control notion is couched in learning theory terms, it shares certain common properties with the cognitive-behavioural change formulation. If one makes the assumption: (a) that the kind of control a person possesses is never static, but rather varies with the environmental situation as well as the psychological state (or awareness) he is in; and (b) that a person's state of awareness or attention likewise varies from one situation to another, and from one psychological state to another, the 'fit' between the two formulations becomes evident. In other words, in terms of attribution theory, whether an individual attributes the results of his behaviour to himself or to some external agent will depend upon his focus of attention. Similarly, in terms of cognitive-behavioural change, as formulated here, whether or not a person attributes a change in his behaviour to himself is determined by the direction of his attention - whether his attention is on his behaviour or not, namely, whether he perceives his behaviour as objectively as others perceive it or not.

Attribution theory would predict that if a person attributed the cause of his (undesirable) behaviour to himself, he would be more likely to alter that behaviour himself than if he attributed its causality to the environment. The 'internal'-'external' notion would predict the same. From our discussion of cognitive-behavioural change model, it is obvious that the same hypothesis would be advanced by the present model.

An interesting correspondence between the 'internal'-'external' locus of control notion and the present framework lies in the fact that both acknowledge, implicitly or explicitly, that the ability to perceive oneself as the agent of one's own behaviour is learnable. However, while Rotter describes the acquisition of this ability in terms of external reinforcement principles, 'cognitive-behavioural change' would be inclined to describe it in terms of 'feedback' or 'self-reinforcement' principles. Whichever of these explanations one may choose, it must be recognised that both derive from 'learning theory'. To the extent that this ability is learnable, cognitive-behavioural change, apart from being similar to any theory of cognitive activity, in a way, is similar also to any theory of learning, behaviourism being perhaps the only exception, even though such theorists as Homme (1965) would disagree with this exception. And as far as methodological procedures are concerned, it is closely related to social learning (modelling) procedures.

(vii) A Comparison Between 'Cognitive-Behavioural Change' and Self-Perception Theory

The relationship between cognitive-behavioural model of behaviour change and 'self-perception' theory deals also with attributional processes and their effects on subsequent behaviour. In 1965, Bem advanced a 'self perception' theory as an alternative interpretation of dissonance phenomena. His original formulation of the theory and its subsequent reformulations (Bem, 1967, 1978) suggest that the results obtained in dissonance studies are due to the judgemental self-observation abilities of the subjects rather than motivational components of dissonance theory.

Bem's suggestion is not significantly different from attributional theories such as Kelly's (1971, 1973). However, Bem has proposed that

such attributional processes are often performed by the individual on himself. An important theoretical basis of Bem's framework, albeit implicit, is the notion of responsibility. In this framework, it appears necessary for the creation of dissonance that the individual recognises some causal connection between himself and an inconsistent event. The source of the causal relationship is not essentially relevant; the relationship may result from intention, personality characteristics or other components of the self.

However, the assumption made by 'self perception' theory that is closely related to cognitive-behavioural change formulation is the circumstances under which behaviour takes place and their effects on an individual's subsequent behaviour. Specifically, self-perception theory, as propounded by Bem, assumes two situations in which behaviour is executed: (1) situations in which the behaviour is free of tangible external reinforcement contingencies, and (2) situations in which the behaviour is perceived by the person to be under external control (or external reinforcement contingencies - rewards or punishments). Thus for self-perception theory, the person engaging in a behaviour by virtue of his judgemental self-observation abilities, becomes the 'actor' and the 'observer' at the same time (self-observer). In other words, the person identifies the direction or consequences of his behaviour and also the circumstances under which the behaviour takes place. He then infers an attitude about the behaviour (i.e. he evaluates the behaviour) according to the controlling circumstances, that is whether the behaviour takes place under the influence of external forces or not. Thus, self-perception would postulate that, in the case of the hypothetical example given above (our obese subject), our subject would not be so motivated to lose weight if she attributed her gluttony or obesity to some external agent(s) rather than to herself.

Self-perception theory, with its notions of responsibility and 'self-observation', hypothesises, in contrast to dissonance theory, that dissonant behaviour attributed to the self, that is, dissonant behaviour for which the person assumes full responsibility, would be more likely to change than a dissonant behaviour influenced by external forces. From our account of cognitive-behavioural change thus far, it is obvious that it would make the same prediction. For instance, if we make the following assumptions: (1) that a person engages in a socially undesirable behaviour (assuming that he accepts the social norms governing the behaviour); and (2) that he is 'objectively' aware of his behaviour and that he cannot deny it (self-observation); both cognitive-behavioural change formulation and self-perception theory would predict that the person will be more likely to experience subjective discomfort (or dissonance), and consequently attempt to reduce the discomfort by changing the behaviour concerned if he cannot attribute the behaviour to some external influences than if he perceives the behaviour to be under the control of external forces.

Although the two theoretical frameworks - cognitive-behavioural change and self-perception theory - approach the problem of behaviour change from slightly different perspectives, there are more obvious similarities than dissimilarities between them. Firstly, both take self-observation as their starting point in their analysis of behaviour change; and secondly, both see causal attribution of behaviour to oneself as one of the major vehicles of behaviour change.

(viii) COGNITIVE-BEHAVIOURAL CHANGE VS. OBJECTIVE SELF-AWARENESS THEORY

Objective self-awareness theory (Duval & Wicklund, 1972; Wicklund, 1975) is based on Mead's (1934) concept of 'social self' and has the notion self-consciousness as its core premise. However, the theory distinguishes between two forms of awareness (or consciousness): (1) subjective self-awareness, and (2) objective self-awareness. Duval and Wicklund use these concepts in a special sense. In subjective self-awareness, the person's focus of attention is the external environment - other people, objects and events within his perceptual field. In other words, a person in a state of subjective self-awareness is the subject as opposed to the object of perception. Objective self-awareness, on the other hand, is analogous to what is termed self-consciousness or introspection in common parlance. In this state of awareness, the person's focus of attention is directed inward; that is the person perceives himself as an object of evaluation. Grammatically, a person in a state of objective self-awareness becomes the object of his own perception (or evaluation). In his later formulation, Wicklund (1975) has substituted the concept self-focused attention for the term objective self-awareness.

The principal assumptions of objective self-awareness theory are similar to those of cognitive-behavioural change theory, and may be summarised as follows:

- (a) objective self-awareness (or self-consciousness) results in a heightened awareness of the self or some aspects of the self that are most prominent in a given situation;
- (b) objective self-awareness leads to automatic self-evaluation, thus, a self-aware person will evaluate himself against some personal or ideal standard which he holds;

- (c) a state of objective self-awareness (and its concomitant self-evaluation) often gives rise to psychological discomfort resulting from a negative discrepancy between the person as he is at the present and what he would like to be. This discomfort in turn motivates the person to reduce the discrepancy;
- (d) the degree of discomfort and the person's efforts to reduce it are a joint function of the proportion of attention (in terms of time) focused on the discrepancy and the magnitude of the discrepancy between the person's self and the negative aspect of the self that is salient to him.

According to objective self-awareness theory, any feature of the person's environment which reminds him of his position as an object in the world may lead to his attention being focused upon the self to the virtual exclusion of other aspects of the environment. In other words, a state of objective self-awareness can be created simply by placing the person in a situation in which he becomes an object to himself. Mirrors, television cameras or an audience may facilitate this.

Much evidence has accumulated to suggest that the self-focused (or self-aware) person engages in self-evaluation. Self-focusing also encourages adherence to personal and/or social standards (e.g. Wicklund & Duval, 1971; Duval, 1976; Diener & Wallborn, 1976; Wegner & Schaefer, 1978). For instance, studies by Diener & Wallborn (1976) and Beaman et al (1979) found that self-focused attention reduced cheating and stealing.

Objective self-awareness theory has been shown to influence various psychological processes - mainly in the area of cognitive social psychology. Such phenomena include conformity and attribution (Duval & Wicklund, 1972, 1973), self-esteem (Ickes et al, 1973), the validity

of self-reports (Pryor et al, 1977), aggression and emotion (Carver, 1974; Wicklund & Frey, 1980), and perspective taking (Hass, 1979; Stephenson & Wicklund, 1983). There also exists some evidence that self-focused attention can facilitate human performance (e.g. Duval & Wicklund, 1972; Liebling et al, 1974).

The results of these studies have generally been interpreted as giving support to objective self-awareness theory. That is, the presence of mirrors or cameras made the subjects aware of the discrepancies between their actual 'selves' or performance and their aspired 'selves' or performance. Of particular interest is a study by Carver (1974) in which the subjects were made to believe that electric shocks would facilitate a (bogus) victim's learning. It was found that self-focused subjects (compared with subjects who were not placed in front of a mirror) exhibited greater correspondence between their values and behaviour in relation to aggression. According to Carver, the subjects showed more aggression (administration of shocks to a victim) because the presence of the mirror highlighted the disparity between their actual aggression and their desired level of aggression.

Although objective self-awareness studies, to date, have chiefly been in the domain of social psychology, Duval and Wicklund's (1972) original formulation of the theory purports to encompass a wide area of psychology, including personality, clinical psychology and human performance. Wicklund's (1980) review attempts to demonstrate the versatility of the theory. Nonetheless, the practical application of the theory, for instance to clinical problems (e.g. behaviour disorders), is virtually lacking in the literature. Two main features or assumptions of objective self-awareness theory are self-evaluation and the desire to be correct or consistent. As Duval has suggested, "All aspects stemming from self-focused attention, whether efforts to avoid or seek out the state

are presumed to be motivated by the person's degree of completeness, goodness or inner consistency" (Duval, 1975, p. 238). Thus in the case of undesirable behaviours such as addictive behaviours of psychopathological behaviours, for instance, the theory would seem to predict inhibition of such behaviours, for example, in the presence of a mirror.

Perhaps the only indirect application of the theory of objective self-awareness to a maladaptive behaviour - cigarette smoking - comes from a study by Leibling et al (1974). The study was described to the subjects as an investigation into music listening, but it actually investigated smoking behaviour. In the experimental condition, the subjects sat in front of a mirror, smoking cigarettes, while listening to music. In brief, the results of the study contradicted objective self-awareness predictions and also the findings of studies conducted for this thesis. The subjects smoked more in the mirror condition. However, it might be argued that Leibling et al's study was a poor test of objective self-awareness theory, under the circumstances. The measured variables (i.e. the subjects' smoking patterns) may not have been the most salient aspects of the situation to the subjects. In other words, the subjects might have been more concerned with their taste in music (which was ostensibly under investigation) than their smoking. This methodological problem inherent in the study might, however, be due to the theory's apparent failure to specify clearly the conditions under which certain evaluative aspects of the person become salient (as Leibling et al have suggested). The theory's apparent lack of application to behaviour (or clinical) problems may partly be attributed to the over-generality of its assumptions about these conditions. As demonstrated by the studies to be described, cognitive-behavioural change theory makes more explicit these conditions.

From the discussion so far, it would seem that objective self-awareness theory and cognitive-behavioural change theory would make similar assumptions. However, there are special instances in which they differ. The following are examples of such instances.

- (a) Objective self-awareness theory postulates that a person in this kind of state will almost always find some defect in himself. Cognitive-behavioural change, on the other hand, proposes that if an individual is placed in a situation in which he can perceive his behaviour objectively - as others see it - it is his undesirable behaviour which will be most salient to him. For instance, if the presence of a mirror always generated negative affect, as objective self-awareness theory suggests, it would be hard to explain the behaviour of the vain teenage girl who spends hours on end in front of a mirror admiring her beauty, or of the athletic young man who stares at his well developed muscles in admiration in front of a mirror.
- (b) The former theory assumes that the greater the discrepancy between a person's ideal self and his actual self, the greater the psychological discomfort experienced, and hence the greater his efforts to reduce the discrepancy will be. Cognitive-behavioural change disagrees with this assumption, and suggests that a smaller gap may indeed give rise to the greatest subjective discomfort which will in turn lead to greater efforts to bridge the gap. An example is the hypothetical obese woman described in the discussion of the theory.
- (c) Another issue of disagreement between the two theories concerns the affective nature (positive or negative) of a discrepancy between a person's ideal self and his actual self. Objective self-awareness theory assumes that such discrepancies are generally in the negative direction - across virtually all people and all traits - with the consequence that self-focused attention is presumed to be an aversive

condition. In this respect, as mentioned above, cognitive-behavioural change makes allowances for individual as well as cultural differences. That is, for a person to regard, for instance, his behaviour (or some aspect of himself) as desirable or undesirable, he must first of all accept the values (social and cultural) governing that behaviour; otherwise no discrepancy exists and therefore no discomfort arises to motivate behaviour change.

- (d) Objective self-awareness assumes that the initial reaction to self-focused attention is self-evaluation. Cognitive-behavioural change, on the other hand, proposes that a person's initial reaction to awareness of one's own behaviour is evaluation of that behaviour, especially if it happens to be undesirable. Nonetheless, the theory acknowledges that the evaluation is always in relation to the self both as a unique as well as a social entity.

Despite the above apparent differences between the two frameworks, like cognitive dissonance theory, they may be conceptualised both as theories of motivation and cognitive theories. Both postulate that awareness of oneself or one's own behaviour motivates the person to evaluate (and/or alter) some aspect of himself or his behaviour. Nevertheless, whereas objective self-awareness deals mainly with the person's inner state or 'self', cognitive-behavioural change deals chiefly with the person's actual behaviour. Thus, they differ in their areas of application. As mentioned already, objective self-awareness studies have tended to follow cognitive dissonance investigations. That is, they have mainly involved such social psychological phenomena as opinion change, conformity, attribution, and so forth. Cognitive-behavioural change

studies (detailed below), on the other hand, fall within the area of clinical psychology - modification of such undesirable behaviours as cigarette smoking, over-eating, and facial mannerisms.

Cognitive-behavioural change theory proposes that behaviour whose evaluative importance has been made prominent to the individual will be inhibited when the person perceives that behaviour (and/or its consequences) in negative terms. This behavioural aspect of the person is not made specific in objective self-awareness theory. Instead, the theory stresses the person's 'self'. This preoccupation with the 'self' might be one of the reasons for the theory's lack of application in the clinical field. Another difficulty with objective self-awareness theory, in terms of its behavioural application, is its assumption that in addition to self-evaluation as a reaction to self-focused attention, the person will avoid or approach the situation depending upon the polar position (negative or positive) of the evaluation. The theory makes a further assumption that in the case of a negative discrepancy (or evaluation), the person may attempt to reduce the discrepancy by avoiding the situation. It is not quite clear how a negative discrepancy or inconsistency can be reduced by a mere avoidance response. Mere avoidance of a stimulus situation which highlights a negative cognitive discrepancy does not necessarily reduce nor eliminate the discrepancy once the person has become aware of its existence. Such a response might, however, reduce the psychological discomfort associated with the discrepancy. In contrast, cognitive-behavioural change stipulates that following a person's objective awareness (or perception) of his undesirable behaviour (and his subsequent negative evaluation of that behaviour) he will attempt, in appropriate conditions, to alter his behaviour in order to reduce the concomitant subjective discomfort.

It might be helpful to emphasise again that objective self-awareness theory appears to concern itself primarily with the person's inner discrepancies whereas cognitive-behavioural change deals principally with behavioural inconsistencies, even though the person's cognitions about his behaviour and himself are considered as playing a crucial role in determining the desirability or undesirability of the behaviour concerned. In essence, objective self-awareness theory is a theory of self-consciousness; cognitive-behavioural change, on the other hand, is a behaviour-evaluation theory. Thus, while the former considers awareness in terms of 'consciousness' (in a psychoanalytic sense), in the latter theory, awareness refers to actual or physical perception (of one's behaviour). So that whereas objective self-awareness theory assumes that any inconsistency within the 'self' will motivate a person to reduce it, cognitive-behavioural change proposes that a mismatch between a person's ideal behaviour and his actual behaviour needs to be, first of all, of an already motivated state of affairs for him to try to reduce it.

SUMMARY

Objective self-awareness theory and cognitive-behavioural change theory are similar in many respects - in methodology and in many of their assumptions. Theoretically, the concept of evaluation, for instance, is central to both theories even though, in the former, the evaluation is more about the 'self' whereas in the latter the evaluation is more about one's behaviour. Thus, in objective self-awareness theory, a discrepancy is defined as the difference between what the person would like to be (e.g. intelligent or beautiful) and what he is at the present; cognitive-behavioural change defines a mismatch or an inconsistency as

the difference between the person's desired behaviour and his actual behaviour. In summary, it might be suggested that the main difference between the two theories is that objective self-awareness theory has the concept 'self-consciousness' as its central premise, whereas cognitive-behavioural change theory places special emphasis on behaviour. Another major difference between these theories lies in their areas of application. Objective self-awareness studies generally fall into the domain of social psychology; cognitive-behavioural change studies, on the other hand, are clinically oriented.

The principal purpose of the present theoretical model is to guide investigations to discover the cognitive factors that mediate the inhibitory effects of self-modelling. Thus for the rest of the analysis, evidence for the main propositions of the theory will be offered, and its theoretical as well as practical ramifications will be further examined.

CHAPTER THREE

THE EFFECTS OF SELF-MODELLING ON CIGARETTE

SMOKING BEHAVIOUR

SUMMARY.

Two studies of self-modelling are described. The first study was a preliminary study which investigated whether self-modelling would inhibit cigarette smoking behaviour. Fourteen cigarette smokers (4 males and 10 females) served as subjects for a repeated-measures design. In the self-modelling condition, the subject watched himself/herself on a television monitor while smoking; in the control condition, s/he watched a short cartoon film while also smoking. The following variables were measured: (1) the amount of tobacco consumed; (2) the amount of time lit cigarettes stayed in the subjects' mouths; and (3) the subjects' physiological responses (GSRs). Study One investigated the role of cognitive factors in self-modelling. It followed the same experimental procedure and involved the same variables as the pilot study. However, unlike the pilot study, it incorporated cognitive variables-attitudes and communications about cigarette smoking. The findings indicated that self-modelling inhibited cigarette smoking. The results also suggest that cognitive factors mediate the effects of self-modelling.

THE EFFECTS OF SELF-MODELLING ON CIGARETTE SMOKING

BEHAVIOUR: AN EXPLORATORY INVESTIGATION

3.1. Introduction

The existing literature on the inhibitory effects of being imitated and self-modelling suggests that being imitated (or self-modelling) inhibits undesirable behaviours since it acts as an aversive stimulus for the 'imitated'. However, these studies have tended to be 'directive'. In other words, they have either employed a second party to contingently imitate the subject, or have included instructions on how the subject's behaviour might be modified or how to deal with similar situations in the future, therefore (perhaps inadvertently) highlighting the negative aspects of the behaviour (e.g. Wheman, 1976; Kauffman et al, 1977; Davis, 1979).

The directive nature of such studies renders the theoretical interpretation of their results problematic. It is unclear whether self-modelling, the instructions, or a combination of both causes the observed behaviour change. To circumvent this methodological problem, and to provide a fuller understanding of modelling in general and self-modelling in particular, it is important that self-modelling procedures are non-directive. In 'non-directive' self-modelling, the individual is at the same time the observer and the model of his own behaviour; he observes his own behaviour directly as it happens. A mirror, a mirror-room or a video system may provide the means of feedback. The study described below used a close-circuit video system.

3.2. Aim

This study was an exploratory investigation into the effects of self-modelling on the behaviour of intelligent adults. It investigated the

effects of self-modelling on cigarette smoking behaviour.

3.3. Hypothesis

It was assumed that owing to the widespread dissemination of health education in Western nations today, cigarette smoking is generally (i.e. medically and socially) deprecated by most people, including many cigarette smokers themselves. These beliefs stem from a negative cognitive evaluation of smoking. Thus, it was hypothesised that in a self-modelling situation, a cigarette smoker would consume less tobacco than in a control condition.

3.4 METHOD AND PROCEDURE

(i) Design. The study employed a repeated-measures design, and consisted of two experimental conditions: (1) 'self-modelling' condition and (2) 'control' (film) condition. In the former condition, through a video system, the subjects viewed themselves on a television monitor for about 10 minutes while smoking; and in the latter the subjects watched a 10-minute long cartoon film (which was relatively void of emotions for adults, at least) on the same television monitor while also smoking. The study was carried out in the Psychology Laboratory of the Department of Social Sciences at Loughborough University. The Laboratory comprised an experimental room and an observation room. The two rooms were adjacent to each other with a one-way screen between them, but the subjects could not be observed through the one-way screen because of the experimental arrangement - the subjects were enclosed in a screen cubicle situated inside the experimental room. However, they could unobtrusively be observed on television monitors attached to a video console inside the observation room [see Appendix 6: Diagrams 1(c) and 1(d)].

Three variables were under observation in each experimental condition. These were: (1) the amount of cigarettes consumed by the subjects (measured in grams); (2) the amount of time lit cigarettes were in contact with the subjects' lips (measured in seconds); and (3) the subjects' emotional responses (GSRs).

(ii) Subjects. Fourteen cigarette smokers (4 males and 10 females) participated in the study. They were all university students (at Loughborough University) who were pursuing various degree courses. Eleven of the subjects completed 6 sessions each (3 sessions under each

experimental condition) while the remaining 3 completed only 4 sessions each (2 sessions under each experimental condition). Six of the subjects expressed positive attitudes to cigarette smoking, while the remaining 8 expressed negative attitudes to the habit.

(iii) Apparatus and Materials. The apparatus and materials which were situated in the experimental room included the following:

- (1) 2 video cameras (Sony, Model AVC 3250E)
- (2) television monitor with a .58m screen (Pye, Model LDO01)
- (3) Electret condenser microphone (R.S. Components Ltd.)
- (4) cigarettes (Benson & Hedges Special Filter King Size)
- (5) an ashtray
- (6) a cigarette lighter
- (7) glass sample tubes with tops
- (8) a screen cubicle.

The main apparatus and materials which were situated in the observation room included the following:

- (1) video-tape recorder (National, Model NV:3030E)
- (2) video-cassette recorder (U-matic No. VO-1810UK)
- (3) video mixture console with Hitachi monitor and speaker
- (4) galvanometer (Biofeedback Systems Ltd., Model SCL.100)
- (5) timer-counter (Campden Instruments Ltd., Model 565)
- (6) an electronic balance (Sartorius, Model 2432)
- (7) cartoon films ('Tarzan and the Apes', Tarzan and the Earthquakes', and 'Honkong Phooey')
- (8) a clock.

See Appendix 6: diagrams 1(a) to 1(d) for experimental room, observation room and apparatus.

(iv) Procedure. The subjects were recruited on the pretext that the study was an investigation into the effects of cigarette smoke (or tar) on domestic television screens, and whether or not such effects interfered with the visual perception of images portrayed on television screens so affected. The subjects were run individually, and each attended 2 sessions a week, with about 3 days between sessions. This was possible because the subjects were given a timetable from which they chose their individual convenient times.

When a subject reported for a session, s/he was ushered into the experimental room. S/he was then asked to run on the spot for about one minute. After that s/he was asked to sit in an armchair situated outside the cubicle. The experimenter then placed the electrodes of the galvanometer on two fingers of the subjects' non-dominant hand, leaving the dominant hand free for smoking. The index and ring fingers were used. The electrodes were connected to the galvanometer situated in the observation room by a wire passed through the wall between the two rooms. With the electrodes in place, the subject was then asked to relax as much as possible. The experimenter then left the room, ostensibly to enable the subject to relax, but in fact left for the observation room and recorded the subjects' GSR in order to establish his/her GSR baseline. Mode 2 and 100% sensitivity level of the galvanometer were selected for this purpose and maintained throughout the session (and the experiment) for all the subjects. In mode 2, the galvanometer provided both auditory and visual feedback of transient increase of skin conductivity. After the subject's GSR baseline had been established, the experimenter

returned to the subject and ushered him/her into the screen cubicle. The cubicle was constructed in such a way that it limited external stimulation to the subject. It also obstructed the one-way screen thereby reassuring the subject that s/he was not being observed.

When the subject and the experimenter entered the cubicle, the subject was asked to sit in an armchair facing the television monitor (the chair was placed about 2m away from the television monitor). The experimenter then ensured that the electrodes were still firmly (but not too tightly) placed on the subjects' fingers. The subject was then given a cup of coffee and his/her attention drawn to a table placed next to the chair. On the table were the following items: (1) a packet of cigarettes (Benson & Hedges Special Filter King Size); (2) a cigarette lighter; (3) an ashtray; (4) a glass sample tube; and (5) a microphone [see Appendix 6: Diagrams 3(a) and 3(b)]. The subject was further requested to relax and try to make himself/herself as comfortable as possible throughout the session. After that the experimenter gave him/her the following instructions as distinctly as possible:

"I'm going next door to play a film on this television monitor for you to watch. While you are watching the film, I'll be monitoring your bodily responses, especially the movements of your eyes and face muscles, to determine if you are relaxed and attending to the film, so try to keep this hand and especially the fingers (the fingers with the electrodes) as still as possible. Rest this hand on the arm of the chair to avoid any unnecessary movements. You can start drinking your coffee whenever you are ready; but, please, do not start smoking till I ask you to do so. When I tell you to smoke, help yourself to these

cigarettes on the table, and try to relax and enjoy your smoke and the film just as you would normally do if you were watching TV and having a smoke by yourself at home or in your flat. Feel free to put the cigarette away when you feel you've had enough of it. You may smoke as many cigarettes as you like inside this cubicle, but you are not to take any of them outside this room. When you've had enough of a cigarette, please, do not stub it out in the ashtray, instead drop it (still burning) in this glass tube and press the cover (top) tightly on it; when the oxygen in it is exhausted, the cigarette end will die a natural death. This makes the ashtray easier to clean for the next subject. But remember to use the ashtray only when you want to flick out the ash from the cigarette. [See Appendix 6: Diagram 3(c).]

"Please, don't be afraid to terminate the session at any point if you don't want to continue. I'm going next door to put on a film on this TV monitor for you now, so when you've finished smoking or want to terminate the session, use this microphone to give me a shout and I'll hear you on the speaker next door. As you can see, I can't see you because you are enclosed, so you need to call me when you've finished."

These instructions were repeated for each subject throughout the study. After giving these instructions, the experimenter went into the observation room and adjusted all the video equipment, and monitored the subject's GSR again. When the subject's GSR reached the baseline level established earlier on, the experimenter started the video cassette recorder to record the subject and then instructed him/her to smoke, and at the same time started the videotape recorder to play a film for the subject to view on the TV monitor in front of him/her; or plugged a coaxial cable into the monitor attached to the console for the subject

to view himself/herself on the same monitor (in the experimental room) depending on the experimental condition [see Appendix 6: Diagrams 1(a), 1(b) and 1(d)]. The subject's GSR was then recorded at one-minute intervals during the first 7 minutes of the session. This started from the very moment the subject started smoking, that is, as soon as s/he put light to the cigarette [see Appendix 6: Diagram 3(a)]. Although the subject could not be observed through the one-way screen, the experimenter could still observe him/her on the monitors attached to the video console.

The experimental conditions (i.e. 'self-modelling' and film) were varied by either playing a cartoon film on the video tape recorder for the subject to watch on the TV monitor in front of him/her, or by plugging a coaxial cable into the monitor attached to the console thereby projecting the subjects' image onto the monitor in front of him/her to view himself/herself actually smoking. The experimental conditions were randomised in such a manner that each subject saw films half of the total number of sessions and himself/herself the other half. This randomisation made it relatively difficult for the subject to predict what he/she was going to see (i.e. himself/herself or film) when he/she reported for a session. The films were also varied so that no subject saw the same film twice.

FIGURE 1

Randomisation of Experimental Conditions for Individual Subjects

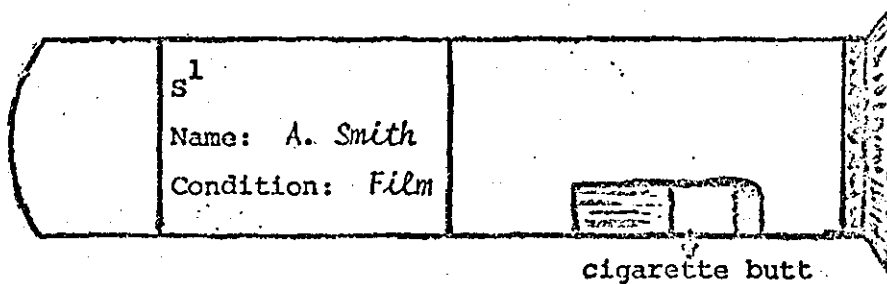
(a)			(b)		
SESSION	SELF	FILM	SESSION	SELF	FILM
1	✓		1		✓
2		✓	2	✓	
3		✓	3	✓	
4	✓		4		✓
5		✓	5	✓	
6	✓		6		✓

Notes: The above figures [Figure 1: (a) and (b)] represent the experimental conditions for 2 subjects. In (a) the subject viewed himself in sessions 1, 4 and 6, and films in sessions 2, 3 and 5; and in (b) the subject viewed himself in sessions 2, 3 and 5, and films in sessions 1, 4 and 6.

When the subject finished smoking, s/he called the experimenter on the microphone, and the experimenter went and removed the electrodes from his/her fingers, thanked him/her for his/her co-operation and reminded him/her of his/her next session. After the subject had left, the experimenter collected the glass tube containing the subject's cigarette butt. He then went into the observation room and stopped the video equipment, and labelled the sample tube (with the butt in it) appropriately (see Figure 2). After that he returned to the experimental room, cleaned the ashtray and re-arranged the cubicle for the next subject.

FIGURE 2

A Glass Sample Tube Containing A Cigarette Butt and Bearing the Subject's Number, Name and Experimental Condition



After the last experimental session of the day, the experimenter played back the recorded experimental sessions onto the monitor attached to the video console and recorded the total length of time a lit cigarette was in contact with each subject's lips. Time count started from the very moment the subject put light to the cigarette. The timer-counter which gave up to .01 second accuracy was used for this purpose. The cigarette butt of each subject was then weighed without the filter (the filter was cut off in order to eliminate saturation effects). The weight of the butt (without the filter) was then recorded. The full weight of an unsmoked Benson & Hedges Special Filter King Size without the filter had already been established (0.8598 grams). The balance (Sartorius 2432) which gave up to 0.1 gram accuracy was used for this purpose. To cut the filter off a cigarette butt, the butt was placed on a piece of aluminium foil and the filter was neatly cut off with a sharp surgical scalpel. The purpose of the aluminium foil was to collect any loose tobacco that fell out of the butt. Having recorded the weights of the cigarette butts, the experimenter then recorded the mean of each subject's minute-by-minute GSRs observed during the experimental session.

A (complete) session lasted on average 10-15 minutes. After completing the last session each subject was invited to comment, in writing, on how s/he felt in both experimental conditions [see Appendix 1 (iii)]. The subjects were also requested to give their opinions about cigarette smoking. They were then classified as "positive" or "negative" in accordance with their expressed opinions (i.e. positive or negative about cigarette smoking). Eight subjects expressed negative attitudes towards cigarette smoking - they expressed the wish to be able to give it up some time; while the remaining 6 subjects expressed positive attitudes towards the habit. The positive subjects regarded cigarette smoking as not any more dangerous to their health than, for instance, crossing a busy road. The experimenter finally thanked the subject for his/her co-operation throughout the study, and debriefed him/her.

3.5. Results and Discussion

Data was obtained on the following variables: (1) the amount of tobacco consumed by the subjects. This was defined as the difference between the weight (gm) of an unsmoked cigarette (without the filter) and the weight of the butt (also without the filter) after the smoking episode; (2) the amount of time lit cigarettes were in contact with the subjects' lips; and (3) the subjects' emotional arousal (GSRs). The experimental mean was 1.642; 27.15; and 18.96 for variables 1, 2 and 3 respectively; and the control mean was 2.134; 29.27; and 7.36 for variables 1, 2 and 3 respectively.

Related t-tests were performed on the data and the results indicated that: (a) the subjects consumed less tobacco in the self-modelling condition than in the control condition ($t = 3.14$, d.f. = 13, $p = .001$); (b) the amount of time lit cigarettes were in contact with

the subjects' lips was significantly lower in the former than in the latter condition ($t = 2.39$, $d.f. = 13$, $p = <.001$); and (c) the subjects were more emotionally aroused in the self-modelling condition than in the control condition ($t = -6.99$, $d.f. = 13$, $p = .007$).

Pearson's correlation coefficients were calculated between the following variables: (1) the amount of tobacco consumed and the amount of time lit cigarettes were in contact with the subjects' lips ($r = .10$); and (2) the amount of tobacco consumed and the subjects' emotional arousal ($r = .18$). Neither of these correlations was statistically significant.

In order to determine whether the subjects' expressed attitudes influenced their behaviour in the experimental conditions, difference scores were calculated between the subjects' scores in the film condition and in the self-modelling condition on all the three measures. The differences between subjects with positive and those with negative attitudes towards smoking were compared using unrelated t-tests. It was predicted that those with negative attitudes towards the habit would be most affected by the self-modelling condition. Although the results were in the expected direction for smoking (for amount consumed, $t = 1.449$, $p = <.05$; and $t = .772$, $p = <.05$ for time lit cigarettes were in contact with the lips), there was a very insignificant difference in the wrong direction for GSR ($t = .135$, $p = >.05$). In general, however, the data gave some grounds for considering further the role of cognitive factors in self-modelling.

3.6. Discussion

The results of the present study were in the predicted direction; that is self-modelling reduced cigarette smoking compared with the control condition.

The apparent redundancy of instructions or a second party in self-modelling, as indicated by the present findings, raises some important theoretical issues. These issues specifically concern the theoretical interpretations of the effects of self-modelling (and being imitated). Most investigators who have reported inhibitory effects of self-modelling (and being imitated) have tended to explain their results in terms of simple learning principles (e.g. Kauffman et al, 1975, 1976, 1977; Cullinan et al, 1975). For instance, Kauffman et al (1977) attributed suppression of tongue protrusion in a retarded mongol child by contingent imitation to punishment. That is the child regarded being imitated as an aversive stimulus. However, it might be argued that the behaviour in question must first of all be negatively valued by the subject in order for him to regard the imitation of that behaviour as aversive. Hence a satisfactory explanation of the effects of modelling in general and self-modelling in particular should take into consideration cognitive factors.

Further tentative support for this assumption comes from the subjects' invited comments on the study [see Appendix 1(a)]. Below is a random selection of the comments:

- Subject*³ (*male*) "... I unconsciously tried not to look at the TV so much as I kept seeing an image I wasn't used to."
- Subject*⁵ (*male*) "... seeing myself the third time, I felt extremely self-critical and dissatisfied somehow with myself."
- Subject*⁷ (*female*) "... smoking seems a useless pastime and to watch myself smoking made me wonder why I continued the habit ..."
- Subject*⁹ (*male*) "... I did not realise that I looked like I did on TV, i.e. my face was longer than I imagined it was and sometimes it felt like looking into the brain of a very weary person."
- Subject*¹⁰ (*female*) "... I avoided watching the television screen after I had sussed out what I looked like. I felt at a loss what to do."
- Subject*¹¹ (*female*) "It gave me a chance to watch how I appear as I smoke or drink and a chance to view myself as others would see me."

In summary, the results of this study indicate clearly that self-modelling can have inhibitory effects on the behaviour of intelligent human adults. The findings (e.g. the subjects' GSR) and the subjects' comments on the experimental condition also seem to indicate

that cognitive involvement on the part of the subject mediate the effects of self-modelling. Hence it is suggested that the behaviour concerned and the subjects' cognitive evaluation of that behaviour are among the various factors that play a paramount role in determining the effects of self-modelling. It would further be hypothesised that if the behaviour entails negative emotions for the subject, then self-modelling will have inhibitory effects on that behaviour. This may explain the findings of the present study.

On the basis of the findings of the present study and the theoretical arguments detailed above, it is necessary to carry out further studies in order to elucidate the role cognitive factors play in self-modelling phenomena (or modelling in general).

STUDY ONE: AN INVESTIGATION INTO THE RELATIONSHIP BETWEEN
COGNITIVE FACTORS AND SELF-MODELLING

3.7. Introduction

In the pilot study, it was found that self-modelling reduced cigarette smoking. The results and findings further suggested that cognitive factors (i.e. cognitive involvement on the part of the subjects) might account, at least in part, for the effects of self-modelling. This suggestion is based upon the assumption that in (non-directive) self-modelling (as used in the pilot study), there is no inbuilt direction for behaviour change, so that only the subject's cognitions about the behaviour concerned can account for the observed behaviour change. However, it was difficult to determine the degree of the relationship between cognitive involvement (on the part of the subjects) and the effects of self-modelling since the study did not investigate directly the role cognitive factors play in self-modelling.

It seems likely that for self-modelling to inhibit or facilitate a person's behaviour, the behaviour concerned must possess negative or positive connotations, as the case may be, for the individual. Thus in order to examine directly the relationship between cognitive factors and self-modelling, the study described below manipulated a cognitive variable - attitudes about cigarette smoking.

Dissonance theory (Festinger, 1957) proposes that inducement of dissonance or consonance in a person, via exposure to dissonant or consonant information about a behaviour or an attitude which he already possesses, will influence his behaviour or attitude accordingly. On

the basis of this proposition, Brehm and Cohen (1962) have classified the major phenomena of dissonance theory into three main categories: (1) forced-compliance studies; (2) free-choice studies; and (3) exposure to information studies. The exposure to information category of dissonance studies involve two main paradigms: (a) studies in which the individual is involuntarily exposed to information that is inconsistent with information or an attitude which he already possesses; and (b) studies that examine the individual's willingness to expose himself voluntarily to dissonant information.

The present study employed the former paradigm (i.e. involuntary exposure to dissonant information) to investigate such cognitive factors as may mediate the effects of self-modelling. The subjects were first of all involuntarily exposed to information that was either consonant or dissonant with their attitudes towards cigarette smoking, and then later viewed themselves engaging in that behaviour. Thus the present paradigm may be referred to as "double forced-exposure to information paradigm". In such a situation, dissonance theory would make the following predictions: (1) if the information is inconsistent with the person's attitudes towards the behaviour, he will either distort the information or change his attitudes about the behaviour (or the behaviour itself) in order to reduce the ensuing dissonance; (2) if the information is consistent with the person's attitudes towards the behaviour then consonance is achieved, and there will be no change in any of the elements of cognition involved. On the other hand, cognitive-behavioural model of behaviour change (as described earlier), like objective self-awareness theory (Duval & Wicklund, 1972; Wicklund, 1975) would hypothesize that, in such a situation, whether or not the person changes his behaviour or attitude towards the behaviour will depend upon the nature of his evaluation

(positive or negative) of not only the behaviour, but also of himself in relation to the behaviour or attitude concerned.

3.8. Aim

The aim of this study was twofold:

- (1) to investigate whether or not cognitive factors mediate the effects of self-modelling;
- (2) to advance a cognitive (theoretical) interpretation of the effects of self-modelling.

3.9. Hypotheses

Partly on the basis of the findings of the pilot study, it was hypothesised that:

- (1) The subjects' initial attitudes to cigarette smoking prior to self-modelling and prior to receiving information would have no effect on the following dependent variables:
 - (a) amount of tobacco consumed;
 - (b) amount of time that lit cigarettes stayed in the subjects' mouths; and
 - (c) the subjects' emotional arousal.
- (2) The subjects who received information favourable to cigarette smoking as compared to those who received unfavourable information about the habit, regardless of their initial attitudes to smoking, would produce:
 - (a) higher levels of tobacco consumption;
 - (b) higher levels of time that lit cigarettes remained in the mouth; and
 - (c) lower levels of emotional arousal.

This is because the favourable information is reassuring, and thus creates no cognitive discomfort. The unfavourable information, on the other hand, would tend to create discomfort in the subjects.

(3) The subjects' initial attitudes would interact with information such that:

(i) subjects with positive attitudes towards smoking who received favourable information about smoking would show:

- (a) higher levels of tobacco consumption;
- (b) greater amount of time that lit cigarettes stayed in their mouths; and
- (c) lower levels of emotional arousal;

(ii) subjects with negative attitudes to smoking who received unfavourable information about the habit would show:

- (a) lower levels of tobacco consumption;
- (b) lower amount of time that lit cigarettes remained in the mouth; and
- (c) higher levels of emotional arousal.

3.10 Method

(i) Subjects

Subjects consisted of 37 regular cigarette smokers (16 males and 21 females). Their mean self-reported cigarette consumption was 15 cigarettes per day. The subjects were all pursuing various degree courses at Loughborough University. Each subject served under two experimental conditions: self-modelling condition and control condition. An experimental mistake involving one of the subjects (a female) necessitated her exclusion from the statistical analyses. None of these subjects participated in the previous study.

(ii) Experimental Design

This study employed a pre-test-post-test design. The post-test condition involved involuntary exposure to information. The variables that were measured in the present study were the same as those in the previous experiment; and both pre-test and post-test data were recorded. In the pre-test condition, the subject viewed a 10-minute long cartoon film on a television monitor while smoking. After all the subjects had served under the pre-test condition, as in the previous experiment, they were asked about their opinions regarding cigarette smoking. For the purposes of the post-test condition, they were then assigned into two groups: (1) positive (or consonant) smokers, and (2) negative (or dissonant) smokers, in accordance with their expressed opinions about cigarette smoking. Members of each group were further randomly categorised into two sub-groups. Each sub-group was then exposed to either consonant or dissonant information about cigarette smoking, that is, information which was either favourable or unfavourable to cigarette smoking (Appendix 2(a) (i) and (ii)). This categorisation (and sub-categorisation) resulted in the following four groups.

- (1) positive smokers exposed to favourable information;
- (2) positive smokers exposed to unfavourable information;
- (3) negative smokers exposed to favourable information;
- (4) negative smokers exposed to unfavourable information.

(iii) Apparatus

The apparatus employed in this study was identical to that used in the previous experiment; the only addition being:

- (1) literature emphasizing the health hazards of cigarette smoking; (Hammond, E.C., 'The Effects of Smoking', Scientific American, 1962, 207, 39-51 (Appendix 2(a) (i)));
- (2) fictitious literature (written by the experimenter) designed to play down the health hazards associated with cigarette smoking (Appendix 2(a) (ii)).

(iv) Procedure

The present experiment was conducted in the same Psychology Laboratory as the previous study; it also followed the same experimental procedure as the one described in the previous study.

However, some minor modifications were made in this study. For instance the subjects were made to believe that the study was an investigation into the relationship between cigarette smoking and long term memory. The purpose of the deception was to distract the subjects from the true purpose of the study; and also to ensure that they read the appropriate literature which they were given. Another difference was that this study employed a pre-test-post-test design; and the subjects were categorised into consonant (or positive) and dissonant (or negative) smokers after the pre-test sessions.

In the pre-test condition, the subjects viewed a 10-minute long cartoon film on a television monitor while smoking. Three days before each group (as described above) reported for the post-test session, all its members were given literature (i.e. favourable or unfavourable information) about cigarette smoking (Appendix 2(a) (i) and (ii)). Each was then requested to read and digest it for the second and final stage of the experiment at the end of which s/he would be given a short memory test based on the literature.

In the post-test condition, the subject viewed himself/herself on a television monitor while smoking. At the end of the post-test session, the experimenter asked the subject one or two questions about the literature s/he had read. This ostensibly constituted the memory test, but it was actually to determine whether or not s/he had read it, and also to reassure him/her that s/he had not wasted his/her time reading it. All the subjects seemed to have read their appropriate literature fairly well. Although almost all the subjects who received the unfavourable literature remarked that parts of it (mainly the medical jargons) were too technical for them to understand,

their discussion of it indicated that on the whole they had got the gist of it. Precautions were taken to ensure that no subject was exposed to both types of literature while the experiment was in progress. One subject (female) who was accidentally exposed to both was excluded from the statistical analyses.

At the end of the post test session, each subject was debriefed and those who received the favourable literature were told to disregard the contents.

3.11 Results

Basically, the design consisted of two independent variables - positive versus negative initial attitude and favourable (consonant) versus unfavourable (dissonant) information about cigarette smoking. The dependent variables consisted of the following:

- (a) amount of tobacco consumed;
- (b) amount of time that lit cigarettes remained in the mouth; and
- (c) the subjects' emotional arousal (GSR).

For the purposes of statistical analyses, the differences between the pre-test and the post-test data were computed for each subject. (See Appendix 2(b): (i) - (iii)).

The following hypotheses were tested in this study:

Hypothesis 1: This concerned the effect of the subjects' initial attitudes on the dependent variables. Unrelated t-tests were performed on the pre-test data to determine whether or not there was such an effect.

Analysis of the results indicated that prior to treatment (i.e. prior to self-modelling and information) the 'positive' and 'negative' subjects were similar as far as the above dependent variables were concerned ($p > .10$; for each variable). 'Positive' mean was .6217; 32.17; and 4.20 for amount of tobacco, amount of time and emotional arousal respectively; and 'negative' mean was .5984; 32.53; and 3.86 for amount of tobacco, time and emotional

arousal respectively (see Appendix 2(d): (i) - (iii)). Hypothesis 1 was therefore supported, in so far as a null hypothesis could be accepted.

Hypothesis 2: This concerned the effect of information on the measured variables regardless of attitude. Thus, in order to examine the effect of information, comparisons were made between the following sub-groups, using unrelated t-tests:

- (1) positive smokers exposed to favourable information;
- (2) positive smokers exposed to unfavourable information;
- (3) negative smokers exposed to favourable information; and
- (4) negative smokers exposed to unfavourable information.

These intergroup comparisons resulted in six separate comparisons (see Appendix 2: (e)-(1)). The data indicated that irrespective of the subjects' initial attitudes to smoking, the subjects who received favourable information about the habit smoked more and showed lower levels of emotional arousal compared to those who received unfavourable information. Hypothesis 2 was therefore substantiated. (See Table 2 below).

Table 2: MEAN DIFFERENCES BETWEEN PRE-TEST AND POST-TEST CONDITIONS
BY ATTITUDE AND INFORMATION

	AMOUNT OF TOBACCO CONSUMED (GRAMS)	TIME (SECONDS) CIGARETTES WERE IN MOUTH	GSR
Consonant Subjects Exposed to Consonant Information	-.0435	-6.10	2.29
Consonant Subjects Exposed to Dissonant Information	.0541	3.47	-1.74
Dissonant Subjects Exposed to Consonant Information	-.0260	-3.84	2.55
Dissonant Subjects Exposed to Dissonant Information	.0739	.91	-2.33

The above Table indicates that irrespective of initial attitudes, subjects exposed to unfavourable information about smoking smoked less than those exposed to favourable information about the habit.

Specifically, when groups exposed to different types of information about cigarette smoking were compared (i.e. favourable versus unfavourable information) significant differences were observed in the amount of tobacco consumed, amount of time that lit cigarettes were in contact with the subjects' lips, and the subjects' emotional arousal ($p < .05$). However, no significant differences were obtained in any of the above variables when groups exposed to the same type of information (i.e. favourable or unfavourable information) were compared ($p > .05$). This was the case irrespective of initial attitude, thus confirming the prediction that the subjects' initial attitudes per se would have no effect on the dependent variables.

Hypothesis 3: This concerned the combined effect of attitude and information on the measured variables. To determine the interaction effect of the above independent variables, a 2-way ANOVA was performed on the data on each dependent variable (see Table 3 below).

TABLE 3: SUMMARY OF 2-WAY ANOVA ON DATA: BY VARIABLE

(i) Amount of tobacco consumed

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F-RATIO	EXPECTED F	PROB.
A (Category of S)	.0024	1	.0024	.3934		> .05
B (Information)	.0876	1	.0876	14.3607	≥ 4.15	< 0.01
AB (Interaction)	.0007	1	.0007	.1148		> .05
Within Cell	.1957	32	.0061			
Total	.2865	35	.0082			

(ii) Amount of time cigarette stayed in mouth

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F-RATIO	EXPECTED F	PROB
A (Category of S)	-	1	-	-		> .05
B (Information)	483.4135	1	483.4135	19.1969	≥ 4.15	< 0.01
AB (Interaction)	59.7538	1	59.7538	2.37289		> .05
Within Cell	805.8213	32	25.1819			
Total	1348.9886	35	38.542431			

(iii) GSR

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F-RATIO	EXPECTED F	PROB
A (Category of S)	.4512	1	.4512	.1516		> .05
B (Information)	173.4371	1	173.4371	58.2903	≥ 4.15	< 0.01
AB (Interaction)	3.2868	1	3.2868	1.1046		> .05
Within Cell	95.2125	32	2.9754			
Total	272.3876	35	7.7825			

The results, as indicated in Table 3, revealed that there was no main effect for attitude; neither was there any interaction effect between the subjects' initial attitudes to smoking and the type of information they received (favourable or unfavourable). Thus hypothesis 3 was not supported. However, a highly significant main effect was found for information ($p < .01$). This effect applied equally to all the three variables. This suggests that the type of information the subjects were exposed to rather than their initial attitudes influenced their smoking behaviour in the self-modelling condition.

Pearson's correlation coefficients were computed on the data to determine if there was any correspondence between any of the variables under investigation. Contrary to the findings of the previous study, analyses of the results revealed a positive correlation between the amount of tobacco consumed and time spent smoking ($r = .3525$); a negative correlation between time spent smoking and physiological arousal ($r = -.3752$); and a negative correlation between amount of tobacco consumed and physiological arousal ($r = -.5223$); (See Appendix 2 (m)). The negative correspondence obtained between the amount of time the subjects spent smoking and their physiological arousal (GSR) indicates that the more emotionally aroused the subjects were the less they tended to smoke and vice-versa. This in fact was in the hypothesised direction.

3.12 Discussion

The following hypotheses were tested in this study:

- (1) The subjects' initial attitudes to smoking per se would have no effect on the dependent variables (i.e. without self-modelling or information).
- (2) In a self-modelling situation, irrespective of the subjects' initial attitudes to smoking, favourable information about cigarette smoking would produce higher levels of tobacco

consumption and the time that lit cigarettes remained in the mouth, and lower emotional arousal compared to information unfavourable to the habit.

- (3) There would be an interaction effect between the subjects' initial attitudes and information on the measured variables, although this effect would depend upon the type of information (favourable or unfavourable) the subjects received.

The above hypotheses in addition clearly relate to the major objective of trying to establish the role of cognitive factors in self-modelling.

The results and findings supported the above predictions with the exception of an interaction between the subjects' initial attitudes and the type of information they received. That is irrespective of initial attitudes smoking was least in the subjects who received unfavourable information about the habit and greatest in those who were given information which was favourable to smoking.

In this study, unlike the pilot study, the subjects' cognitions about smoking were manipulated directly through exposure to information that was either favourable or unfavourable to cigarette smoking. The results seem to indicate that this manipulation (i.e. the information) varied the effects of self-modelling.

The present results and findings support the assumption that cognitive processes are involved in self-modelling. However, as indicated by the pre-test data and the findings of Study Four (Ch. 6) these same cognitive factors (i.e. attitude and information) without self-modelling seem to have no effect. Thus the lack of interaction between attitude and information is not surprising given the lack of

effect of attitude acting independently. This lack of interaction may be due to the fact that attitude and smoking had clearly co-existed in the subjects.

The assumption that an individual who possesses negative cognitions about a behaviour should experience psychological discomfort when seeing himself indulging in that behaviour seems supported by the data.

Similarly they appear to support the suggestion that one of the ways in which an individual in such a situation may reduce the discomfort is by terminating or modifying the behaviour concerned.

Through health education, most cigarette smokers are aware of the health risks associated with smoking; thus many cigarette smokers may be said to harbour, albeit to varying degrees, a discrepancy between their knowledge of the ill-effects of smoking and their actual behaviour (i.e. smoking). It would appear that in the pilot study, for instance, this discrepancy was made more prominent to the subjects by the self-modelling condition - when they viewed themselves actually smoking - relative to the control condition. The heightened awareness of this discrepancy in the self-modelling situation led the subjects to evaluate their smoking negatively. It may be that one of the consequences of this negative evaluation was the higher emotional arousal observed in that situation compared with the control condition. The subject's comments on the study seem to support this suggestion (p.88).

Although the results and findings of the above two studies seem to contradict the findings of a similar study based on Duval and Wicklund's (1972) objective self-awareness theory (Liebling, et al, 1974), they appear to indicate that: (1) self-modelling can inhibit

cigarette smoking behaviour; and (2) that cognitive factors mediate the effects of self-modelling. Thus these findings give some grounds for discussing the present results in cognitive terms.

3.13. General Discussion

One of the aims of Study One was to investigate whether or not cognitive factors mediate the effects of self-modelling; that is, to examine the theoretical implications of the results and findings of the previous study (pilot study). Cognitive behavioural model of behaviour change (described in Chapter 2) seems appropriate in this endeavour. Like cognitive consistency theories, one of the basic assumptions of this model is that every human organism, like all biological organisms, is an equilibrium-seeking organism; thus, most, if not all, of his behaviour is directed towards the maintenance or establishment of internal or cognitive equilibrium. According to 'cognitive-behavioural model of behaviour change', the existence of inconsistency (or mismatch) between a person's 'ideal' behaviour and his actual behaviour should motivate him to re-establish consistency. This of course depends on the further assumption that the person is aware (or is made aware) of the existence of such inconsistency, and also that he evaluates negatively one or both of the cognitions involved. (i.e. himself and the behaviour).

The model proposes that negative evaluation of one or more of the cognitive elements involved (e.g. the behaviour or self) entails negative emotions. Thus if the inconsistency is evaluated in negative terms, the person will be more likely to change the behaviour (or cognitions about himself) in order to eliminate or reduce the negative emotions arising out of the inconsistency - that is, to establish consistency. This will be particularly likely if other modes of reducing the discomfort such as avoiding the situation or other people

who are likely to make the inconsistency salient to the person are not feasible.

This cognitive framework would thus seem a satisfactory explanation for the results and findings of the present studies. As mentioned previously, in Britain today as in most Western nations, health education is widespread. Through the mass media and other sources of information, most cigarette smokers have become aware that cigarette smoking is incompatible with a healthy life. They recognise that ideally, they should not smoke at all, or at least they should smoke less than they actually do. Consequently, many smokers may be said to harbour (albeit to varying degrees) dissonance or cognitive inconsistency between their knowledge of the ill-effects of smoking and their actual behaviour (i.e. smoking). It would appear, therefore, that in the pilot study, for instance, the existence of such inconsistency was made salient to the subjects in the self-modelling condition - when they viewed themselves actually smoking. The heightened awareness of this inconsistency, as proposed by cognitive behavioural model of behaviour change, led the subjects to evaluate their behaviour (smoking) negatively. One of the consequences of this negative evaluation of smoking might be the greater emotional arousal observed in the self-modelling condition relative to the film condition (as measured by GSR). That the subjects attempted to reduce this negative affect by altering their behaviour is supported by their reduction of tobacco consumption both in terms of quantity and amount of time they left lit cigarettes in their mouths in the self-modelling condition. The subjects' comments on the study (pilot study) as a whole makes this suggestion all the more plausible (p. 88).

The role of cognitive factors in self-modelling becomes more evident through examination of the results of Study One. For instance a comparison between consonant subjects exposed to favourable information and dissonant subjects exposed to unfavourable information reveals highly significant differences between the two groups in the amount of tobacco consumed, the amount of time lit cigarettes were in contact with their lips, and their emotional response ($P = < .01$ for each variable). On the other hand, when consonant subjects and dissonant subjects were exposed to the same type of information (favourable or unfavourable) about cigarette smoking, no significant differences were observed between them as far as the above variables were concerned ($P = > .10$). Neither was any significant difference found between the subjects with negative attitudes and those with positive attitudes to smoking in their smoking behaviour in the pre-test condition ($p = > .10$).

The overall implication of the present results is that the subjects' smoking behaviour patterns in the self-modelling situation varied in accordance with the type of information they were exposed to, as opposed to their initial attitudes. In other words, the manipulation of the subjects' cognitions about smoking via exposure to information had a significant influence on their smoking behaviour in the experimental situation. Thus, according to cognitive-behavioural model of behaviour change, subjects who were exposed to favourable information about cigarette smoking evaluated their behaviour (assuming that they accepted the information) positively in the self-modelling situation, and hence smoked accordingly; while those who were exposed to unfavourable information evaluated smoking negatively and consequently smoked less relative to the former group of subjects. This is not surprising because the former type of information was designed to

foster consonance or positive affect in the subjects while the latter information was designed to induce dissonance or negative affect in the subjects. Thus, as indicated by the results, the more negative the concomitant affect the greater the emotional arousal experienced and the less the subjects smoked, and vice-versa. The suggestion that the subjects made cognitive evaluation of themselves and their smoking behaviour in the self-modelling condition is further attested by the comments of the subjects involved in the pilot study.

Although these experiments involved relatively young and healthy subjects (university students), it is doubtful if the results would have contradicted the present findings had the subjects been older smokers with a longer history of cigarette smoking or more concerned with their health. In fact, it might be assumed that had the subjects been older or more concerned with their health, the results would have moved even closer in the hypothesized direction because it is generally accepted that older people are more susceptible to the diseases associated with cigarette smoking, such as heart disease and lung cancer, than young people.

Both studies demonstrate that self-modelling can inhibit a person's undesirable behaviour. The results also raise a number of theoretical as well as practical implications. As already suggested, the findings of the present studies support the theoretical viewpoint advanced in Chapter Two. This proposes that if an individual evaluates his behaviour and/or its consequences negatively, he will experience subjective discomfort when placed in a situation where he can observe himself engaging in that behaviour. In order to eliminate or reduce the subjective discomfort resulting from such evaluation, the person will either change the behaviour or reorganise his cognition (i.e.

opinion or belief) about the behaviour. Thus one of the major theoretical issues raised by the results and findings of these studies is that cognitive factors mediate self-modelling phenomena. In other words, the effects of self-modelling on a person's behaviour (facilitatory or inhibitory) depends largely on his cognitions (positive or negative) about the behaviour concerned. In Study One, inducement of consonance in the subjects, via exposure to favourable information about cigarette smoking, seemed to have facilitated their smoking behaviour. Conversely, inducement of dissonance via exposure to unfavourable information about the habit seemed to have inhibited the subjects' smoking behaviour.

This cognitive interpretation of the effects of self-modelling (or modelling in general), differs from learning theory interpretations of self-modelling or being imitated discussed in chapter one (e.g. Byrne, 1971; Cullinan et al, 1975; Kauffman et al, 1976,1977; Thelen et al, 1976, 1977, 1981). For instance, Kauffman et al, (1977) in their report of suppression of tongue protrusion in a mentally retarded mongol child by contingent imitation concluded that the subject regarded being imitated as an aversive stimulus. In other words, the subject interpreted being imitated as an aversive (or punishing) stimulus from which he tried to escape by keeping his tongue in his mouth. A cognitive interpretation of Kauffman and his colleagues' findings would be that their subject's suppression of his tongue protrusion was a result of cognitive reorganisation of his behaviour which he was made more aware of following being imitated. However, if one regards negative affect (as proposed by cognitive-behavioural model) as an aversive drive or stimulus, then the above two interpretations are not essentially dissimilar. However, the interpretation of such intangible stimulus as

being imitated as aversive (or rewarding) involves cognitive processes on the part of the individual. Thus, cognitive-behavioural model of behaviour change would appear to be a more appropriate framework in which self-modelling phenomena may be interpreted.

The findings of the present studies have implications for therapy as well. For instance, with regard to smoking, the literature on the modification of cigarette smoking behaviour indicates several subject factors that might be employed in the design of treatment programmes. Two of the cognitive factors which have been employed in the treatment of cigarette smoking are: (1) Rotter's (1966) locus of control, and (2) Effective Cognitive Dissonance (Keutzer, 1968). For instance, Best and Steffy (1971) using a procedure designed to induce dissonance in the subjects reported that inducement of dissonance in the subjects produced greater reductions in cigarette smoking than the use of locus of control procedures. Kuetzer (1968) also found that the level of the subject's cognitive dissonance at the beginning of smoking treatment was a significant predictor of treatment outcome. These findings give further support to the cognitive interpretation of the findings of the present study. With respect to treatment it would seem that inducement of cognitive dissonance combined with self-modelling may be a more effective technique for the treatment of cigarette smoking behaviour. The results and findings of the present studies support this suggestion. In both studies, volunteer subjects who did not actively seek help to break the habit reduced their tobacco consumption remarkably in the self-modelling situation relative to the control condition. The impact of self-modelling on cigarette smoking was even more remarkable when it was combined, in Study One, with dissonance arousal procedure.

The results and findings of the above two studies have implications for cigarette smokers themselves. For instance, asked why they smoke, cigarette smokers often give such reasons (or excuses) as: "To calm the nerves", "To break the monotony and the boredom", and so forth. These are two of the most frequently cited reasons by cigarette smokers for continuing the habit. If smoking actually had such effects, we would expect the subjects to increase their smoking in the self-modelling condition in which one would expect them to be more bored than in the film condition rather than vice-versa, as indicated by the results of the above two studies. Likewise, to calm their nerves, they should have consumed more tobacco in the self-modelling condition in which they were more emotionally aroused (as measured by GSR) than in the film condition. Instead, the opposite was observed. It would seem, therefore, that 'boredom' and 'bad nerves' are mere feeble excuses often given by smokers for continuing the habit. At best, any calming effect that a cigarette smoker may derive from smoking may be described as placebo effect. After all, nicotine is a stimulant rather than a tranquillizer.

In conclusion, the results and findings of the present studies seem to indicate that cognitive factors mediate self-modelling phenomena. They demonstrate that the type of effect (facilitatory or inhibitory) self-modelling has on a person's behaviour is dependent, to a large extent, upon the person's cognitions (or evaluation) about the behaviour in question. If the person evaluates the behaviour in positive terms, then that behaviour will be facilitated in a self-modelling (or imitation) situation. Conversely, if the behaviour is negatively evaluated by the individual, then that behaviour will be inhibited or suppressed in a self-modelling situation. Thus it appears that

CHAPTER FOUR

STUDY TWO: SELF-MODELLING AS A MODE OF SELF-CONTROL IN AN EYEBLINK CLASSICAL EXTINCTION EXPERIMENT

SUMMARY

The use of self-modelling as a technique for self-control was investigated. Two groups of 64 subjects received 40 eyeblink conditioning trials each, followed by extinction trials with a 30-second rest period between the acquisition phase and the extinction phase. The experimental group viewed themselves in a mirror during the extinction phase, whereas the control group received no visual feedback. The conditioned stimulus consisted of an auditory tone, while the unconditioned stimulus consisted of light from an electronic flashgun directed into the subject's eyes. Analysis of the extinction data showed that self-modelling inhibited the conditioned response. This is consistent with the findings of similar studies which employed facilitative and inhibitory 'instruction techniques'. This study provides further evidence that cognitive processes are involved in the effects of self-modelling. It also suggests that these operate in (classical conditioning) situations where the role of cognitive factors has not been fully recognised.

4.1 INTRODUCTION

The traditional hypothesis for classical conditioning is that repeated pairing of a conditioned stimulus (CS) with an unconditioned stimulus (UCS) will cause the CS to elicit a conditioned response (CR) in a subject in an unconscious automatic fashion. Thus the hypothesis assumes that in humans, the higher mental or cognitive processes are a myth, or at best, a minor factor that need not be considered in standard conditioning experiments. This assumption obviously ignores the important role the subject's awareness of the CS-UCS relationship, as well as his awareness of his own behaviour, plays in the kind of events observed by the experimenter in conditioning experiments.

In autonomic conditioning, there seems to be little need for the subject to be aware of his response. In most cases, for instance, GSR, the subject may not even be aware that he is capable of producing the response. However, in most standard motor classical conditioning experiments such as finger withdrawal conditioning, it might be assumed that the subject's awareness of the situation plays an important role. In such a situation, the subject makes a conscious decision about what response to make, so that he must, at least, initially be aware of the response. It is possible, nonetheless, to conceive of a situation where the subject is not kinesthetically aware of his motor response, e.g. a slight blink of the eyelid when he expects the eliciting UCS to occur.

Such a motor task with an unconscious response is analogous to autonomic conditioning.

Recent investigators of conditioning phenomena in humans have become aware that when exposed to a conditioning experiment, the human subject does not often remain a passive pliable vessel responding to the dictates of the stimuli and their contingencies. As Lockhart (1973) and Orne (1962), for instance, have suggested, more often than not the human subject comes to the experiment with thoughts, feelings, emotions, attitudes, beliefs and expectations which play a major and critical role in the behaviour which we observe in the experimental situation. In short, attempts to understand human conditioning in terms of simple stimulus and response characteristics have not done justice to the complexity of behavioural variation which the subject exhibits even in the simplest or most disguised conditioning situations. For instance, it may be suggested that the subject's knowledge and interpretation of the stimulus arrangements is at least as potent a variable as are the stimulus characteristics themselves. Accordingly, it may be postulated that manipulation of the knowledge or awareness dimension alone is sufficient to facilitate or inhibit responding despite the physical characteristics of the experimental paradigm. It is not surprising, therefore, that there is a developing trend to study this cognitive (knowledge/awareness) dimension of human interaction with conditioning procedures.

One of the early investigators who showed interest in practical questions of extinguishing undesirable conditioned autonomic responses where conventional extinction procedures were compared to what might be termed "extinction plus knowledge" was Haggard (1943). Haggard investigated a

variety of cognitive variables affecting skin resistance (CSR) phenomena by associating shock with a verbal stimulus. One of the conclusions drawn from this study was that cognitive factors have an important effect on general reactivity (emotional arousal) variables and that the influence of cognition on extinction, while present, depends upon other variables, such as task requirements.

Warren (1934) has defined cognition as "a generic term used to designate all processes involved in knowing (it begins with immediate awareness of objects and perception and extends to all forms of reasoning)." (in Grant, p. 75). If we accept this definition, then it becomes obvious that the human subject in a classical conditioning (or extinction) experiment is not only physically but also cognitively involved in the experiment. Thus cognitions are certainly involved in eyelid conditioning, but the question of how these may affect behaviour is not very well understood. It will be hypothesised in the present study that the effects of these cognitions on a person's behaviour primarily depend upon the human subject's evaluation of the behaviour involved.

The study of cognitive activity or awareness in conditioning has mainly involved "instruction techniques". For instance, Gormezano and Moore (1962), Hilgard and Humphreys (1938), and Prokasy and Allen (1969) used the "Instructed Conditioning Technique" with the eyeblink response. All these investigators reported conditioning. On the other hand, Fishbein and Gormezano (1966), Hilgard and Humphreys (1938), Miller (1939), Hill (1967) and Prokasy and Allen (1969) using the "Instructed Non-Conditioning Technique" reported a drastic reduction in conditioning. All these findings highlight the importance of cognitive variables in conditioning experiments. Cognitive activity in classical as well as

operant conditioning has been a subject of a number of reviews (e.g. Creelman, 1966; Ross, 1971; and Brewer, 1975). The existence of this review literature permits the present author to focus attention chiefly on one of the ways in which the subject's cognitions may influence his behaviour in a conditioning experiment.

It is perhaps not a coincidence that 'involuntary' responses are the ones that we ordinarily do not see or feel, whereas the 'voluntary' responses of large skeletal muscles are out in the open for our inspection. It seems, therefore, that it is the absence of continuous information about our internal responses that cause them to be beyond our volitional control. After all, we ordinarily learn responses and learn to guide our behaviour by observing what we do, seeing its consequences and making appropriate adjustments. Knowledge of the response and its consequences is embodied in what is termed "feedback stimuli". These feedback stimuli are exceptionally important not only in learning, for instance, new skilled motor movements, but also in our control of undesirable behaviour and maintenance of adaptive behaviour.

4.2 AIM

This experiment explored learning theory interpretation of self-modelling phenomena relative to cognitive-behavioural model of behaviour change. Thus it investigated the use of self-modelling (or self-feedback) as a mode of self-control in an eyeblink classical extinction experiment.

4.3 HYPOTHESIS

An abnormally high rate of eyeblink is deemed socially undesirable in humans (and perhaps a threat to survival). Hence it was hypothesised that a human subject in an eyeblink classical conditioning experiment who was provided with a visual feedback of his responses would be less resistant to extinction than his counterpart who was not provided with such feedback.

4.4 METHOD AND PROCEDURE

(i) Subjects

Sixty-four volunteer subjects (31 males and 33 females) participated in the experiment. The subjects consisted of postgraduates and undergraduates of various academic disciplines at Loughborough University. They were recruited on the pretext of a study of how human adults process two different kinds of sensory stimuli presented simultaneously. Four subjects were excluded from the statistical analyses owing to equipment difficulties during the experiment. All the subjects were screened for contact lenses.

(ii) Apparatus

This comprised the following:

- (1) Birbeck Laboratory Timer and Signal Source
- (2) Oscillograph (George Washington Ltd., 400 MD/2)
- (3) Electronic Flash Unit with Gold Xenon Tube (Sunpak Auto 24)
- (4) Headphones (ITT, SKH 400)

- (5) A large mirror (61 cm x 45 cm)
- (6) 3 screens
- (7) 3 electrodes
- (8) Electro-jelly
- (9) Surgical spirit
- (10) Surgical adhesive tape
- (11) Cotton Wool

(See Appendix 6: Diagrams 2(a) and 2(b).)

(iii) Design

The experiment involved the extinction of eyeblink classical conditioning. The stimuli were a tone (CS) and a flash of light (UCS) which were presented to the subject simultaneously (interstimulus interval = .0). The stimuli were controlled by a Birbeck Laboratory Timer and Signal Source. The metronome mode of this equipment was selected. In this mode, auditory pulses of 100 msec duration occurred at 4.5 second intervals. The audio level was set to maximum and the stimulus was fed to the subject via headphones of 400 ohm impedance. The Birbeck had an internal relay providing two sets of output contacts. Throughout the experiment, a connection was made to the normally open contacts of both sets. At the commencement of the auditory tone, these contacts closed. One set of contacts was used to provide a reference signal for the oscillograph (George Washington 400 MD/2).

The oscillograph was an ink-pen recorder of which two tracts were used, each having its input from a 100 uv cal. A.C. input coupler module, No. FC124. These modules plugged into the Washington (oscillograph), and could be substituted for others - the galvanomic module was used in this experiment. The closure of the other set of the Birbeck's output contacts provided a sufficient 'disturbance' at the input of one A.C. input coupler of the oscillograph to enable a suitable deflection of the pen to be made. These pulses were recorded as events. The second A.C. input coupler of the oscillograph was connected to three electrodes which were placed in appropriate areas of the subject to enable eyeblink responses to be significantly recorded on the other track of the oscillograph. In addition to the pen recording the event marking, a timer pen was also triggered from appropriate leads from the Birbeck Timer and Signal Source. The chart speed of the oscillograph was set at .625 cm/sec. The gain control on the oscillograph was adjusted for each subject such that UR (unconditioned response) produced a pen deflection of not less than 4 mm. The Birbeck and the Washington were screened from the subjects throughout the experiment.

The visual stimulus (UCS) was provided by an electronic flash unit (Sunpak Auto 24). The flash unit was supplied from 240 volt A.C. mains via a Sunpak A.C. adapter, and was operated on manual setting. The UCS too was controlled by the Birbeck Timer and Signal Source. The Birbeck maintained constant intertrial intervals of 4.5 seconds through the experiment. The flash unit was mounted on a tripod placed behind (and above) the mirror in front of the subject at eye level, and 188 cm away from the subject. The mirror was mounted on a table (74 cm high) placed in front of, and 160 cm away from, the subject. A white 1 cm circular spot was placed in the middle of the front and back (opaque side) of

the mirror for the subjects of fixate on (See Appendix 6: Diagrams 2: (a) and (b)).

The subjects were assigned alternately to the experimental and control groups. All the subjects faced the back of the mirror during the acquisition phase. However, the experimental subjects viewed themselves in the mirror during the extinction phase, whereas the control subjects continued to face the back (i.e. the opaque side) of it. This enabled the experimental subjects to obtain visual feedback of their conditioned responses, whereas the control subject were denied this visual feedback. The subjects were run individually.

During the acquisition phase, 40 simultaneous presentations (i.e. inter-stimulus interval = .0 sec.) of the conditioned and unconditioned stimuli were given to the subject. In a pilot study using 12 subjects, the mean number of trials required to condition and extinguish were found to be 10 and 4 respectively. The acquisition phase of the experiment was followed by a 30-second rest period after which the conditioned stimulus (tone) alone was presented to the subject. The mirror was turned around during the rest period for the experimental subjects to view themselves throughout the extinction phase. Only the subject's responses (i.e. eyeblinks) during the latter phase were recorded for statistical analyses. The main variable of interest was the number of trials the subject required to reach a criterion of 4 successive non-responses to the conditioned stimulus presentations.

All the subject's eyeblink responses were continuously recorded during the extinction phase. For data analysis, the subject's responses were scored for all pen deflections of more than 2 mm. All other responses of 2mm or less were considered as 'non-responses'. A response was scored as conditioned response if it occurred simultaneously with the onset of the conditioned stimulus or if it occurred 154 msec before the onset or after the offset of the conditioned stimulus. All other responses (i.e. eyeblinks) which fell outside these criteria were regarded as non-responses. Extinction (or response inhibition) was defined as 4 successive non-response trials; and the number required to reach this criterion included these 4 successive non-response trials.

(iv) Procedure

The present study was carried out in the Social Psychology Laboratory at Loughborough University.

When the subject arrived for the experimental session, s/he was seated in a comfortable armchair inside the screen-cubicle situated in a dimly illuminated room (even though illumination was dim, the Experimental Subjects could see their reflections clearly in the mirror - Appendix 6: Diagram 2(a)). The purpose of the experiment (as described earlier) was then explained to him/her, and was asked to try to relax as much as s/he could.

The experimenter then cleaned the appropriate areas of the subject's face for the electrodes with surgical spirit. Electro-jelly was then applied on the electrodes which were then placed on the appropriate areas of the subject's face: one electrode was attached to the subject's

forehead (between the eyebrows); another was placed just above the subject's left eyebrow, and the third electrode was placed just below the left eye. Surgical adhesive tape was used to keep the electrodes in place (Appendix 6: Diagram 2(b)). After this the experimenter instructed the subject to try as much as possible to fixate on the white circular spot in the middle of the front or back or the mirror, depending on the phase (i.e. acquisition or extinction) of the experiment and whether the subject was in the Experimental or Control Group. The subject was further instructed to fixate on the white circular spot throughout the experiment, but not to stare or look so hard as to strain his/her eyes. The purpose of fixating on the white spot was to encourage the Experimental Subjects to view themselves in the mirror during the extinction phase; and also to discourage both groups of subjects from looking around the room, as this would have made it difficult to control (or monitor) the eyeblinks. It was also to make conditions as uniform as possible for both groups.

After placing the electrodes on the subject and having adjusted the equipment (the Birbeck and the Washington) behind the screen (i.e. out of the subjects' sight), the experimenter helped the subject to put the headphones on. Having done this, the experimenter went behind the screen and adjusted the gain control on the Washington for the subject such that his/her UR (which was verbally elicited by the experimenter) produced a pen deflection of not less than 4 mm. After that the subject was given 40 acquisition trials (i.e. CS-UCS presentations). These presentations were controlled by the Birbeck at constant intervals of 4.5 sec. The duration of each presentation was 100 msec. The CS was presented to the subject via the headphones, while UCS to the subject's eyes was produced by the flash unit. The

acquisition phase was immediately followed by a 30-second rest period during which the experimenter turned the mirror around for the Experimental Subjects to view themselves. The extinction trials involved the presentation of CS alone to the subject at the same interval and duration as during the acquisition period. Extinction trials were run to a criterion of 4 successive non-response trials (as described above). The subject's responses (i.e. eyeblinks) were recorded by the oscillograph throughout the experiment for data analysis.

Upon termination of the extinction phase, the experimenter stopped the equipment, removed the headphones and the electrodes from the subject and wiped the electro-jelly from the subject's face with cotton wool and surgical spirit. The experimenter then verbally (i.e. informally) interrogated the subject about his/her suspicions and beliefs about the nature of the experiment. This was done as an attempt to assess the subject's awareness of his/her conditioned responses. The subject was subsequently debriefed, and asked not to discuss the experiment with any of his/her friends who were likely to take part in it. The experimenter then showed the subject his/her printed-out responses and thanked him/her for taking part in the study.

4.5 RESULTS

For the purpose of data analysis, a conditioned response was defined as an eyeblink of more than 2mm amplitude occurring simultaneously with the conditioned stimulus onset or 154 msec before the onset or after the offset of the conditioned stimulus. Any other response

(i.e. eyeblink which did not meet this criterion) was regarded as non-response. Analyses of the results were confined to extinction, which was in turn defined as 4 successive non-response trials. The results were analysed in terms of number of trials the subjects required to reach extinction criterion. This included the 4 successive non-response trials. The data from 4 subjects were randomly deleted by a third party to allow the use of equal Ns for the analysis of variance. The mean number of trials required to reach extinction criterion was 21.214 and 28.312 for the experimental group and the control group respectively (See Appendix 3(b): (i) and (ii)).

To test the experimental hypothesis, a 2-way ANOVA was performed on the data. The results are summarised in the Table below.

TABLE 4
SUMMARY OF 2-WAY ANOVA ON OBSERVED DATA

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	F-RATIO	PROB.
A (Category of S)	707	1	707	4.80	< .01
B (Sex)	154	1	154	1.05	> .05
AB (Interaction)	463	1	463	3.15	< .05
Within cell	7621	52	147		
Total	8946	55			

The above Table indicates that there was a significant main effect for the experimental condition; that is the experimental subjects extinguished quicker than the control subjects ($p = <.01$). However,

the results also revealed an interaction effect between sex and the experimental condition ($p = <.05$).

Because of the observed interaction effect, further comparisons (on the basis of sex) were made, using t-tests, between the following groups:

- (1) experimental male subjects vs. control male subjects;
- (2) experimental female subjects vs. control female subjects;
- (3) experimental male subjects vs. experimental female subjects;
- (4) control male subjects vs. control female subjects.

The means for these groups were: experimental male subjects, 22.429; experimental female subjects, 20.0; control male subjects, 23.786; and control female subjects, 32.857 (See Appendix 3(b): (i) to (iv)).

Examination of the results revealed a significant difference between the experimental female subjects and their control counterparts,

($t = -2.704$; d.f. = 26; $p = <.05$). However, no significant difference was obtained between the experimental and control male subjects

($t = -0.309$; d.f. = 26; $p = >.05$). Similarly, there was no significant difference between the sexes of the same experimental condition

($p = >.05$); although the difference between the control male subjects and their female counterparts approached the conventional .05 level of significance. Clearly the interaction is producing the apparent main effect which should be treated cautiously. The analysis of variance will give precedence to main effects when in fact they are the product of interaction.

4.6 SUMMARY AND ANALYSES OF RESULTS

The only variable that was under investigation in the present experiment was the number of trials the subjects required to reach the extinction criterion described earlier. It was hypothesised that extinction of conditioned eyeblink response would be quicker in the experimental condition compared with the control condition. A 2-way ANOVA performed on the data revealed a significant main effect for the experimental condition; that is self-modelling reduced the conditioned response relative to the control condition ($F = 4.80$; d.f. = 1; $p = < .01$; 1-tail). The hypothesis was thus supported.

However, the results also revealed a significant interaction effect between sex and the experimental condition ($F = 3.15$; d.f. = 1; $p = < .05$). Thus, further comparisons using unrelated t-tests were made to examine inter-sex as well as intra-sex differences. The following results emerged:

- (1) there was no significant difference between the male subjects of the two experimental conditions ($p = > .05$);
- (2) a significant difference was obtained between the experimental female subjects and their control counterparts ($p = < .05$);
- (3) no significant difference was obtained between the two sexes of the same experimental condition ($p = > .05$); however, the difference between the control male subjects and their female counterparts was close to .05 level of significance.

In general, the results seemed to indicate that the experimental condition alone did not have an effect on the subjects' responses; but the experimental female subjects were more responsive to self-modelling than the experimental male subjects. The control female subjects appeared to have been the most resistant to extinction. It would therefore seem that the interaction has produced a spurious main effect.

4.7 DISCUSSION

The results of the present experiment were in the predicted direction; that is self-modelling reduced conditioned eyeblink response relative to the control condition. However, the results also seemed to indicate that the experimental female subjects were the most affected by self-modelling. They also indicated that the control female subjects were the most resistant to extinction compared with their female counterparts and the males of both experimental conditions.

The present findings are contradictory to learning (Stimulus-Response) theory predictions. In other words, classical learning theory would predict no difference between the two experimental conditions of the present study. Thus, the superior extinction performance of the experimental subjects relative to the control subjects can hardly be explained in terms of simple Stimulus-Response principles.

In cognitive-behavioural terms, however, the explanation for the present results and finding is obvious. According to this model, the rapid rate of extinction observed in the Experimental Subjects was due to the psychological discomfort they experienced following their negative evaluation of their CRs. In other words, the subjects in the experimental condition experienced discomfort because they obtained instant visual feed-back of their own responses (CRs) which were inconsistent with their self-images. Cognitive-behavioural model of behaviour change would propose that because the subjects did not like seeing themselves blink at a subjectively undesirable rate, they used this feedback to control their eyeblink responses. The Control Subjects, on the other hand, could not avail themselves of this knowledge of

response (i.e. visual feedback), and therefore were not visually aware of their excessive blinks. Thus, the control subjects did not experience the kind of subjective discomfort that was experienced by their experimental counterparts, or at least not to such an extent as to motivate them to suppress or inhibit their conditioned responses.

That the Experimental Subjects experienced psychological discomfort is borne out by the Subject's post-experimental verbal descriptions of the study. For instance, while 78% of the Experimental Subjects reported that they realised in the extinction phase, that they were blinking their eyes at a greater rate than they normally did, only 30% of the Control Subjects reported awareness of this fact. Also, while the former group of subjects seemed to have used this knowledge to control their conditioned responses, the few control subjects who reported awareness of their responses failed to use this awareness (or feedback) to control their eyeblinks. As one Experimental female subject reported: "I did not like seeing myself blinking so much so I tried to stop myself from blinking".

As indicated by the results, there was no significant difference between the male subjects of the two experimental conditions. But a significant difference was found between the females of both conditions. These findings might be due to sex differences in conditionability (or dissipation). If this were the case, then the rapid rate of extinction in the experimental female subjects relative to the control female subjects might be interpreted as giving further support to the cognitive interpretation of the results obtained in this study. In Western societies, as in

most human societies, there are social pressures on females to be more particular, and hence more self-conscious, about their physical appearance or 'self-presentation' than males (Orbach, 1978). It is not surprising, therefore, that the experimental females in this study were found to be more responsive to the experimental condition. They appeared to be more perceptive of their responses (i.e. paid more attention in front of the mirror). Since their responses (i.e. feedback of their CRs) were negatively inconsistent with their self-image, according to cognitive-behavioural change theory, they experienced greater subjective discomfort. One of the modes of reducing this discomfort, as the above theory would predict, was a change in behaviour; and this is what these subjects appeared to have done. That is, they tried to control their conditioned responses to coincide with their self-image. The control females, in contrast, could not avail themselves of such visual feedback. The significant difference found between the female subjects of the two experimental situations makes this suggestion even more plausible.

The most plausible interpretation of the results and general findings of the present study is that the response decrement observed in the experimental group was produced to a large extent by their negative evaluation of their responses and its concomitant subjective discomfort. This suggests that cognitive factors are involved in classical conditioning phenomena, at least, as far as human subjects are concerned. The results also suggest that the human subject can employ his/her self-observed behaviour or responses to control or modify his/her own behaviour.

Some of the theoretical implications of the results and findings of this study for learning theory have already been mentioned. Briefly, these findings imply that in eyelid conditioning experiments, as in any other learning situation, many cognitive variables are of theoretical importance. The variables which have been identified stress the importance of awareness and verbally induced sets upon performance. Whether any learning occurs in classical conditioning situations in the absence of awareness is an open question. Of major importance is the question of just how cognitive factors operate in determining conditioned behaviour.

Traditionally, one of the most frequent interpretations of cognitive influences in conditioning has been in terms of facilitatory or inhibitory effects upon performance through the subject's set towards his/her task or the experimental conditions. For eyeblink conditioning situations, these effects are of historical significance and have been extensively discussed (e.g. Hilgard and Hunphreys, 1938; Norris and Grant, 1948). The general results have been clear evidence of inhibition and facilitation by instructional variables. Some more recent reports on electrodermal response illustrate this type of effect. For instance, Hill (1967) first discussed conditioning with her subjects. She then told half of them that the "intelligent thing is to be conditioned", while telling the other half that "the intelligent thing is not to be conditioned". The results indicated differential responding in accordance with instruction - the favourable group responded at a consistently higher level than the anti-instruction group. The findings of the present experiment are consistent with this report and stress the important role of cognitive variables in determining the acquisition or performance of any human behaviour.

The decision as to whether to be conditioned or not is often influenced by the experimenter in most instruction procedures, such as Hill's (1967). However, in the present experiment, the decision was made (perhaps subconsciously) entirely by the subject; this decision was manipulated indirectly only by the experimental setting. In other words, the subject was exposed to his/her own response, and it was left entirely to him/her to decide whether to continue to make the response or to inhibit it. Whichever the subject decided to do was, according to cognitive-behavioural model of behaviour change, chiefly determined by his/her cognitions about the response. The point may become more clear if we liken the two conditions of the present experiment to the "instructed conditioning" and "instructed non-conditioning" technique such as Hill's (1967). Both the "instructed non-conditioning" paradigm of Hill's and the experimental condition of the present study were designed to arouse psychological discomfort in the subjects regarding their responses. Hill's "instructed conditioning" paradigm, however, was to foster consonance in her subjects whereas the control condition of the present study might be described as emotionally "neutral". The results of both studies indicate to us how cognitive factors operate in determining conditioned behaviour. They indicate that, at least in human subjects, whether a behaviour becomes conditioned or not depends to a large extent upon whether or not that behaviour is consistent with the subject's cognitions about the behaviour. This interpretation is in keeping with Rescola's (1973, 1974) suggestion that conditioning involves not only the formation of associations between events, but also the development of internal representations of these events. However, in the case of eyelid blinks, like any other response that the subject cannot see himself/herself making, s/he cannot form an accurate internal representation

of his/her response unless s/he is provided with a visual feedback or his/her response to enable him/her to regulate it. In the present study, this feedback was provided in the experimental condition.

These results are of special relevance to social learning or modelling theory. Several theories assume that some type of mediational process is involved in observational learning (e.g. Aronfreed, 1968; Bandura, 1969, 1977; Rosenbaum and Arenson, 1968). All these theories suggest that mediation occurs, at least in part, during the period when the observer is exposed to the model's performance. Although the covert performance of a previously learned imitative response may be regulated by reinforcing contingencies (Bandura, 1969) the acquisition of the response may be influenced by a variety of mediating factors, such as task characteristics and model characteristics. Because it is difficult to measure covert mediation, theories of observational learning have had to assume the presence of mediating processes. The findings of this experiment may be regarded as contributing towards the assessment of one form of mediational factors involved in observational learning, namely (cognitive) evaluation or affect regarding the behaviour. They demonstrate the effects of exposure to one's own response and the cognitive factors associated with it on the learning or conditioning of automatic responses such as eyelid blinks.

The results and findings of the present experiment have implications not only for theory but also for therapies using models. Exposure to a model's performance tends to elicit similar observer responses, but as the present results indicate, this appears to be the case only if the observer has a favourable attitude or cognitions about the model or the behaviour being performed. The implications of these findings for

therapies using biofeedback techniques are also apparent. It would appear that many internal (as well as external) behaviours could be made more discriminable, and hence learnable or controllable, if their activity were to be fed directly to the conscious person through amplifiers or other appropriate means. This suggests that the success or failure of biofeedback techniques to influence the activities of the internal (involuntary) organs of a person is principally dependent upon the person's ability or inability to recognise the changes that take place in the organs concerned; that is, the person's awareness of the internal activities, as originally suggested by the work of Kamiya (1962, 1969). This implies that awareness of an individual's own behaviour or internal activity appears to be a necessary prerequisite for effecting changes in behaviour. The importance of one's awareness of one's own behaviour in effecting behaviour change also explains positively why, for instance, two visceral responses, micturition and defecation are successfully controlled by almost everyone through cultural training. Such successes make plausible the hypothesis that other internal responses can be similarly controlled given sufficiently pervasive and persistent training conditions.

Because eyeblink is in the autonomic nervous system this study brings cognitions into an area which is slightly unusual in the literature. Thus the conclusion (and suggestion) that may be drawn from the results and findings of the present experiment is that a person can control or regulate his own behaviour (volitional or autonomic) effectively if he can observe or discriminate that behaviour. In other words, if an individual cannot observe or discriminate when he is or is not doing some 'act' then he cannot mobilise his cognitions pertinent to the act. to enable him to control or regulate that act. This implies the

potential effectiveness of 'self-modelling' as a method of self-control, and thus as a potential therapeutic technique for the control and management of behaviour disorders where traditional procedures have either failed or achieved only limited success. Further investigations are needed to determine its potential in the clinical and educational fields as well as other fields of psychology.

CHAPTER FIVE

STUDY THREE: SELF-MODELLING AND WEIGHT CONTROL

SUMMARY

This study involved the use of self-modelling in an applied area. It investigated the use of self-modelling in the treatment of obesity or overweight. Thirty-two females enrolled in a private slimming club volunteered to participate in this study which was conducted over a period of 10 weeks. The Experimental and Control Groups were similar as far as their pre-treatment mean weights and desired mean weights were concerned. Analyses of the data indicated that towards the end of the study, the Experimental Group lost significantly more weight than the Control Groups. At the end of the study, the average weight loss for the Experimental Group was 4.27 pounds, and the average weight loss for Control Group I was 2.45 pounds, while the average weight loss for Control Group II was 3.66 pounds. Analyses of follow-up data collected 6 weeks after the end of the study confirmed this finding. At follow-up the mean weight loss was 8.27 pounds, 2.78 pounds and 2.00 pounds for Experimental Group, Control Group I and Control Group II respectively. The data suggest that self-modelling can be used in the control of addictive behaviours such as overeating, cigarette smoking they also suggest that cognitive factors are involved both in the acquisition and control of such behaviours. The data are explained in cognitive terms, and their implications are discussed.

5.1 INTRODUCTION

The problem of overweight is widely recognised not only as a physical or medical problem, but also as a social and psychological problem. It is common knowledge in the medical field that the obese person cannot achieve optimal health. S/he is more likely than the non-obese person to experience diabetes and is more likely to suffer from vaso-muscular diseases such as hypertension and heart diseases. Socio-psychologically such a person, in Western cultures especially, is also more likely to experience low self-esteem, poor body image, and a feeling of self-consciousness than his/her non-obese counterpart (this is particularly so of women because of the social pressures on them to be attractive to men [Orbach, 1978]); these in turn have adverse effects on the person's physical health. The economic burden that the medical treatment of obesity places on the NHS in Britain, for instance, not to mention the amount of money individuals spend annually on drugs and aids to dieting, is likewise enormous (Howitt, 1982).

The literature on the origins and problems of obesity adopts several approaches. For instance, the behaviourist approach views overeating as a maladaptive learned response to environmental cues, that is, for instance, an obese person eats as a means of obtaining social rewards such as attention from others (e.g. Ferster et al, 1962). Traditional cognitive approach, on the other hand, views the obese person as stimulus-bound (Schacter, 1967; Schacter and Gloss, 1968). This means

that the obese individual has not learned to distinguish the physiological cues to hunger from other physiological states. Thus, for the obese person, according to traditional cognitive approach, eating is partly a learned avoidance and a means of coping with, for instance, anger, reaching for food whenever he is irritated.

Losing weight has shown to be a formidable task for both therapist and client, as aptly summarised by Stunkard (1958), "Most obese persons will not remain in treatment, most will not lose weight, and of those who do lose weight, most will regain it" (p. 79). This pessimistic view is supported not only by case histories (e.g. Ferster et al, 1962; Goldiamond, 1965; Cautela, 1966b), but also by survey studies of clients in medical settings (e.g. Harmon et al, 1958; Franklin and Rynearson, 1960; Silverstone and Solomon, 1965), most of which have reported a general lack of success in effecting any long-term weight reduction. Various reports on diet restriction have likewise been disappointing (e.g. Stollak, 1967; Bray, 1970). Generally, behavioural approaches to the treatment of obesity along the lines of Ferster's et al (1962) and Stuart's (1967) procedures have also been relatively ineffective as far as long-term weight reduction is concerned.

Generally, the behavioural approaches to the treatment of obesity tend to be confined to a list of stimulus and environmental control procedures, such as "chew food 20 times"; "knives and forks down after each bite", and so forth. Such a behavioural approach gives little attention to the affective and cognitive processes involved in overeating. As an extension of general experimental psychology, behaviour modification is essentially environmentalistic, looking to external variables for the alteration of undesirable behaviour; it does not tell us how, for

instance, the obese individual so manipulated perceives the reasons for his changing.

An examination of the contingencies governing addictive behaviours in general, and overeating in particular, shows several reasons why this type of behaviour should be resistant to change. Addictive behaviours such as overeating provides immediate positive reinforcement for the individual, while the reward for not eating is usually extremely delayed. Furthermore, the aversive consequences of overeating are typically delayed for weeks or even years. As Eysenck (1961) has pointed out, therapies based on pairing aversive reinforcement with the performance of the undesirable behaviour are likely to be ineffective in the long run, because the fear of the negative consequences will tend to be extinguished when the behaviour is performed without the negative reinforcement following. Hence, in the case of obesity, it seems reasonable to postulate that the type of treatment programme that is likely to effect weight reduction and its long-term maintenance would be one that would not necessarily prolong the (immediate) positive reinforcement a person derives from overeating, but would rather bring forward the negative consequences of doing so, that is, a programme that would take into account the person's cognitions not only about obesity per se, but also about his/her body image.

5.2 AIM

This study was a field investigation into the use of self-modelling in the treatment of overweight.

3.3 HYPOTHESES

Orbach (1978) has suggested that most obese persons are very aware of how their faces look but not in relation to the rest of their bodies, and that such individuals tend to avoid subjectively unacceptable views of themselves by, for example, keeping their heads down as they walk past shop windows lest they cast a glance of themselves unaware and trigger negative feelings or cognitions. In other words, most obese persons seek to avoid reflection of their body images. It would, therefore, follow from cognitive-behavioural model of behaviour change that if an obese person were made (objectively) aware of his or her entire body:

- (1) s/he would experience negative feelings or cognitions about over-eating and would thus exercise self-control over his/her eating habits, and/or engage in more physical activities;
- (2) s/he would be more motivated to lose weight than his/her counterpart;
- (3) s/he would stay in treatment for a longer period of time than his/her counterparts;
- (4) such an individual would be more likely to maintain his/her weight loss than his/her counterparts.

5.4 METHOD AND PROCEDURE

(i) Subjects

The subjects were 32 females who had voluntarily enrolled in a private slimming club which met weekly for one hour. The mean age of subjects was 31 years, and ranged from 16 years to 58 years. Subjects' mean baseline weight in poundage was 147 and ranged from 114 to 195; and their mean desired weight (goal) was 129.53 [Appendix 4(e): (i) - (iii)]. Each subject paid a membership fee and a weekly session charge to the club. Twenty-four subjects had been with the club for an average period of 4 months when this experiment began, while 8 of them enrolled at about the same time as the study began. Subjects were in various occupations at the time of the study, including teachers, a nurse, typists, school canteen ladies, housewives and 2 school girls. The mean age of onset of overweight amongst all the subjects was 22 years, although 49% of them described themselves as overweight during adolescence. Sixty per cent of all the subjects in this study stated that they had made at least two unsuccessful attempts at weight reduction previously. A pre-experimental questionnaire revealed that almost all the subjects wanted to lose weight for cosmetic reasons. With regard to the subjects' levels of motivation to lose weight, the questionnaire further revealed that most of them (75%) envisaged a 'lot' of satisfaction from weight loss. This was confirmed by the subjects' reported self-perception prior to joining the slimming club. Seventy eight per cent of them described their body images prior to joining the club in a negative fashion [see Appendices 4(a) and 4(b)].

(ii) Apparatus

The apparatus used in the present experiment consisted of a mirror-room together with a Slater 209 measuring scale to record the subjects' weights. The mirror-room, which was portable, was specially constructed for the purposes of this study, and consisted of a square 'room' with 8 feet sides and height of 5½ feet. The inside was covered in non-breakable acrylic mirrors. This enabled the subjects to see their bodies from all angles [see Appendix 6: Diagram 3(d)].

(iii) Procedure

One week prior to the study, each subject answered a questionnaire designed to investigate such factors as her level of motivation to lose weight, her body image, eating habits and physical activity, whether she looked at her body either in the nude or half-clothed in a full-length mirror and her feelings about her reflection in the mirror [see Appendix 4(a)]. Subjects were also requested to complete another questionnaire six weeks after the termination of the experiment (follow-up contacts)[see Appendices 4(c) and 4(d)]. After the completion of the pre-experimental questionnaire, subjects were given forms and instructions to self-monitor their daily eating habits, body weight and physical activities for one week. This constituted the baseline week.

After the baseline period, the subjects were allocated into three separate groups on the basis of their willingness to participate in the experiment. Twenty-one subjects volunteered to participate and were randomly assigned to conditions. Of these 12 were in the Experimental Group and 9 in Control Group I. These subjects continued to monitor

daily their eating habits, body weights, and physical activities. The Experimental Group also viewed themselves in the mirror-room weekly, initially for one minute, and from the third week onwards, the time was increased to 2-3 minutes. Of course, Control Group I was subjected to the same treatment but did not enter the mirror-room.

Subjects who refused to participate in the study comprised Control Group II. They neither monitored their daily eating habits, physical activities nor their daily body weights; and like Control Group I, they never entered the mirror-room. All the subjects, however, weighed-in on a Slater 209 scale provided by the club leader before each weekly one-hour group session began, and the leader recorded clients' weekly body weights on their individual cards. These recorded individual weekly weights were used, at the end of the study, for intergroup comparisons. The data on daily body weight, food intake and physical activity were also collected for comparisons between the Experimental Group and Control Group I.

When subjects met for a weekly session, they changed into their appropriate costumes (leotards) and then lined up for their weekly weigh-ins. The Experimental Subjects weighed-in first in order for them to visit the mirror-room before the session began. After the weigh-ins, the group (club) leader announced their individual weights. The client who lost the most in poundage in that week was proclaimed the 'Slimmer of the Week'. The slimmer of the week received a certificate from the leader and applause from the whole group (other clients). After that the experimenter collected the completed forms for self-monitoring for the previous week from the Experimental Subjects and Control Group I Subjects, and supplied them with fresh forms for the following week.

After weighing-in, the Experimental Subjects, in their leotards, followed the experimenter to a separate room where the mirror-room was situated. The subjects then entered the mirror-room, one at a time, and viewed themselves from all angles. The subjects waited outside the room where the mirror-room was situated and took turns to enter. The experimenter remained unobtrusively outside the mirror-room. During the first two sessions, each subject was allowed to view herself closely from all angles for a period of one minute. From the third week onwards subjects viewed themselves on average for 2-3 minutes weekly. After a subject had viewed herself, she joined the other groups for their weekly session. During a session, the group leader advised the whole group on dieting and grooming for about 4-6 minutes. After that the whole group carried out various light bodily exercises to pop music played on a standard cassette recorder for about 20 minutes.

The experiment was conducted over a period of 10 weeks. Six weeks after the end of the study, subjects in all the 3 groups were contacted. Those who were still attending sessions were contacted by the experimenter while those who had left the club were contacted by post, and were requested to complete a post-experimental questionnaire. The post-experimental questionnaire was similar to the pre-experimental questionnaire [Appendices 4(a) and 4(c)]. Data on the subjects' weights at follow-up were also collected for analyses [Appendix 4(g)].

Like most obesity studies, attrition amongst all the 3 groups involved was found. On the last day of the study (the tenth week), only 41% (5 out of 12), 33% (3 out of 9), and 18.2% (2 out of 11) of the Experimental Group, and Control Groups I and II respectively, attended session [Appendix 4(e): (i)-(iii)].

5.5 RESULTS

Because of lack of co-operation on the part of the subjects in monitoring their daily eating habits and physical activities, coupled with serious inaccuracies in their self-reports, these variables - eating habits and physical activity - were not used for statistical analyses. Thus only data on the subjects' body weights were analysed.

Data on subjects' body weights were analysed in terms of (1) pre-treatment weight, (2) desired weight (goal), (3) weekly absolute weight loss, and (4) cumulative (net) weight loss (i.e. pre-treatment weight minus weight at the end of the study or at the time the subject left the programme). Following Stunkard and McLaren-Humes' (1959) and Harris and Bruner's (1971) suggestion, individual results are presented [see Appendix 4(e): (i)-(iii)]¹.

The mean pre-treatment weight in poundage was: Experimental Group, 146.08; Control Group I, 149.66; and Control Group II, 146.72. The mean desired weight in poundage was: Experimental Group, 131; Control Group I, 130; and Control Group II, 127. A oneway ANOVA performed on the pre-treatment data revealed that there were no significant differences between the means of the 3 groups as far as their pre-treatment weights and desired weights were concerned ($F = .065$; $d/f = 2$; $p = .9370$; and $F = .0031$; $d/f = 2$; $p = .9969$ for pre-treatment weight and desired weight respectively).

¹ Appendix 4(e): (i)-(iii) represents individual changes in weight during the treatment period. The data also reflect the drop-out rate of the subjects and also specify treatment time for each subject.

Because of the lack of significant differences amongst the groups in their pre-treatment weights and desired weights, the analysis suggested by Wilson's (1978) weight index: $(\text{kg lost}/\text{initial overweight}) \times (\text{initial kg}/\text{ideal kg}) \times 100$: was not employed in subsequent analyses.

A oneway ANOVA was performed on all the other data. According to the analyses, no significant differences emerged between the groups until the seventh week of treatment. In the seventh week, a highly significant difference was observed between the group means in terms of weekly absolute weight loss ($F = 7.6408$; $d/f = 2$; $p = .0043$). Further t-tests (Student's t-test) indicated that the differences were between the Experimental Group and Control Group I ($p = <.05$) and also between the two Control Groups ($p = <.05$). No significant difference between the Experimental Group and Control Group II was observed at this stage. No significant differences were observed in week 8, however. Analysis of weekly absolute changes in week 8 only approached the conventional .05 level of significance ($F = 2.2801$; $d/f = 2$; $p = .1366$). However, in the tenth week, the last week of the study, a highly significant difference was obtained between the means (weekly absolute weight loss) of the groups ($F = 10.9744$; $d/f = 2$; $p = .0099$) [Appendix 4(f): (i)-(iv)]. Subsequent t-tests indicated that the obtained difference was only between the Experimental Group and Control Group II ($p = .01$).

A follow-up study was carried out 6 weeks after the end of the experiment. All the subjects were contacted either personally or by post. During this period, 4 Experimental Subjects, 2 Control Group I Subjects and 3 Control Group II Subjects had stopped attending club sessions. One of the Experimental Subjects left 4 weeks before the end of the study because she had almost achieved her goal (140 lb) and during contact she

was still losing weight; and another (Experimental Subject) had left because of pregnancy. All the drop-outs were contacted by post and all of them responded.

Subjects' individual weights were observed at follow-up, and analysed according to groups. However, the Experimental Subject who was pregnant during this period was excluded from the analyses. The data were analysed in terms of (1) follow-up weight (i.e. pre-treatment weight minus weight at follow-up) and (2) percentage follow-up weight (i.e. percentage difference between pre-treatment weight and follow-up weight). The mean follow-up weight in poundage was: Experimental Group, 141.8; Control Group I, 146; and Control Group II, 144.27 [Appendix 4(g): (i)-(iii)]. A oneway ANOVA performed on the follow-up weight yielded a marginally significant difference between the means of the 3 groups ($F = 2.5601$; $d/f = 2$; $p = .0953$) [see Appendix 4(g): (iv)-(v)]. Subsequent student's t-tests performed on the same data indicated significant differences between the Experimental Group and Control Group I ($t = 2.32$; $d/f = 18$; $p = .025$ [one-tailed]), and between the Experimental Group and Control Group II ($t = 2$; $d/f = 20$; $p = .05$ [one-tailed]). There was no significant difference between the Control Groups. These results indicate that the effects of the experimental condition were more evident during the follow-up period.

The 3 groups were also compared on percentage follow-up weight (as defined above) and a oneway ANOVA performed on the percentage data revealed an overall significant difference between the means of the 3 groups ($F = 3.3608$; $d/f = 2$; $p = .0492$). Further t-tests (one-tailed) indicated significant differences between the Experimental Group and Control Group I ($t = 1.9841$; $d/f = 18$; $p = .05$) and between the

Experimental Group and Control Group II ($t = 2.3579$; $d/f = 20$; $p = >.025$). However, there was no significant difference between the 2 Control Groups ($t = 0.3967$; $d/f = 18$; $p = >.05$), as one would expect.

5.6 SUMMARY AND ANALYSES OF RESULTS

Four main hypotheses were advanced in the present experiment: if an obese person with negative attitudes towards obesity were made (objectively) aware of his/her entire body: (1) s/he would experience negative feelings about his/her body image and would thus exercise self-control over his/her eating habits; (2) s/he would be more motivated to lose weight than his/her counterparts; (3) s/he would stay in treatment for a longer period of time than his/her counterparts; (4) s/he would be more likely to maintain his/her weight loss than his/her counterparts.

As mentioned earlier, the first hypothesis could not be tested owing to the difficulties involved in self-monitoring and serious inaccuracies in self-reports. Although the results of the data collected during the treatment period generally failed to support the second hypothesis, the follow-up results support this hypothesis. The general lack of support for the second hypothesis by the treatment data may be due to the fact that the experiment was not carried out over a long enough period of time for its effects to be fully realised. This suggestion becomes more plausible when one examines the data on absolute weekly weight loss. The main significant differences, as far as the absolute weekly weight loss was concerned, were observed during the later stage of the experiment, that is, between the seventh and tenth week: significant

differences between the Experimental Group and Control Group I (at the 5% level) and between the 2 Control Groups in the seventh week; and .01 significant difference between the Experimental Group and Control Group II in the tenth week. Inspection of the results indicates that in the period between week 7 and week 10 of treatment, the Experimental Group appeared to differ from the Control Groups. However, while the Experimental Group showed some stability, the Control Groups fluctuated during this period which was to be expected since the Control Groups were not receiving any treatment. The results also suggest that the (requested) daily self-monitoring of eating habits, body weight and physical activity had no influence on the results. Nevertheless, because of the fluctuating nature of body weight, like body temperature or heart rate, it appears that a week by week analysis of the results of the present study was not a particularly meaningful method of evaluating the efficacy of the experiment.

Hypotheses 2, 3 and 4 were all supported by both treatment and follow-up data. In the ninth week of the experiment attendance rate was: Experimental Group, 50%; Control Group I, 33%; and Control Group II, 36%, and in the tenth week (the last week of the study) attendance rate was: Experimental Group, 41.66%; Control Group I, 33.3%, and Control Group II, 18.2%. Also during follow-up, the Experimental Subjects as a group had lost more poundage than either of the Control Groups. In terms of attrition, 4 Experimental Subjects (including the pregnant subject), 2 Control Group I Subjects, and 4 Control Group II Subjects had left the club during the follow-up period. However, of the 4 Experimental Subjects who had left the club, one did so because of pregnancy, and another because she had almost reached her goal. Besides, the Experimental dropouts, except for the pregnant one, continued to lose weight during this period. On the other hand, all the dropouts of the

Control Groups, except for one Control Group II Subject, had gained weight, as indicated by Individual Results. In brief, analyses of the follow-up data indicated that the Experimental Group, as a whole, was significantly associated with weight change in the predicted direction, namely, this group lost the greatest amount of weight; whereas the Control Groups did not differ significantly in the amounts of weight lost over the same period.

5.7 DISCUSSION

Obesity, whatever its root causes, is seen as the result of a positive energy balance. When the energy balance can be reversed, obesity can be overcome. It is this model of obesity which serves as the ingredient for most traditional and behavioural intervention procedures. The results of the present study, however, introduce another dimension into the concept of obesity and its intervention procedures. This study, unlike for instance behavioural procedures, takes into account the obese person's views and cognitions about obesity itself, herself, as well as her consumatory behaviour. The present results suggest that a treatment procedure for obesity must start with the individual's perception and cognitions about his physical state or looks. If the individual's awareness of her body arouses negative cognitions or affect in her, she will be more likely to change her behaviour either by eating less or by engaging in more physical activities, or indeed, by combining both, to accord with her cognitions. This suggestion permits a cognitive-behavioural interpretation of the results of the present study. Goldman et al (1968) reported that anxiety and nervousness about shock decreased more for non-obese subjects than for obese subjects following eating, therefore leading to a refutation of the commonplace fallacy

that obese persons are more likely to eat in response to negative arousal than non-obese persons and that eating is more likely to reduce the subjective discomfort of obese persons than non-obese persons. This report in fact ties in with the findings of the present study and also suggests that subjective discomfort was experienced by the Experimental Subjects involved in this study as a result of being exposed to their bodies.

The traditional concept of the aetiology of obesity and its dynamics is that personality disturbance precipitates overeating and that obesity is a symptom of this underlying disturbance. Since personality factors trigger off inappropriate eating in this conceptualisation, intervention is aimed at changing personality. A behavioural analysis of obesity, on the other hand, as delineated by Stuart and his associates (Stuart, 1971; Stuart and Davis, 1972) for instance, views inappropriate behaviour as the first step in the chain. According to Stuart (1971), it is the obese state itself which precipitates the thoughts and feelings associated with personality problems. Hence, the behavioural approach intervenes by attempting to alter the individual's eating habits directly so that he or she can have different experiences in his or her environment, these experiences leading, in turn, to changes in the thoughts and feelings which comprise the message which the individual gives himself or herself. This approach is correct insofar as it goes. As Stuart himself has pointed out, the consequences, that is, the weight loss, social acceptance and changes in thoughts and feelings, are often delayed because people need to lose large amounts of weight, which takes time. Therefore, intervention at only the behavioural level is not enough. For instance, massive weight loss achieved through hospitalised fasting has proved to be insufficient motivation to control weight

(Swanson and Dinello, 1970). Neither is intervention at the 'thoughts and feelings' level, e.g. in Stuart's model, is enough by itself, as demonstrated by the lack of positive results achieved by traditional psychotherapy. It appears obvious, therefore, that attacking the problem at both behavioural and cognitive levels is a necessary intervention strategy. In the absence of therapist contact or social pressure or support, it is unlikely that the use of any programme along Ferster's (Ferster et al, 1962) such as Stuart's model will result in a significant weight loss which will be maintained over time, as Jeffery (1976) has pointed out.

The present study attempted to approach the problem of obesity simultaneously at 3 levels: (1) self-perception or objective body awareness (i.e. exposure to the subject's own body in its entirety), (2) subject's cognitions or feelings of her own body image, and (3) subject's behaviour. According to this strategy, the obese person must first of all see his or her body as objectively as possible - as others see him or her; the person must accept his or her body as it is, in its largeness. The second step in the chain is the individual's cognitions or evaluation, positive or negative, of his or her body. Lastly, having made cognitive evaluation of his or her body, the person will then decide to behave or act in accordance with his or her cognitions of himself or herself.

The basic premise of the present study was that if an obese person's awareness of his or her undistorted body image aroused negative cognitions or feelings in him or her, s/he would strive to eliminate or reduce such negative affects (or dissonance) by modifying his/her behaviour; that is either by reducing his/her caloric intake, or by

increasing his/her energy expenditure, or indeed by combining both. This in fact is what seemed to have happened in this experiment. It has already been suggested that negative affect was aroused in the subjects who viewed themselves weekly in the mirror-room. This group of subjects lost the greatest amount of weight compared to their control counterparts. However, cognitive-behavioural model of behaviour change acknowledges the fact that an obese person who holds positive cognitions about obesity or roundness of the body, would behave accordingly. That is the negative affect is aroused in a culture which values slimness; the cognitions may be different in cultures with opposite values. For instance, Worsley (1981) has reported that Australian adolescents of South Eastern European parentage have more positive attitudes towards overweight individuals (adolescents) than their counterparts of Western European parentage.

That the experimental condition aroused negative affect in the subjects is attested by their reactions to their body images on their first two visits to the mirror-room. Most of them expressed surprise at their own objective views of themselves in the experimental situation, as indicated by their responses to the post-experimental questionnaire [see Appendices 4(c) and 4(d): question 26]. Almost all of them perceived their mirror reflections as being fatter than they thought they actually were. On their first visits almost everyone of them could be heard by the experimenter, from behind the mirror-room, weighing various parts of her body, for instance, patting her buttocks, feeling her waist and thighs, and holding her stomach in and so forth; and at the same time muttering to herself, such as: "Oh, I'm fat!"; "Christ, I didn't realise that I was so fat ... Perhaps the mirrors are distorted."; "I must lose a hell of a lot of weight on my bum."; "Oh,

this is depressing! My legs don't feel as fat as they look."; and so forth. In fact, one subject (21 year old), on her first visit, emerged from the mirror-room in tears. However, she continued to participate in the experiment, since, according to her, the mirrors enabled her to see which parts of her body needed "shaping up".

While behavioural treatment programmes of obesity typically seek to manipulate only environmental variables, the present study recognises that important as they are, these variables are not necessarily the only set of factors behind this problem. The important role the obese person's cognitions of his or her physical state or looks plays in his or her motivation, or lack of it, towards weight reduction needs to be acknowledged. It must be appreciated that cognitive factors are as manipulable as environmental factors, as emphasized by Homme (1965): "Coverants - the covert operants of the mind." The present study followed Homme's suggestion.

In efforts to facilitate the maintenance of weight loss, some investigators have studied the application of self-reinforcement. The basic assumption of self-reinforcement is that the subject will eventually have to manage his or her own weight in the absence of the therapist's support. This involves the training of the subject in self-management (e.g. Jeffery & Christensen, 1972). In the treatment of overweight, self-modelling, as used in the present study, would appear to be more parsimonious, and more effective than application of self-reinforcement as suggested by Jeffery & Christensen, (1972). In the first place, it does not require any training on the part of the subject. Secondly, self-modelling is capable of applying both positive and negative reinforcements simultaneously. For instance, in the case of overweight, the individual is instantly reinforced either positively or negatively following

overeating, depending upon his or her cognitions or level of motivation toward weight reduction, by virtue of the fact that as a result of his/her exposure to his/her body, s/he will carry a mental representation of his/her body in its largeness. This ubiquitous mental picture should remind the obese individual of his/her body image and his/her efforts to reduce weight or control it; it should remind him/her of his/her weight problem in the face of temptation to overeat. If the person succumbs to temptation to overeat s/he is instantly negatively reinforced by this mental picture; on the other hand, if s/he is able to resist the temptation, s/he is positively reinforced by the knowledge that s/he has taken a step in the desired direction. However, the major potential self-modelling possesses for the treatment of overweight appears to lie in the fact that, unlike most behavioural procedures, the negative reinforcement associated with overeating is not delayed for years, months or even hours, instead the behaviour (i.e. overeating) and the negative reinforcement (e.g. feelings of guilt) bear a very close temporal relationship.

Self-modelling, according to the findings of the present study, may also prove to be an important contribution towards the solution of the formidable problem of attrition which besets most traditional as well as behavioural procedures.

It is generally agreed that the purpose of an effective and permanent weight reduction and weight control programme is the development of self-control of eating and related daily activities. Bandura (1969) has stressed the importance of mediating variables in the process of self-control. This implies the importance of thoughts in dealing with impulsive action and for introducing competing cognitive

alternatives into self-regulatory sequences. The 'cognitive-behavioural' model adopted in the present study fully embodies the suggestion offered above by Bandura. Both dissonance research and the data Bem (1967) has gathered supporting the interpretation of that research, and studies of 'locus of control' (e.g. Rotter, 1966) lead to the conclusion that behaviour change is very much influenced by an individual's explanation for his/her behaviour. If an individual believes that s/he is responsible for engaging in a behaviour which is inconsistent with his/her own attitude, his/her attitude or behaviour will more readily change to become consistent with one or the other than if s/he believes that external forces are responsible for his/her behaviour. If we make the assumption that the behaviour modification or therapy client construes agents of change to be outside himself, then we have a change brought about via external influences. It would thus appear that operant approaches would pose problems for the maintenance of weight loss once the artificially imposed contingencies are withdrawn. Hence, the paucity of reports of behaviour change through traditional behavioural techniques such as operant procedures in the treatment of obesity, as of cigarette smoking and other addictive behaviours, may be accounted for, in part, by notions of attribution. It would appear, therefore, that behaviour change believed to be brought about by oneself will be maintained to a greater degree than behaviour change which is believed to be due to external forces or agents. It is therefore not surprising that the Experimental Subjects involved in the present study were, as a group, associated with a greater weight loss than the Control Subjects during the follow-up period. The decision and the motivation to lose weight was taken and fostered by the subjects themselves as a result of the cognitive processes engendered by the experimental condition, as a result of becoming objectively aware of their body

images; and because they attributed the changes in their body weights to themselves, they became more encouraged and motivated to persevere in their efforts to control their weights. As one Experimental Subject summarised it at follow-up: "When I lost 14 lb, I thought I could do it by myself, so I left the club, and I did it. Now I feel confident and proud of myself, because I have lost more than I originally aimed for." [see Appendix 4(d): question 26].

The present experiment was a field study which investigated the application of self-modelling to social behaviour, in the long or medium term, outside of the strictly controlled laboratory situation. It investigated the use of self-modelling in the treatment of overweight. The results and findings support those of previous studies, which have been described above. They further demonstrate that self-modelling as a therapeutic technique has potential not only in laboratory situations, but also outside of the laboratory. Nevertheless, further studies are needed to gauge its efficacy relative to other forms of behaviour change procedures.

CHAPTER SIX

STUDY FOUR: THE RELATIVE EFFICACY OF SELF-MODELLING COMPARED WITH OTHER BEHAVIOUR CHANGE TECHNIQUES

SUMMARY

This study compared the relative efficacy of self-modelling with two forms of behaviour change techniques: (1) negative modelling in which the subject is vicariously punished for the modelled behaviour, and (2) a form of biofeedback in which the subject observes visually and auditorily his/her own physiological response to the behaviour s/he is performing. The study was of cigarette smoking behaviour; and it employed a pre-test-post-test experimental design. In the self-modelling condition the subject smoked in a mirror-room. In order to manipulate cognitive aspects of the situation so that all the subjects had negative cognitions about smoking, anti-smoking literature was given to the subjects three days before the second part of the experiment. The results showed that the amount of tobacco consumed was lowest in the self-modelling group.

6.1 INTRODUCTION

Much effort has been made in the conceptualisation and development of procedures in the area of behaviour change. Because of the large number of procedures which have been developed for modification of behaviour, comparisons of different procedures are needed in order to gauge what theoretical conceptualisations contribute most to our understanding of behaviour change, and also what procedures are most effective in bringing about such changes. Most behaviour modification programmes, today, follow the works of such historical as well as contemporary learning theorists and investigators as Pavlov (1927), Watson (1924), Skinner (1953, 1957), Wolpe (1958), Lazarus (1958), Wolpe & Lazarus (1966), and Bandura (1969).

In the clinical field, 'modelling' (in its various forms) and 'bio-feedback' are two of the major procedures used in bringing about behaviour change. Both procedures derive from learning principles. The theoretical underlying assumptions of biofeedback techniques are based on operant conditioning principles; whereas modelling techniques have social learning as their basic principle.

Biofeedback has been reported to be particularly successful in the treatment of physical or physiological disorders such as neuromuscular disorders (e.g. Shapiro & Surwitz, 1976; Basmajian, (1977), tension headache and migraine (e.g. Sturgis et al, 1978), muscle

tension (e.g. Haynes et al, 1975; Bild and Adams, 1980), and cardiovascular disorders (e.g. Engel, 1977; Blanchard & Epstein, 1978). Essentially, biofeedback involves training the client to recognise his/her own physiological (or internal) responses and to use this knowledge (or feedback) to control such responses. As regards the future of biofeedback in clinical practice, Ferguson (1981) has emphasised the important role this technique will play, in the 1980s, in the treatment of a variety of medical and psychological problems. He has also predicted that biofeedback is going to form an important part of the growing trend towards health care as opposed to disease care.

Modelling, on the other hand, has mainly been used in the treatment or modification of (overt) behaviour disorders. For instance, Bandura et al (1967) and Somerville et al (1981) have used modelling to treat snake phobia; and Davis (1979) has used it to modify classroom disruptive behaviour. Modelling has also been used in the training of desirable behaviours such as moral behaviour (Bandura & McDonald, 1963) as well as self-help skills (Wheman, 1976). Sarason and Sarason (1981) have also demonstrated that modelling can be used to teach cognitive as well as social skills in adolescent delinquents. Common to biofeedback and modelling techniques is the fact that they both rely on knowledge of response (or feedback) for effecting the appropriate behaviour change.

One of the various forms of modelling procedures is 'negative modelling'. According to Bandura (1969, 1971), negative modelling refers to a situation in which the observer is vicariously punished for the modelled behaviour. Thus, this modelling effect is contingent upon vicarious reinforcement which is defined as the operation of exposing the observer to the procedure of presenting a reinforcing stimulus to the model

after, and contingent upon, a certain response made by the model.

Vicarious reinforcement is not contingent upon a response made by the observer.

Vicarious reinforcement can either increase or decrease the imitation of the model by the observer depending upon the nature of the reinforcement being applied. That is, positive reinforcement is likely to increase the imitation of the model, whereas negative reinforcement is likely to decrease the imitation of the model. It has been reported that training under vicarious punishment conditions gives rise to decrements in imitation (e.g. Bandura & Walters, 1963; Bandura & Kupers, 1964). For instance, Bandura (1971b; 1977) has reported that subjects often decreased their imitation of the model if the model was punished. He suggests that seeing the model rewarded or punished provides the observer with information regarding the types of responses most likely to lead to reward or punishment. Bandura (1977) has further suggested that seeing the consequences to the model may lead to the arousal of the observer's emotions (especially in the case of punishment).

A feature of vicarious reinforcement is that it does not have to be experienced by the observer directly. As noted by Bandura & Baratz (1971), human imitative behaviour is often controlled by anticipated consequences of prospective actions. These anticipated consequences are often established through differential reinforcement that is either directly experienced, inferred from observed response consequences of others, or conveyed through verbal explanations. The occurrence of inhibitory effects of vicarious experiences is indicated when, as a function of observing negative response consequences to the model, the observer shows either decrements in the same class of behaviour or a

general reduction of responsiveness. The inhibitory effects of 'negative modelling' can therefore best be evaluated either by measuring response decrements from baseline levels or by comparison with the performances of subjects who have not experienced the same negative response consequences.

Negative modelling, as described above, requires at least two individuals: a model and an observer. In contrast, in a self-modelling situation, as used in previous studies (detailed above), the observer is his own model. The results of previous studies indicated that self-modelling can be used as a successful procedure for the extinction of undesirable behaviours. Nonetheless, the practical usefulness of self-modelling, like any other treatment or training procedure, can only be gauged by investigations comparing it with other forms of modelling (or feedback) procedures. The present investigation compares the relative efficacy of self-modelling and other forms of feedback systems in the intervention of cigarette smoking behaviour.

6.2 AIM

This study investigated the relative practical usefulness of self-modelling compared with negative modelling and a form of biofeedback in the treatment of cigarette smoking behaviour.

6.3 HYPOTHESIS

On the basis of previous self-modelling studies and evidence from existing negative modelling and biofeedback studies, it was hypothesised that cigarette smokers would smoke less in terms of the amount of

tobacco consumed and the amount of time lit cigarettes stayed in their mouths in the following treatment conditions: (1) self-modelling, (2) negative modelling, and (3) biofeedback, than in a control (or no-treatment) condition.

6.4 METHOD AND PROCEDURE

(i) Subjects

Forty university students at Loughborough University volunteered to participate in this experiment. Four of them dropped out of the experiment after the pre-test session, thus leaving 36 subjects (19 males and 17 females). At the time of the study all the subjects were active cigarette smokers with an average consumption of 15 cigarettes per day (as reported by the subjects themselves).

(ii) Apparatus

The apparatus used in the present experiment was the same as that employed in previous smoking experiments [see Appendix 6: Diagrams 1 and 2]. However, the following apparatus was also used in this experiment:

- (1) a mirror-room [see Appendix 6: Diagram 3(d)]
- (2) fictitious anti-smoking literature written by the experimenter [see Appendix 5(a)]

(3) a pre-taped BBC television (Blue Peter) programme ('What Ice Did To The Land').

(4) a television film of two models of both sexes (two cigarette smokers).

(iii) Experimental Design and Procedure

This study was conducted in the Social Psychology Laboratory at Loughborough University. It followed the same experimental design as a previous smoking experiment (see Study Two), thus a pre-test-post-test design was employed. However, unlike the previous one, only the following variables were measured:

- (1) the amount of tobacco (measured in grams) consumed by the subjects; and
- (2) the amount of time (in seconds) lit cigarettes were in contact with the subjects' lips.

In the pre-test condition, all the subjects smoked cigarettes, individually, in the same experimental condition. That is each subject smoked while watching a pre-taped television programme (BBC's Blue Peter) on rock formation ('What Ice Did To The Land'). After all the subjects had served under the pre-test condition, each was then randomly assigned to one of four experimental conditions: (1) self-modelling, (2) negative modelling, (3) biofeedback, and (4) control. Having been assigned into groups, the subjects were then run, again individually, on a group basis. Three days before a group reported for

the second part of the experiment, each member received fictitious anti-smoking literature designed to manipulate cognitive aspects of the situation so that all the subjects had negative cognitions about smoking [see Appendix 5(a)]. The subject was requested to read and try to understand it, and also to familiarise himself/herself with it before reporting for session. Each subject was told that, at the end of the session, s/he would be asked a few questions relating to the literature. This was to ensure that the subjects read and understood the literature. The subjects believed both the literature and the request to be genuine.

In the post-test condition, the self-modelling subject sat in a mirror-room in which s/he could see, from all angles his/her full-size image (or reflection) and every movement s/he made, including his/her smoking pattern (e.g. his/her puffs at a cigarette, and exhalation of cigarette smoke). The mirror-room was constructed such that the subject could not avoid viewing himself/herself and his/her actions [see Appendix 6: Diagram 3(d)]. In the negative modelling condition, the subject watched a film of pre-taped bronchial patients of both sexes (modelled by two drama students) on a television monitor while smoking. The models coughed very badly when they inhaled cigarette smoke. The film served as negative vicarious reinforcement to the subjects. In the biofeedback condition, GSR electrodes were attached to two fingers of the subject's non-dominant hand. The galvanometer which provided both visual and auditory feedback was placed next to the subject so that s/he could see and hear his/her own response [see Appendix 6: Diagrams 3(a)-3(c)]. The subject was made to believe that the magnitude of the feedback (auditory as well as visual) was closely associated with the amount of cigarette smoke inhaled, that is, the amount of nicotine and other noxious chemicals and gases absorbed into his/her lungs and bloodstream

(in previous studies, it was observed that the subjects' GSR tended to be higher during puffs and inhalation). The post-test condition for the control group was the same as the pre-test condition.

This investigation followed the same procedure as the one used in Study Two: that is, the subject sat and watched himself/herself in the mirror-room or a film on a TV monitor while smoking, and was filmed. The negative modelling subjects and control subjects received the same instructions as did their counterparts involved in Study Two. However, the instructions were appropriately modified for the other two groups. For instance, the self-modelling subjects were instructed to view themselves in the mirrors as much as possible; while the biofeedback subjects were instructed to attend, as much as possible, to both the visual and auditory feedback provided by the galvanometer.

At the end of the post-test session, each subject was interviewed (unstructured interview) by the experimenter about the anti-smoking literature and the experimental condition under which s/he served, with regard to whether the literature or the experimental condition (or in fact both) had any effects on his/her attitude to smoking; and whether or not s/he was likely to cease smoking as a result. This interview, like the rest of the session, was videotaped and later analysed. At the end of the interview, the experimenter debriefed the subject, thanked him/her for his/her participation in the experiment, and asked him/her not to discuss it with anyone who was taking part in it.

6.5 RESULTS

The variables that were measured in this investigation were:

- (1) the amount of tobacco (measured in grams) consumed by the subjects; and
- (2) the total amount of time (in seconds) lit cigarettes were in contact with the subjects' lips.

The former variable was calculated in terms of the difference between the weight of an unsmoked cigarette (with the filter) and the weight of the butt (with the filter) after the smoking episode (the weight of an unsmoked Benson and Hedges Special Filter King Size - with the filter - being 1.0024 grams). The latter variable was calculated in terms of the total amount of time (seconds) a lit cigarette was in contact with the subjects' lips, and this included the very moment s/he set light to the cigarette [see Appendix 6: Diagram 3(a)].

The data were analysed in terms of:

- (1) the difference between the amount of tobacco consumed (as defined above) in the pre-test and the post-test conditions;
- (2) the difference between the total length of time (seconds) lit cigarettes were in contact with the subjects' lips in the pre-test and post-test conditions [see Appendix 5(b): (i)-(iv)].

TABLE 5

Group Means: Amount of Tobacco Consumed and Amount of Time Lit Cigarettes Stayed in Subjects' Mouths

	MEAN AMOUNT OF TOBACCO CONSUMED (GRAMS)			MEAN AMOUNT OF TIME (SECONDS) CIGARETTES WERE IN SUBJECTS' MOUTHS		
	Pre-Test	Post-Test	Difference	Pre-Test	Post-Test	Difference
SELF MODELLING SUBJECTS (N = 9)	.6478	.4855	.1629	39.53	32.51	7.0178
NEGATIVE MODELLING SUBJECTS (N = 9)	.6671	.6615	.0056	25.79	28.90	-3.111
BIOFEEDBACK SUBJECTS (N = 9)	.6079	.5767	.0311	31.51	31.9822	-.4756
CONTROL SUBJECTS (N = 9)	.6394	.6423	-.0027	34.55	28.3133	-3.7633

Table 2 shows the group means of the amount of tobacco consumed by the subjects (as measured in grams) and the amount of time (in seconds) lit cigarettes were in contact with the subject's lips.

A oneway ANOVA was performed on the pre-test data and the results indicated that there were no significant differences between the means of the groups as far as the variables under investigation were concerned. This suggests that the four groups were similar in their smoking behaviour prior to treatment ($F = .3091$; $d.f. = 3$; $p = .8186$; and $F = 1.5382$; $d.f. = 3$; $p = .2236$; for amount of tobacco consumed and amount of time respectively); [see Appendix 5(c): (i) and (iii)]. A Pearson's correlation coefficient was also performed on the pre-test data. Analyses of the results revealed a statistically significant correspondence between the two variables: amount consumed and amount of time [$r = .71$; $p = .001$ - see Appendix 5(d)].

In view of the above results, the use of the differences between pre-test and post-test data for statistical analyses was justified. A oneway ANOVA performed on the data (i.e. the differences) indicated that there were significant differences between the group means with regard to amount of tobacco consumed ($F = 3.0791$; $d.f. = 3$; $p = .0413$); but not in amount of time cigarettes were in contact with the subjects' lips ($F = 1.6039$; $d.f. = 3$; $p = .2078$); [see Appendix 5(c): (iv) and (v)]. Subsequent student's t-tests were calculated on the data. Analyses of the results showed that the observed difference was only between the self-modelling subjects and the other groups. This means that smoking was least in the self-modelling subjects. The self-modelling subjects differed, in amount of tobacco consumed, not only from the control subjects but also from 'negative modelling' and 'biofeedback' subjects. This difference was significant at the .05 level of significance. The other experimental groups (i.e. negative modelling subjects and biofeedback subjects) did not differ significantly from each other, nor from the control group ($p = >.05$). As far as the second variable (i.e. amount

of time) was concerned, none of the experimental groups differed significantly from the control group. However, a Pearson's correlated coefficient revealed a high correspondence between the two variables ($r = .72$; $p = .001$); [see Appendix 5(d)].

6.6 DISCUSSION

It is generally recognised that negative modelling in which the subject (or observer) is vicariously punished for the modelled behaviour has an inhibitory effect on the performance of the behaviour (e.g. Bandura, 1971b, 1977). It is also generally accepted in the clinical field that appropriate training in biofeedback can produce changes in behaviour (at least physiologically). Self-modelling, as used in this study and in previous studies, has hardly been employed as a behaviour change technique. However, the results and findings of the present study and previous ones demonstrate the potential of self-modelling as a behaviour intervention technique. The results indicate that self-modelling compares (more) favourably with other well established behaviour change procedures (negative modelling and biofeedback). Of the three procedures used in the present study, only self-modelling was effective in reducing smoking as compared to the control condition. Thus the hypothesis put forward in this study was only partially supported.

The results and findings of this study have implications for health education via the mass media. For instance, post-experimental interview (unstructured) revealed that even though the subjects involved in this study fully comprehended the anti-smoking literature and regarded its contents (especially the data) as disconcerting, it failed to make any lasting impression on their pre-existing attitudes towards cigarette

smoking. All the subjects' comments on the literature regarding its impact on their attitudes and smoking habits may be summarised thus: "We've heard it all before. These days it is difficult to avoid such messages unless you don't watch TV or you never visit a doctor's surgery." Specifically, one biofeedback female subject admitted that even though her father was a medical doctor (GP) whose surgery was full of anti-smoking posters and leaflets, every member of her family (including her father) was a heavy cigarette smoker.

With regard to the experimental conditions, the negative modelling subjects appeared the least affected compared with the control subjects. In fact they tended to imitate the models' smoking behaviour; that is, they tended to use the model's smoking or cough as cue for them to smoke. However, on interviewing, almost everyone of them reported that if s/he coughed as badly as the models (especially the female model) did, s/he would seriously think twice about smoking. It appears therefore that in this instance negative modelling aroused (vicariously) the subjects' emotions, but failed to reduce their smoking significantly. These findings contradict, for instance, Bandura's (1971b; 1977) report that vicarious negative reinforcement inhibited the subjects' imitation of the modelled act. Therefore it appears that the effect of negative modelling depends not only upon the valence of the modelled situation and the valence of the consequences to the model, as suggested by Weiland (1981), but also upon the likelihood or latency of the consequences to the observer.

The biofeedback condition, on the other hand, appeared to have had a greater impression at least on the subjects' cognitions about smoking. Even though they did not smoke significantly less than the control

subjects, about 70% of them reported that it made them aware of the damage they were doing to their physical health, and thus tried to inhale less smoke than they normally would have done. A further 65% of them believed that if they had such a gadget (the galvanometer) in a portable form (e.g. in the form of a wrist watch) to give them such feedback it would reduce their smoking rate (or smoking topology) considerably for at least a few days or weeks (perhaps, until they habituated to it). Nonetheless, three of the subjects reported that they found the galvanometer and how it reflected their physiological response so intriguing that they intentionally smoked more - took longer puffs and inhaled deeper - than they would otherwise have done. They did this to test the machine (the galvanometer), as they called it. In other words, they tried to trigger off the galvanometer to satisfy their curiosity. This may explain partly why the biofeedback subjects as a group did not differ significantly from the control group both in their tobacco consumption and amount of time lit cigarettes were in contact with their lips.

As indicated by the results, smoking was least in the self-modelling condition relative to the other experimental conditions and the control condition. Furthermore, post-experimental interview revealed that the self-modelling condition aroused negative emotions in the subjects. Of these, only two subjects (males) reported absence of any subjective discomfort in the experimental condition. The rest (about 88%) reported that the presence of mirrors surrounding them made them feel very uncomfortably self-conscious. They also pointed out that besides making them self-conscious, the mirrors heightened their awareness of the fact that they were smoking, which in turn heightened their feelings (or knowledge) that they were doing something (smoking) that they should not

be doing. For instance, one male subject stated: "Seeing your entire self from every corner you look is off-putting enough, seeing smoke coming out of your mouth and nostrils makes it even worse." Another subject (female) stated that the mirrors made her feel so uncomfortable and guilty about smoking that she was going to make a real effort to give it up. Yet another female subject was even more emphatic about her feelings towards the mirrors: "... if I could only smoke in such a situation, surrounded by mirrors, I would rather not smoke at all."

The above results and findings clearly demonstrate that self-modelling, at least as used in this study, is a viable and potentially useful technique for altering behaviour in the desired direction. In this study, its potential for bringing about behaviour change relative to two forms of feedback systems - negative modelling and biofeedback - is made obvious. However, promising as these results are, more extensive and comparative studies are needed in order to gauge the full potential and efficacy of self-modelling as a therapeutic (i.e. treatment or training) technique. The necessity for such studies becomes more compelling when one considers the various advantages this type of self-modelling possesses over other forms of behaviour intervention procedures such as drugs and other behaviour therapy procedures. Some of these advantages are:

- (1) economically, the apparatus involved is fairly cheap to purchase, and does not require an expert personnel to operate or maintain it;
- (2) the procedure does not require any training on the part of the client in order for him/her to benefit from it;

(3) it is relatively free from the ethical problems which beset a number of behaviour modification procedures; and

(4) compared with drugs, the advantages and benefits of self-modelling must be calculated not only in monetary terms, but also in terms of physiological ill-effects.

These advantages plus the apparent effectiveness of the procedure make self-modelling a potentially valuable tool for the investigation and treatment (or modification) of a wide range of behaviour problems, for instance, overeating, alcoholism, cigarette smoking, and such behavioural mannerisms as tics or excessive eyeblinks as well as such minor neuroses as shyness and phobias. The potential of self-modelling as a training (as opposed to treatment) technique can only be determined by further studies.

CHAPTER SEVEN

SUMMARY OF THE STUDIES AND CONCLUSIONS

SUMMARY

This final section outlines briefly the methods, results, and general findings of the four experiments. In addition, the evidence from the existing literature is considered in relation to the new findings. Of particular concern is the role of cognitive factors in self-modelling. Finally, the theoretical and practical implications of the present research are discussed.

7.1 THE FOUR STUDIES ON SELF-MODELLING

The four studies were designed to examine two main aspects of self-modelling: (a) the use of self-modelling in laboratory and field settings; (b) a theoretical framework based on both cognitive and behavioural factors. This cognitive-behavioural theory provides a fuller explanation of human imitation and particularly self-modelling than simple learning theory models do.

Self-modelling is defined as a process by which the subject observes his/her own behaviour (and/or its consequences) directly as it happens (for instance by means of a mirror, a mirror-room, or a video system).

Four studies were carried out each of which contributed directly or indirectly to the proposition that cognitive factors may be involved in self-modelling. In each study, the subjects' cognitions about the behaviour concerned (and/or its consequences) seem to be central to understanding self-modelling. Each of these studies and their main findings are outlined below.

The Pilot Study

Following reports of previous studies (mainly with children and mentally retarded individuals) on the effects of being imitated and self-modelling, this study investigated whether self-modelling could be

used to suppress undesirable behaviours in adults. It was hypothesised that cigarette smokers would smoke less in a self-modelling situation than in a control condition. A repeated-measures experimental design was employed. In the self-modelling condition, the subject watched himself/herself on a television monitor while smoking. In the control condition the subject watched a short cartoon film on the same monitor while also smoking. The following variables were measured: (a) the amount of tobacco consumed; (b) the amount of time subjects had lit cigarettes in their mouths; and (c) the subjects' galvanic skin responses. These were compared between the experimental and control conditions. The data were in the predicted direction - self-modelling inhibited the amount and duration of tobacco consumption. Furthermore, the subjects were significantly more aroused (as measured by GSR) in the experimental condition. In this study, there was of course no direct evidence of the involvement of cognitive factors in self-modelling. The predictions were based on the assumption that cigarette smoking was generally deprecated by the subjects.

Study One

This investigated the role of cognitive factors in self-modelling directly. It was hypothesised that in a self-modelling situation cigarette smokers with negative attitudes to smoking would smoke less than those with positive attitudes to the habit. This applies equally to the amount of tobacco consumed and the amount of time that lighted cigarettes stayed in their mouths. It was also hypothesised that the former group of subjects would be more emotionally aroused than the latter group of subjects. The subjects were also exposed to information about cigarette smoking that was either consonant or dissonant with their

existing attitudes. The results indicated that smoking was (a) least in those with negative attitudes to smoking who were given anti-smoking information and (b) greatest in those with positive attitudes to the habit who were given favourable information about smoking. Those with negative attitudes to smoking who received unfavourable information smoked less and those with positive attitudes to smoking who received favourable information smoked more in the self-modelling condition than in the control condition. Moreover, the subjects' physiological responses (as measured by GSR) in the experimental condition were in correspondence with the kind of information they received. This study shows that cognitive factors mediate the effects of self-modelling directly.

Study Two -

This investigated the use of self-modelling as a mode of self-control in an eyeblink classical extinction experiment. An eyeblink response was conditioned followed immediately by extinction trials. Analysis of the results was confined to extinction trials. It was found that extinction was quicker with self-modelling than with the control condition. Extinction was quickest in the experimental female subjects. This study may be interpreted as providing support for cognitive involvement in self-modelling if it is assumed that frequent eye blinking is regarded as undesirable. It also demonstrates that cognitive factors are involved in the kinds of behaviour observed in classical conditioning experiments using human subjects.

Study Three

This was a field experiment into the use of self-modelling in the treatment of overweight or obesity. Female subjects enrolled in a private slimming club volunteered to participate in this 10 week longitudinal study. The subjects' weights were recorded weekly. The data included pre-treatment weight, desired weight (or goal) accepted by the subject, weekly absolute weight loss, and net weight loss. The experimental and control subjects were alike in their pre-treatment weights and desired weights. Towards the end of the study, the experimental group had more weight loss than the control groups. Follow-up data collected 6 weeks after the end of the study confirmed this finding. In this study all the subjects were anti-fatness (as can be seen by the fact that they were all members of the slimming club) so that their cognitions would tend to be negative towards fatness. This study suggests that self-modelling can be employed as a practical technique for weight control.

Study Four

This compared self-modelling with other behaviour change techniques. These were negative modelling in which the observer is vicariously punished for the behaviour; and a form of biofeedback. In the self-modelling condition, the subject sat and smoked in a mirror-room. In the negative modelling condition, the subject watched a video of models who coughed badly on inhaling cigarette smoke (i.e. smoking was punished). In the biofeedback condition the subject was informed that his/her GSR was an indication of how much smoke was being inhaled (an auditory tone was associated with the amount of inhalation). A pre-test-post-test design was employed; and in order to manipulate

cognitive aspects of the situation so that all the subjects had negative cognitions about smoking, anti-smoking literature was given to the subjects 3 days before the second part of the experiment. The results showed that smoking was least in the self-modelling group. None of the other groups including a no-treatment (control) group differed significantly from each other in terms of reduction of smoking. This experiment seems to suggest that self-modelling, at least in the circumstances of this study, was rather more effective than the other fairly typical behaviour intervention techniques.

The results and general findings of the foregoing studies clearly lend support for (a) the effectiveness of self-modelling as a behaviour intervention technique, and (b) the role of cognitive factors in self-modelling.

7.2 GENERAL DISCUSSION

Although cognitive factors were manipulated directly in only one of the studies, it is necessary to explain why behaviour should change in a particular direction. In general, in these studies, these changes seem to be in the direction of social norms (e.g. anti-smoking, anti-fatness, anti-facial mannerisms such as eyeblinks). Indeed, it is difficult to explain self-modelling without reference to cognitive variables since unlike normal modelling there is no inbuilt direction for change. In conventional modelling, the model exhibits behaviour (or responses) different from that of the observer. In self-modelling the behaviour of the model and the observer are identical so only motivating factors within the observer may change the observer's behaviour.

Existing literature, however, points to the view that being imitated (or self-modelling) has inhibitory effects on a person's behaviour because the modelled behaviour acts as an aversive stimulus. Hence studies on the inhibitory effects of being imitated and self-modelling have tended to be directive. That is to say, they tend to combine self-modelling (or being imitated) with instructions, thereby (perhaps inadvertently), highlighting to the subject the negative (or aversive) aspects of the modelled behaviour (e.g. Kauffman et al, 1977; Davis, 1979). Needless to say that the directive nature of these studies renders interpretation of their results problematic. In other words, it is difficult to determine the true cause of the change in behaviour observed - whether the change is due to self-modelling or instructions or a combination of both.

It has been suggested in chapter one that for an individual to respond to being imitated or self-modelling as an aversive stimulus, the behaviour concerned must entail negative connotations for him. Therefore a satisfactory explanation of the effects of self-modelling needs to take cognitions into consideration. 'Non-directive' self-modelling (as used in the present research) makes such an allowance.

In so far as the inhibitory effects of self-modelling are concerned, it seems that the more negative a person's cognitions about a behaviour are the more likely it is for the behaviour to be inhibited. This suggestion is made particularly plausible by the findings of Study One. In this study, it was found that subjects with positive cognitions about cigarette smoking who were given favourable information about the habit smoked more in a self-modelling situation than in a control condition. Conversely, subjects with negative attitudes to smoking who were given

unfavourable information about cigarette smoking smoked less in the former situation than in the latter. Furthermore, the former group of subjects showed less emotional arousal (as measured by GSR) than the latter group of subjects in the self-modelling condition.

As mentioned in chapter one, investigators with a bias towards learning theory propose that the inhibitory effects of being imitated are due to the aversive nature of being imitated (e.g. Miller & Morris, 1974; Kauffman et al, 1975, 1976, 1977). Cognitive-behavioural theory of behaviour change, on the other hand, proposes that the form which the effects of self-modelling (or being imitated) take (i.e. facilitatory or inhibitory) is determined by the cognitive contingencies (positive or negative) governing the behaviour and/or its consequences. Evidence from Study One directly lends support to this. It is not dissimilar from Aronfreed's (1969) argument that the learning of a model's responses and their subsequent reproduction by the observer are influenced by the emotional circumstances in which the responses are initially performed. According to Aronfreed, responses which have a positive emotional value for the observer are more likely to be imitated. Conversely, it is proposed that responses which have a negative emotional value for the observer are more likely to be inhibited (as indicated by the findings of the present research).

In the analysis of the role of cognitions in self-modelling phenomena, the present project has identified two main cognitive processes on the part of the subject: (1) awareness and (2) evaluation. First of all, the subject must be aware of the behaviour. Secondly, he must evaluate the behaviour and/or its consequences in accordance with some ideal (personal, social, or ideological). It is proposed that if the person

evaluates the behaviour and/or its consequences negatively, he will experience negative emotions. Because these negative emotions are psychologically uncomfortable, it is assumed that the person will attempt to modify the behaviour in order to reduce the discomfort where other modes of achieving this are not feasible. However, if the behaviour (and/or its consequences) is positively evaluated, then the behaviour is likely to be facilitated. The results of the present studies, particularly Study One, support the proposition that one of the consequences of a negative evaluation of one's behaviour (and/or its consequences) is suppression or modification of that behaviour. Thus it might be suggested that in a self-modelling situation, the extent to which behaviour is suppressed (or facilitated) is an indication of the involvement of cognitive factors in self-modelling.

The cognitive-behavioural framework propounded in chapter two takes the subject's cognitions as central to understanding of self-modelling. This runs counter to existing reinforcement interpretations of the effects of self-modelling (or being imitated). Nonetheless, it might be contended that whilst the present conceptualisation relates to cognitive processes, it is also a reinforcement theory in that reduction of negative emotions (or dissonance) is presumed to be a positive experience, as suggested by Thelen et al (1981). On the other hand, any emotional experience (positive or negative) arising out of self-modelling is a product of cognitive processes on the part of the subject. In other words, it is a product of cognitive consistency or inconsistency between the subject's cognitions pertinent to the behaviour rather than a product of self-modelling per se. Thus, a positive cognitive evaluation of the behaviour by the subject is likely to result in a positive experience. In contrast, a negative evaluation of the behaviour is likely to result in a negative experience.

As mentioned earlier in this chapter, studies on the inhibitory effects of contingent imitation and self-modelling have tended to be directive. The present studies employed 'non-directive' self-modelling; and although the results are similar to those of previous investigations, they can hardly be explained in simple learning theory terms. In each of the present studies, it is suggested that the subjects' cognitions influenced their behaviour in the experimental condition in a more significant manner than simple reinforcement principles would suggest. Study Two is a case in point. In this study, it was found that the experimental paradigms had differential effects on the subjects' conditioned responses. That is, extinction of the conditioned response (eyeblink) was quicker in the self-modelling condition than in the control condition. This was the case in spite of the fact that the two conditions were identical as far as conditioned stimulus-unconditioned stimulus interval, and the intensity and duration of the conditioned and unconditioned stimuli were concerned. All of the subjects received 40 conditioning trials during the acquisition phase. These were followed by extinction trials during which the conditioned stimulus alone was presented. In this study (classical) learning theory would predict no differences between the self-modelling and control groups. However, the experimental subjects differed significantly from the controls. It is suggested that the experimental subjects, unlike the control subjects, used the feedback (of their conditioned responses) provided by the experimental setting (i.e. the mirror) to control their negatively valued responses (eyeblinks). These findings indicate that cognitive factors influence behaviour in a self-modelling situation. This seems to be the case even where an involuntary or autonomic response is involved. Thus, this highlights the important role the subjects' cognitions play in influencing his/her behaviour. This fact is often overlooked by learning theorists.

As well as raising theoretical issues, the present research has also practical implications for other areas of psychology. These include social psychology (e.g. interpersonal relationships), education, and the clinical field. It also raises methodological issues.

Considering interpersonal relationships, there is a common fallacy that "imitation is the sincerest form of flattery". Some research evidence on imitation lends support for this. However, such evidence has been interpreted largely in terms of reinforcement or in terms of Byrne's (1971) theory of attraction. Even the latter is rooted in reinforcement principles. For instance, summarising studies on being imitated, Thelen et al (1981) concluded (albeit with a caveat); "... being imitated is reinforcing; it leads to attraction towards the imitator, increased imitation, increased reward to the imitator. Clearly the effects of being imitated ... are positive effects, the kinds of reactions that people often solicit in their interpersonal relationships" (p. 410). Some of the studies supporting such interpretations as this have already been discussed in chapter one. However, the present research fails to support the simple reinforcement view.

Self-modelling and being imitated may not be identical in implications for behaviour, nonetheless, while not refuting the validity of existing evidence from investigations into the effects of being imitated, the results and general findings of the present studies pose problems for the unqualified reinforcement interpretations of the effects of being imitated. A close examination of the results of the foregoing studies as well as existing investigations reveals that imitation (being imitated or self-modelling) produces differential effects as a function of individual as well as situational variables. The most important

mediating individual variables are of course the subject's cognitions about the behaviour. It is therefore not unreasonable to suggest that imitation or being imitated will lead to positive consequences (e.g. reciprocal attraction) to the imitated and the imitator only when the behaviour concerned is positively valenced by both parties (or at least by the 'imitated'). If the behaviour is negatively valued by the subject (i.e. the 'imitated'), then the reverse of what Thelen et al (1981) have suggested are more likely to obtain, as the present research would seem to indicate.

Evidence for the practical application of self-modelling or being imitated is limited. However, the few reported studies show self-modelling to be a potentially viable and useful tool for the training of motor skills, social skills, and cognitive skills (e.g. Wheman, 1976; Miklich et al, 1977; Kauffman et al, 1976, 1978). Indeed, Kauffman et al (1976) have stressed the importance of being imitated in children's cognitive awareness and cognitive control. Davis (1979) has likewise demonstrated the usefulness of self-modelling in social skills training.

Although the results of existing investigations such as those mentioned above are promising, further research is needed to gauge the full potential of self-modelling as a practical technique. For instance, such harmful and socially undesirable behaviours as cigarette smoking, drug abuse, and aggressiveness are often learned during childhood or adolescence, that is, before school-leaving age. The use of self-modelling (perhaps combined with health education) in school settings may prove to be an effective tool in combating for instance cigarette smoking in the young. Evidence from the present research lends some support for this proposition, though direct evidence of long-term effectiveness and ecological validity is lacking. Nonetheless, Kopel and Arkowitz (1975) have noted that there

is reason to believe that behaviour therapies which produce cognitive orientation (as self-modelling presumably does) produce particularly enduring effects. Thus the use of self-modelling in school settings might be recommended tentatively.

In the clinical field, some investigators have reported the successful use of self-modelling and contingent imitation in the modification of undesirable behaviours and the training of desirable ones (e.g. Creer & Miklich, 1970; Wheman, 1976; Kauffman et al, 1976, 1977; Miklich et al, 1977). The results and findings of the present studies support these reports. They also highlight the need for further research in this area. The present studies together with existing investigations show how self-modelling can be used to alter a wide range of behaviour disorders. This applies not only in children or mentally retarded individuals, but also in relatively intelligent adults. Such behaviour disorders include addictive behaviours (e.g. cigarette smoking, over-eating, alcoholism and drug abuse) and behavioural mannerisms (e.g. eyeblinks, tics, nail-biting and thumb-sucking).

The practical usefulness and effectiveness of self-modelling relative to other typical behaviour intervention techniques is illustrated by Study Five. Its advantages over these fairly well-established techniques have been discussed in the preceding chapters. These include:

(1) economy, (2) ease of application, and (3) its relative freedom from the ethical problems which beset many behaviour intervention procedures.

With respect to economy, the apparatus involved (mirrors) is relatively inexpensive both in terms of purchase and maintenance. It does not require expert and expensive personnel to maintain it. The procedure

is simple and easy to apply. A major advantage of self-modelling is that, unlike other therapy procedures (e.g. biofeedback and covert sensitisation), it does not require any lengthy or expensive training in order for the client to benefit from it.

Some of the ethical objections that may be levelled against behaviour therapy techniques using (tangible) reinforcement practices include the following:

- (1) there is the fear that if a person is frequently and deliberately rewarded for responding, s/he will be inhibited from responding appropriately unless s/he is continually rewarded (or bribed) to do so; and when the reinforcement contingencies are withdrawn s/he may cease to respond altogether;
- (2) contingent reinforcement is also likely to interfere with the development of a sense of responsibility (for one's actions), intrinsic motivational systems, and other self-determined personality characteristics;
- (3) the deliberate use of reinforcement may also be considered as deceptive, manipulative, and an insult to the personal freedom of human beings.

As can be seen, self-modelling as employed in the present research is relatively free from these ethical implications.

Behaviour therapies which employ aversive or noxious procedures have ethical implications as well. They include the following:

- (1) aversive therapies often use exceedingly noxious stimuli (e.g. electric shocks or emetic drugs) even though they do not (always) produce greater changes in behaviour than stimuli with weaker intensities;
- (2) besides the emotional and/or physical discomfort inherent in such procedures, repeated aversive experiences often give rise to undesirable side-effects that can seriously impede progress. For instance, repeated administration of drugs often results in physical tolerance and the drug becomes less effective. Consequently, the use of increasingly large dosages of the drug becomes necessary. This may cause resentment towards the therapist and the treatment procedure and eventually lead to the termination of treatment altogether.

Again, self-modelling is virtually free from these problems. Furthermore, compared with drugs, self-modelling lacks physiological ill-effects, and requires no expensive materials.

A primary purpose of treatment procedures is to provide the client with a means of exercising control over maladaptive behaviours. This means that it is necessary for the client to play an active role in practising self-control techniques rather than serving as a passive recipient of rewards or stimulus pairing. Thus, for instance, in the treatment of smoking behaviour or over-eating, the aim must be to encourage the client to develop self-control techniques. This is inherent in self-modelling because it produces cognitive reorganisation (or orientation) on the part of the client, as indicated by the present research (especially Study One and Study Three).

Studies into the effects of imitation and its derivatives have tended to concentrate mostly on dyads - a model and an observer. Consequently, such studies are characterised by a preoccupation with the effects of the model on the observer, as noted by Flanders (1968). This has been the conventional pattern of investigation in modern times beginning with the early works of Miller & Dollard (1941) up to the introduction of self-modelling procedures (e.g. Creer & Miklich, 1970) and the concept of being imitated (e.g. Fouts, 1972). Even in these latter procedures, the tendency has been towards the employment of a second party to either contingently imitate the subject or to play a directive role in facilitating the desired behaviour change.

The present research demonstrates that a second party is not necessary in self-modelling. The subject serves in the dual capacity of model and observer. The advantages of omitting this second-party procedure have emerged out of the foregoing studies, and dealt with in the discussions of each experiment. However, it should be stressed that it eliminates variability due to the second party which may confuse the interpretation of imitation studies.

7.3 CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER RESEARCH

The following conclusions and recommendations are offered on the basis of the present and previous studies:

- (1) Self-modelling can be used to alter the behaviours of adults, children and mentally retarded individuals. This suggests that self-modelling is a particularly viable and appropriate behaviour modification form of modelling in that the self-reference (or

feedback) of the modelled behaviour is always immediate and obvious.

- (2) Self-modelling appears to be superior to other forms of feedback techniques: (a) negative modelling, and (b) biofeedback in the modification of undesirable behaviours. However, further tests of this are needed and of the (suggested) superiority of self-modelling over other treatment procedures.
- (3) There is also a need to explore the variety of behaviour to which self-modelling is applied. All the foregoing studies involve ordinary behaviours (albeit socially undesirable) in 'normal' and relatively intelligent adults. It is unknown whether this technique is also effective with psychopathological behaviours and patients such as neurotics, stutterers, and so forth.
- (4) Evidence provided by the present research seems to suggest that cognitive processes mediate the effects of self-modelling. That is, the effects of self-modelling on a person's behaviour (facilitatory or inhibitory) are largely dependent upon the cognitive contingencies (positive or negative) governing that behaviour (and/or its consequences). A behaviour which entails positive connotations for the individual is likely to be facilitated by self-modelling. Conversely, a behaviour which entails negative connotations for the individual is likely to be inhibited by self-modelling.

Further research may elucidate the theoretical issues raised by the present project. Such research is also needed to gauge the usefulness of (non-directive) self-modelling as a treatment procedure across a wide range of behaviour disorders.

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APPENDICES

APPENDIX 1(b): OBSERVED DATA, BY SUBJECT, CONDITION AND VARIABLE

SUBJECT	AMOUNT CONSUMED (GRAMS)*			TIME (IN SECONDS)			MEAN GSR		
	Film	Self	Difference	Film	Self	Difference	Film	Self	Difference
1	.2192	.2023	.0169	39.9567	32.9533	7.0034	6.42	22.45	-16
2	.1624	.1086	.0538	22.3450	25.3450	-3.225	7.30	21.77	-14
3	.1979	.2394	-.0415	23.6200	22.1567	1.4633	11.22	29.08	-18
4	.0815	.1488	-.0673	27.1933	28.5233	-1.3300	13.41	20.02	-7
5	.1395	.1783	-.0389	35.4700	35.4233	0.0467	7.65	23.47	-16
6	.2684	.3311	-.0627	27.9467	23.7133	4.2334	6.13	16.71	-11
7	.1002	.1807	-.0805	29.883	29.6500	0.2333	4.71	16.05	-11
8	.0725	.1321	-.0596	3 ⁵ .6333	36.3800	-0.7467	11.61	23.76	-12
9	.1382	.2229	-.0847	32.5700	25.8200	6.7500	12.50	19.79	-7
10	.1875	.3883	-.2008	22.9667	22.8700	0.0967	3.49	22.49	-19
11	.1978	.2096	-.0118	30.4267	27.3433	3.0834	13.61	26.56	-13
12	.0723	.1330	-.0607	30.86	18.9800	11.8800	3.27	21.56	-18
13	.3303	.3754	-.0451	24.8933	19.8200	5.0733	-	-	-
14	.1379	.1429	-.0050	37.0350	30.9350	6.1000	-	-	-

N = 14

* Amount consumed equals weight of an unsmoked cigarette minus weight of the butt after the smoking episode.

APPENDIX 1(c):

(i) Summary of Comparison of Amount of Cigarettes Consumed (in grams): Film vs. Self (correlated t-test)

	Mean	Standard Deviation	Standard Error	Mean Difference	Standard Deviation	Standard Error	Degree of Freedom	T-Value	Two-Tail Prob
FILM	2.134	.908	.243	-0.491	.585	.156	13	-3.14	.001
SELF	1.642	.755	.202						

The subjects consumed less cigarettes (as measured in grams) in the self-modelling condition than in the film condition.

(ii) Summary of Comparison of Amount of Time (seconds) Cigarette was in Mouth: Film vs. Self (correlated t-test)

	Mean	Standard Deviation	Standard Error	Mean Difference	Standard Deviation	Standard Error	Degree of Freedom	T-Value	Two-Tail Prob
FILM	30.0571	6.012	1.607	2.463	3.317	.887	13	2.39	.000
SELF	27.1522	5.475	1.463						

The amount of time cigarettes were in contact with the subjects' lips was less in the self-modelling condition than in the film condition.

(iii) Summary of Comparison of the Subjects' Emotional Response (GSR): Film vs. Self (correlated t-test)

	Mean	Standard Deviation	Standard Error	Mean Difference	Standard Deviation	Standard Error	Degree of Freedom	T-Value	Two-Tail Prob
FILM	7.3557	4.458	1.191	-11.6071	6.216	1.661	13	-6.99	.007
SELF	18.9629	8.326	2.225						

The subjects were more emotionally aroused (as measured by GSR) in the self-modelling condition than in the film condition.

APPENDIX 1(c): continued

(iv) *Summary of Pearson Correlation Coefficients: Amount of Cigarettes Consumed, Amount of Time Cigarettes Stayed in the Subjects' Mouths and Subjects' Emotional Response (GSR): Differences Between Film and Self*

N = 14	Diff. Amount	Diff. Time	Diff. GSR
Diff. Amount	-	r = .0997 p = .367	r = .1778 p = .272
Diff. Time	r = .0997 p = .367	-	r = .4040 p = .076
Diff. GSR	r = .1778 p = .272	r = .4040 p = .076	-

There was no significant relationship found between the amount of cigarettes consumed (as measured in grams) and the amount of time cigarettes were in contact with the subjects' lips, nor between the former variable and the subjects' level of emotional arousal (GSR).

Note 1:

- (a) Diff. Amount denotes the difference between the amount of tobacco consumed by the subjects in the two experimental conditions.
- (b) Diff. Time denotes the difference between the amount of time cigarettes were in contact with the subjects' lips in the two experimental conditions.
- (c) Diff. GSR denotes the difference between the subjects mean GSR in the two experimental conditions.

Note 2:

For the purpose of the above statistical summaries, the subjects' scores were computed as whole numbers rather than decimals.

APPENDIX 1(d): TWO-WAY ANOVA ON SUBJECTS' GSR DATA BY ATTITUDE

(i) Observed Data¹

Attitude	Subject	Film	Self	Total
(A ₁) POSITIVE (+)*	1	6.42	22.45	28.87 = P1
	2	7.30	21.77	29.07 = P2
	3	11.22	29.08	40.30 = P3
	4	13.41	20.02	33.43 = P4
	5	7.65	23.47	31.12 = P5
	6	6.13	16.71	22.84 = P6
(A ₂) NEGATIVE (-)*	7	4.71	16.05	20.76 = P7
	8	11.61	23.76	35.37 = P8
	9	12.50	19.97	32.47 = P9
	10	3.49	22.70	26.19 = P10
	11	13.61	26.56	40.17 = P11
	12	3.27	21.56	24.83 = P12
	N = 12	101.32	264.10	365.42 = G

(ii) +- (AB) Summary Table

	Film	Self	Total
+(A1)	52.13	133.50	185.63
-(A2)	49.19	130.60	179.79
Total	101.32	264.10	365.42

(iii) Computational Symbols

$$(1) = G^2/npq = 365.42^2/6 \times 2 \times 2 = \frac{355.42^2}{24} = \frac{133531.77}{24} = 5563.82$$

$$(2) = \Sigma x^2 = 6.42^2 + 22.45^2 + \dots + 3.27^2 + 21.56^2 = 6978.56$$

$$(3) = (\Sigma A_j^2)/nq = \frac{(185.63)^2 + (179.79)^2}{6(2)} = \frac{34458.50 + 23234.44}{12} = 5565.25$$

$$(4) = (\Sigma B_j^2)/np = \frac{(101.32)^2 + (264.10)^2}{6(2)} = \frac{10265.74 + 69748.81}{12} = 6667.88$$

$$(5) = [\Sigma (AB)^2]/n = \frac{52.13^2 + 133.50^2 + 49.19^2 + 130.60^2}{6} = 6669.30$$

$$(6) = (\Sigma P^2)/q = \frac{28.87^2 + 29.07^2 + \dots}{2} = \frac{11562.7065}{2} = 5781.353$$

¹ Because of technical difficulties, the GSR scores of 2 subjects were excluded from this analysis.

*'Positive' and 'Negative' denote subjects who expressed positive/negative attitudes towards cigarette smoking.

APPENDIX 1(d): continued

(iv) Summary of a Two-Way ANOVA on Subjects' GSR, By Attitude

Source of Variation	Computational Formula	Sum of Squares	DF	Mean Square	F	F-Prob
Between Subjects	5781.353 - 5563.82	= 217.533	11	19.776		
(Calibration) A-	5565.25 - 5563.82	= 1.43	1	1.43	.07	>.05
Subjects Within Groups	5781.353 - 5565.25	= 216.103	10	21.65		
Within Subjects	6978.56 - 5781.353	= 11972.21	12	99.768		
B. (shape)	6667.88 - 5563.82	= 1104.06	1	1104.06	118.5	<.01
AB	6669.30 - 5565.25 - 6667.88 + 5563.82	= -0.01	1	0.0	0.0	>.05
B x Subjects Within Groups	6978.56 - 6669.30 - 5781.353 + 5565.25	= 93.157	10	93.157		

As far as the subjects' GSR was concerned, the above analysis indicates the following:

- (1) there was no significant difference between 'positive' and 'negative' subjects;
- (2) no interaction effect was found;
- (3) however, a highly significant difference (main effect) was found between the experimental conditions (F = 118; d.f. = 1; p = <0.01); indicating that the subjects were more emotionally aroused in the self-modelling condition than in the film condition irrespective of their expressed attitudes towards cigarette smoking.

APPENDIX 2: APPENDIX TO STUDY ONE

The Effects of Smoking

There is no longer any doubt that cigarette smokers have a higher death rate than nonsmokers. New biological studies help to explain how tobacco smoke damages the lungs, heart and other body tissues

by E. Cuyler Hammond

In 1580 Jean Nicot, the French ambassador to Portugal, wrote that an American Indian herb he had acquired had marvelous curative powers. For a time his view was widely accepted, and in his honor the herb was given the generic name *Nicotiana*. The species *Nicotiana rustica*, first introduced into Europe for smoking in pipes, was harsh and rather disagreeable. Later it was supplanted by *Nicotiana tabacum*, which produces a pleasanter smoke. *N. rustica* is still grown in the U.S.S.R. and other parts of Asia, but *N. tabacum* is now the chief source of smoking tobacco and is the only species cultivated in the U.S.

Skepticism about the medical value of tobacco developed near the end of the 16th century; not long thereafter smoking was condemned as a pernicious habit responsible for all manner of ills. This did not prevent smoking from becoming an almost universal habit among men in Europe and the American colonies. Actually there was no scientific evidence for any harmful effects of tobacco until the middle of the 19th century.

It appears that M. Bouisson, an obscure French physician, deserves credit for the first well-documented clinical study of the matter. In 1859, reporting on patients in the hospital at Montpellier, he observed that of 68 patients with cancer of the buccal cavity (45 of the lip, 11 of the mouth, seven of the tongue and five of the tonsil) 66 smoked pipes, one chewed tobacco and one apparently used tobacco in some form. He noted

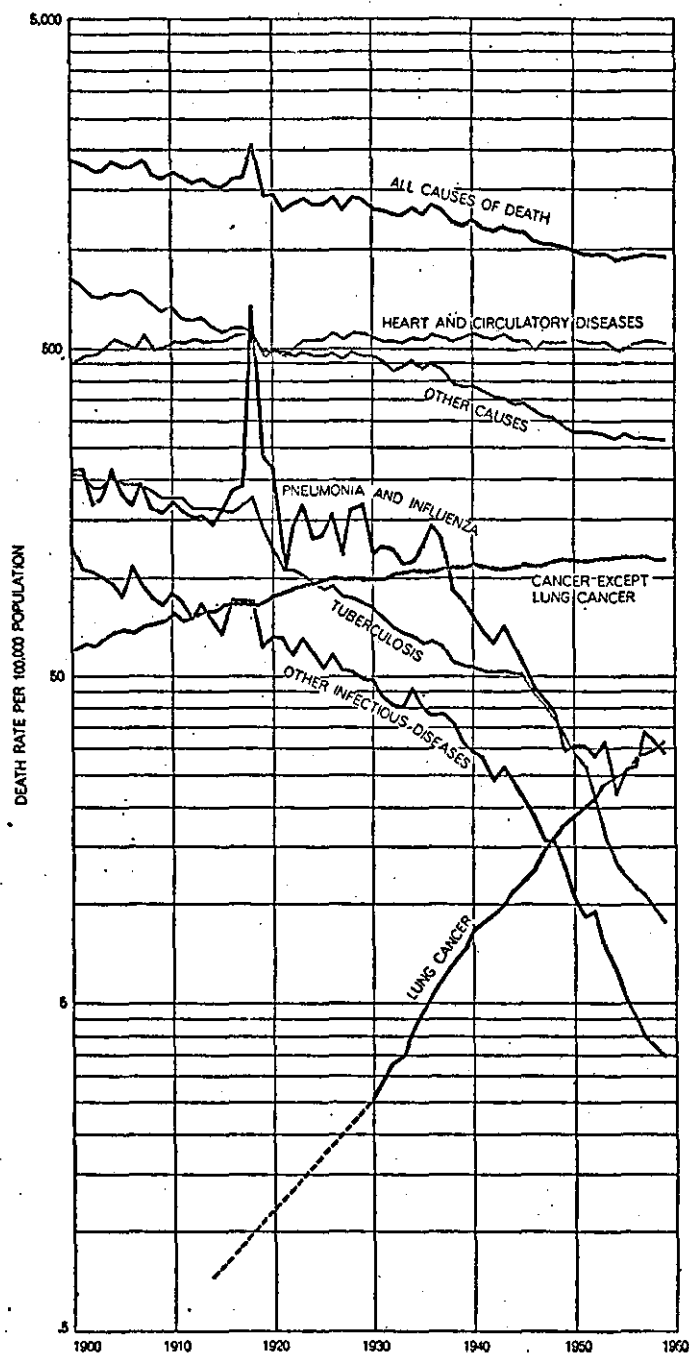
that cancer of the lower lip ordinarily developed at the point where the pipe was held in the mouth. He further noted that lip cancer occurred more frequently among individuals who smoked short-stemmed pipes (then called "mouth burners") than among those who smoked long-stemmed clay pipes or pipes with stems made of a substance that does not conduct heat. He suggested that the cancer resulted from irritation of the tissue by tobacco products and heat.

Bouisson's observations were confirmed repeatedly over the next half-century, but since mouth cancer did not loom as a major medical problem the effect on smoking habits was insignificant. Another statistically unimportant problem early recognized as being associated with smoking was Buerger's disease, a rare affliction of the peripheral arteries. It was found to occur exclusively among smokers and to subside when the patient stopped smoking. In 1936, however, two New Orleans surgeons, Alton Ochsner and Michael E. De Bakey, observed that nearly all their lung cancer patients were cigarette smokers. Noting that lung cancer seemed to be on the increase and that it was paralleled by a general rise in cigarette smoking, they suggested a causal connection between the two phenomena. In 1938 Raymond Pearl, the noted Johns Hopkins University medical statistician, reported that smokers had a far shorter life expectancy than those who did not

use tobacco. The effect was so great as to indicate that smoking must be associated with diseases other than cancer. The first experimental evidence for an association between tobacco and cancer came in 1939, when A. H. Roffo of Argentina reported that he had produced cancer by painting tarlike tobacco extracts on the backs of rabbits. After World War II there was renewed interest in the subject of smoking and health, due partly to trends in tobacco consumption and partly to trends in death rates.

Before 1914 tobacco had been consumed mainly in pipes, cigars, chewing tobacco and snuff [see illustration on page 41]. Cigarettes began to be popular during World War I. In the period from the early 1920's to 1960 the consumption of manufactured cigarettes in the U.S. rose from about 750 per adult per year to 3,900 per adult per year. During the same period the consumption of tobacco in all other forms declined by about 70 per cent. The net result was that consumption of all tobacco products rose about 30 per cent.

The changes in smoking habits are more significant than the over-all rise in tobacco consumption. Smoke from cigars and pipes is heavy and as a rule slightly alkaline. Few people can inhale it without coughing or becoming dizzy or nauseated. Cigarette smoke, on the other hand, is relatively light, nearly neutral and can be inhaled readily. Most habit-



RISE IN LUNG CANCER DEATHS runs counter to the 60-year downtrend in total death rates among U.S. men. In 1959 lung cancer accounted for 29,335 deaths. Colon and rectal cancers, next in order of frequency, caused 19,129 male deaths. The nearly steady death rate for heart and circulatory diseases conceals a significant rise in coronary artery disease, which is offset by a long-term decline in infectious heart diseases. Curves are age-adjusted so that death rates are not spuriously shifted by the changing age composition of the population.

ual cigarette smokers inhale to some degree, and heavy cigarette smokers tend to inhale deeply. In a recent study conducted by the American Cancer Society detailed information has been obtained on the smoking habits of 43,068 men and women. Only 7 per cent of the cigarette smokers among the men said that they did not inhale, whereas noninhalation was reported by 53 per cent of the pipe smokers and 71 per cent of the cigar smokers. Deep inhalation was reported by 24 per cent of the cigarette smokers compared with only 3 per cent of the pipe smokers and 1.5 per cent of the cigar smokers. Women who smoke inhale to a lesser degree than men smokers do. Furthermore, women over the age of 40 smoke far fewer cigarettes than men of the same age do, and few women over 55 smoke as much as a pack a day. Among current cigarette smokers now over 50, the majority of the men started the habit before they were 20, whereas the majority of the women did not begin until they were over 35.

During the past half-century total death rates—including death rates from almost all infectious diseases and some noninfectious ones—have declined rapidly. Lung cancer is a striking exception. Deaths from lung cancer in the U.S. have climbed from 4,000 in 1935 to 11,000 in 1945 and to 36,000 in 1960. The toll in 1960 was approximately equal to the number of deaths caused by traffic accidents. In 1960, 86 per cent of those who died from lung cancer were men. Between 1935 and 1960 the age-standardized death rate from lung cancer among U.S. men (the death rate adjusted for age differences in the composition of the population) increased 600 per cent; among women it increased 125 per cent. And for the past several years lung cancer has been the principal form of fatal cancer among men.

Painstaking studies have clearly demonstrated that the increase in lung cancer is real and not attributable merely to improvement in diagnosis. Lung cancer (that is, bronchogenic carcinoma) arises in the epithelium, or lining, of the bronchial tubes. The increase seems to be confined to two closely related forms of the disease: epidermoid carcinoma and undifferentiated carcinoma. There seems to be little, if any, increase in another form of the disease: adenocarcinoma. (In adenocarcinoma the diseased cells assume an arrangement resembling that of the cells in a gland.)

Lung cancer accounted for about 2 per cent of all U.S. deaths in 1960, and for about 6 per cent of deaths among men in their late 50's and 60's. The lead-

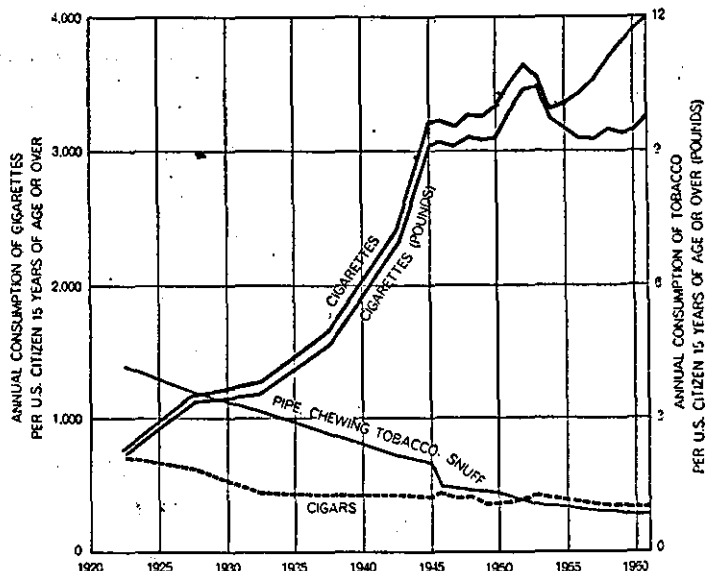
ing cause of death in the U.S. is coronary artery disease of the heart, which accounted in 1960 for nearly 29 per cent of all deaths, and for about 35 per cent of deaths among men still in their 40's and 50's. As in the case of lung cancer, coronary artery disease is less common among women, accounting for only about 16 per cent of the deaths occurring between the ages of 40 and 59.

In the late 1940's, when a number of investigators became concerned with lung cancer, cigarette smoking was only one of several factors suggested as possible causes for the increase in the disease. It was already well known that lung cancer could result from prolonged and heavy occupational exposure to certain industrial dusts and vapors. These include chromates, nickel carbonyl and dusts containing radioactive particles. Moreover, they result in epidermoid or undifferentiated carcinoma of the bronchial tubes and not in the less common adenocarcinoma.

This led to the hypothesis that the increase in lung cancer was due to increased exposure of the human population to air contamination of some sort. The factor involved had to be widespread and not confined to any particular occupational group. (In all countries with adequate mortality statistics lung cancer was found to have increased.) Three factors that met the requirements were: fumes from the combustion of solid and liquid fuels, dust from asphalt roads and the tires of motor vehicles, and cigarette smoking. The first two have not been ruled out as possibly contributing somewhat to the occurrence of lung cancer. It is the third that concerns us here.

As a first step a number of studies were made comparing the smoking habits of lung cancer patients with the smoking habits of individuals free of the disease. The results confirmed the 1936 observation of Ochsner and De Bakey. In every such study a far larger percentage of cigarette smokers was found in the lung cancer group than in the control group. Indeed, virtually all patients with epidermoid or undifferentiated carcinoma of the bronchial tubes admitted to smoking. There appeared to be less association, if there was any at all, between smoking habits and adenocarcinoma of the lung.

Cancer was not the only disease studied in relation to smoking habits. Knowing the acute effects of nicotine on the circulatory system, many physicians believed that smoking might be bad for patients with heart disease. In fact, a



CHANGES IN TOBACCO USE produced a fivefold rise in cigarette consumption between the early 1920's and 1961, and a drop of nearly 70 per cent in consumption of all other tobacco products. Cigarettes are plotted both in units (color) and in pounds of unstemmed-tobacco equivalent. Other tobacco products are shown only in pounds. Filter cigarettes, which use less tobacco than nonfilter types, have been growing in popularity since 1954.

study made at the Mayo Clinic in 1940 by John P. English, Fredrick A. Willis and Joseph Berkson had indicated a considerable degree of association between smoking habits and coronary artery disease. Furthermore, many doctors were under the impression that smoking had a bad effect on patients with gastric and duodenal ulcers.

A number of investigators, myself among them, were uncertain as to the validity of these "clinical impressions" and "retrospective studies." A useful way to minimize bias and other difficulties in looking for an association between a disease and its possible causes is to employ the "prospective," or "follow up," method of investigation. The method consists of questioning a large number of presumably healthy individuals, keeping in touch with them for a number of years and finally ascertaining whether or not deaths in later years are associated with habits reported by the subjects before they became ill.

Two such prospective studies were undertaken in the fall of 1951, one in Britain by W. Richard Doll and A. Bradford Hill and the other in the U.S. by Daniel Horn and me. Under the auspices of the British Medical Research Council, Doll and Hill initiated their investigation by mailing questionnaires on smoking habits to all British physicians. They ob-

tained information on all deaths among British physicians by checking death certificates. Their study is still in progress. Several years later similar investigations were undertaken by Harold F. Dorn, who studied U.S. veterans holding life insurance; by E. W. R. Best, G. H. Josie and C. B. Walker, who are studying Canadian veterans and pensioners; and by John Edward Dunn, Jr., George Linden and Lester Breslow, who are studying men employed in certain occupations in California. In 1959 I started a new and more extensive prospective study in which smoking is included as only one of many factors under investigation.

The findings in all these investigations are remarkably similar; indeed, they are as close as could possibly be expected considering that the subjects were drawn from different populations and were of different ages. In the interest of brevity, therefore, I shall present data only from two studies with which I am personally concerned. The first of these was carried out as follows.

After designing and pretesting a questionnaire in the fall of 1951, we trained more than 22,000 American Cancer Society volunteers as researchers for the study. Between January 1 and May 31 of 1952 they enrolled subjects in 394 counties in nine states. The subjects,

all men between the ages of 50 and 69, answered a simple confidential questionnaire on their smoking habits, both past and present. A total of 187,783 men were enrolled, filled out usable questionnaires and were successfully kept track of for the next 44 months. Death certificates were obtained for all who died, and additional medical information was gathered for those who were reported to have died of cancer. All together 11,870

deaths were reported, of which 2,249 were attributed to cancer.

The most important finding was that the total death rate (from all causes of death combined) is far higher among men with a history of regular cigarette smoking than among men who never smoked, but only slightly higher among pipe and cigar smokers than among men who never smoked. This is illustrated in the first of the series of charts on pages

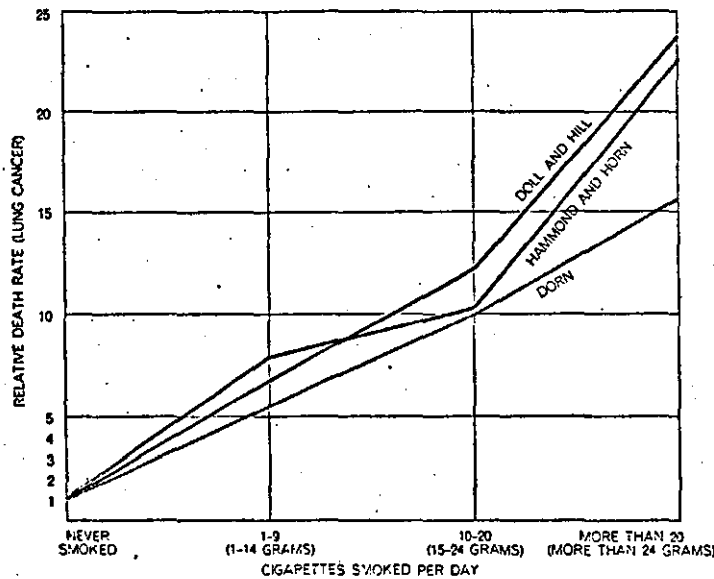
44, 45 and 46. The death rates have been adjusted for age, and for ease of comparison the death rate of men who never smoked has been set at one.

Men who had smoked cigarettes regularly and exclusively were classified according to their cigarette consumption at the time they were enrolled in the study. It was found that death rates rose progressively with increasing number of cigarettes smoked per day, as shown in the second chart in the series. The death rate of those who smoked two or more packs of cigarettes a day was approximately two and a quarter times higher than the death rate of men who never smoked.

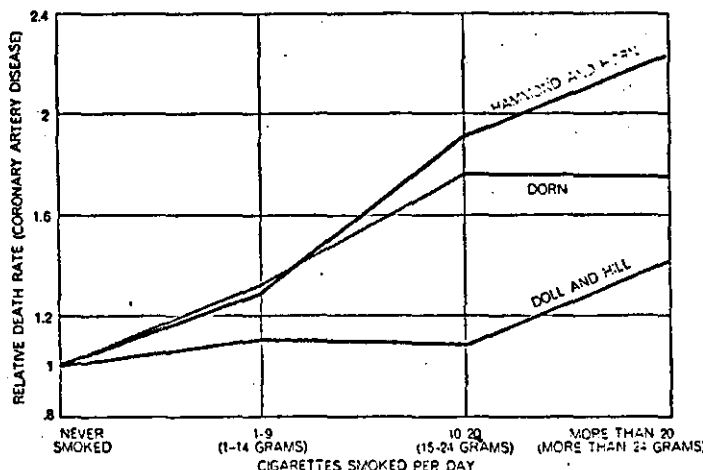
Being a heavy cigarette smoker myself at the time, I was curious to know the death rate of ex-cigarette smokers. This is shown in the third chart in the series. The death rate of men who had given up cigarette smoking a year or more prior to enrollment was considerably lower than that of men who were still smoking cigarettes when they were enrolled in the study.

Next we analyzed the data in relation to cause of death as reported on death certificates. Such information is subject to error, but on checking medical records we found that the diagnosis of cancer had been confirmed by microscopic examination of tissue in 79 per cent of the deaths ascribed to this disease. Even in some of these cases, however, the site or origin of the cancer was unknown or open to question. This is because cancer, unless successfully treated at an early stage, spreads through the body and its source is often difficult to determine. There is another difficulty that has to do with other causes of death. People in the older age groups not infrequently suffer from two or more diseases, one or another of which could be fatal. Since death can result from the combined effects of these diseases, it is difficult, or perhaps illogical, to ascribe death to one alone. These difficulties should be kept in mind in evaluating the following findings.

During the course of the study 7,300 deaths occurred among subjects with history of regular cigarette smoking (some of whom smoked pipes and cigars as well as cigarettes). We divided these deaths according to primary cause as reported on death certificates. This is shown in the table on the opposite page under the heading "Observed death." Only 4,651 of these cigarette smokers would have died during the course of the study if their death rates had exactly matched those of men of the same age who had never smoked. This is shown



LUNG CANCER as a cause of death increases with the number of cigarettes (or gram equivalent) consumed per day, according to three major studies cited in the text. "Relative death rate" is the death rate among smokers divided by the death rate found among nonsmokers.



CORONARY ARTERY DISEASE as a cause of death also increases with the cigarettes smoked per day. The relative death rates are lower than for lung cancer because coronary artery disease is the leading cause of death among nonsmokers as well as among smokers.

the table under the heading "Expected deaths." The difference of 2,665 deaths (7,316 minus 4,651) can be considered the "Excess deaths" associated with a history of regular cigarette smoking. Of these excess deaths 52.1 per cent were attributed to coronary artery disease of the heart, 13.5 per cent to lung cancer and the remainder to other diseases. From this it is apparent that as a cause of death coronary artery disease is by far the most important disease associated with cigarette smoking.

From the standpoint of attempting to determine causal relations, it is best to study the figures in the table under the heading "Relative death rate." This is the observed number of deaths divided by the expected number of deaths, which in essence is the death rate of cigarette smokers divided by the death rate of subjects who never smoked.

Since coronary artery disease is the leading cause of death among men in the U.S. today, it is not surprising that we found it to be the leading cause of death among nonsmokers as well as among cigarette smokers. But the rate was 70 per cent higher among cigarette smokers. As shown in the fourth chart in the series on the next three pages, the death rate attributed to coronary artery disease increased progressively with the amount of cigarette smoking. We also found that ex-cigarette smokers had a lower death rate from this disease than did men who were still smoking cigarettes at the start of the study.

Lung cancer is an extremely rare cause of death among nonsmokers, except for those who have had prolonged and heavy occupational exposure to certain dusts and fumes. Taking death-certificate diagnosis at face value, the lung cancer death rate was more than 10 times higher among cigarette smokers than among nonsmokers. On obtaining medical records we found that, of 448 deaths attributed to this cause, the diagnosis of bronchogenic carcinoma was established by microscopic examination in addition to other evidence in 327 cases, of which 32 were adenocarcinoma. The fifth chart in the series shows age-standardized death rates by amount of cigarette smoking based on the 295 deaths from well-verified cases of bronchogenic carcinoma other than adenocarcinoma. The rate was very low for men who had never smoked, it increased with the amount of cigarette smoking, and it was very high for men who smoked two or more packs of cigarettes a day. When standardized both for age and for the amount of smoking, the rate for ex-cigarette smokers who had given up the

habit for a year or more was considerably lower than the rate for men who were smoking cigarettes regularly at the start of the study. The lung cancer death rate of cigar and pipe smokers was very low compared with that of cigarette smokers, although higher than the rate for nonsmokers.

All together 127 deaths were attributed to cancer of other tissues (mouth, tongue, lip, larynx, pharynx and esophagus) that are directly exposed to tobacco smoke and material condensed from tobacco smoke. In 114 of these cases the diagnosis was confirmed by microscopic examination. Of these 114 men, 110 were smokers and only four had never smoked. The figures suggest that pipe and cigar smoking may be more important than cigarette smoking in relation to cancer of one or more sites included in this group, but the number of cases was not sufficient for a reliable evaluation of this point. Nevertheless, these cancers were the only causes of death for which the death rate of pipe and cigar smokers was found to be far higher than the death rate of nonsmokers.

Other reported causes of death showing a fairly high degree of association with cigarette smoking were gastric and duodenal ulcers, certain diseases of the arteries, pulmonary diseases (including pneumonia and influenza), cancer of the bladder and cirrhosis of the liver. Many other diseases appeared to be somewhat associated with cigarette smoking.

In 1959 I started a new study considerably larger than the first one. By securing the services of some 68,000 volunteer workers of the American Cancer Society in 1,121 counties in 25 states, we enrolled as subjects 1,079,000 men and women over the age of 30. Each of them filled out a lengthy confidential questionnaire including questions on family history, diseases and physical complaints, diet, smoking and other habits, residence history, occupational exposures and many other factors not included in previous studies. We plan to follow these subjects for six years. So far follow-up information is available only for the first 10½ months of observation.

The early findings on smoking are in close agreement with findings in all previous studies. In this study smokers were asked the degree to which they inhaled the smoke. It was found that, in relation to total death rates, the degree of inhalation is as important, and perhaps more important, than the amount of smoking [see illustration on page 47].

The new study has also revealed a high degree of association between cigarette smoking and a number of physical complaints, most particularly coughing, shortness of breath, loss of appetite and loss of weight [see illustration on page 49]. These complaints were related to the degree of inhalation as well as to the amount of smoking. They were reported less frequently by cigar and pipe smokers (most of whom do not inhale) than by cigarette smokers (most of whom

CAUSE OF DEATH	OBSERVED DEATHS	EXPECTED DEATHS	EXCESS DEATHS	PERCENTAGE OF EXCESS	RELATIVE DEATH RATE
TOTAL DEATHS (ALL CAUSES)	7,316	4,651	2,665	100.0	1.57
CORONARY ARTERY DISEASE	3,361	1,973	1,388	52.1	1.70
OTHER HEART DISEASES	503	425	78	2.9	1.18
CEREBRAL VASCULAR LESIONS	556	428	128	4.8	1.30
ANEURYSM AND BUEGGER'S DISEASE	86	29	57	2.1	2.97
OTHER CIRCULATORY DISEASES	87	68	19	0.7	1.28
LUNG CANCER	397	37	360	13.5	10.73
CANCER OF THE BUCCAL CAVITY, LARYNX OR ESOPHAGUS	91	18	73	2.7	5.06
CANCER OF THE BLADDER	70	35	35	1.3	2.00
OTHER CANCERS	902	651	251	9.4	1.39
GASTRIC AND DUODENAL ULCER	100	25	75	2.8	4.00
CIRRHOIS OF THE LIVER	83	43	40	1.5	1.93
PULMONARY DISEASE (EXCEPT CANCER)	231	81	150	5.6	2.85
ALL OTHER DISEASES	486	453	33	1.2	1.07
ACCIDENT, VIOLENCE, SUICIDE	363	385	-22	-0.8	0.94

DEATHS AMONG REGULAR CIGARETTE SMOKERS, labeled "Observed deaths," are compared with the number of deaths "expected" if the death rates for each age group among smokers had been the same as those found among nonsmokers. The table summarizes the results of the study conducted by the author and Daniel Horn. The column "Excess deaths" can be considered as the excess number of deaths associated with cigarette smoking. "Relative death rate" is the observed number of deaths divided by the expected number.

inhale either moderately or deeply).

Two prospective studies of smoking in relation to the occurrence of coronary artery disease have been carried out in Framingham, Mass., and Albany, N.Y. The combined findings from these studies were published on April 19 in *The New England Journal of Medicine* by Joseph T. Doyle, Thomas R. Dawber, William B. Kannel, A. Sandra Heslin and Harold A. Kahn. On enrollment in these studies each subject was given a medical examination. No symptoms of coronary artery disease were initially found in 4,120 men. These men were re-examined from time to time for a number of years. Symptoms of coronary artery disease (as well as death from this disease) were found far more frequently among those who smoked cigarettes regularly than among those who did not smoke. The total death rate was more than twice as high among men who smoked more than 20 cigarettes a day as among men who had never smoked. Ex-smokers and cigar and pipe smokers had morbidity and mortality records similar to the records of those who had never smoked. Thus the findings in this study based on medical examination of subjects were in close agreement with findings in the other U.S. studies.

Although all the studies have shown essentially the same results, there are some interesting differences between the results in Britain and the U.S. Lung

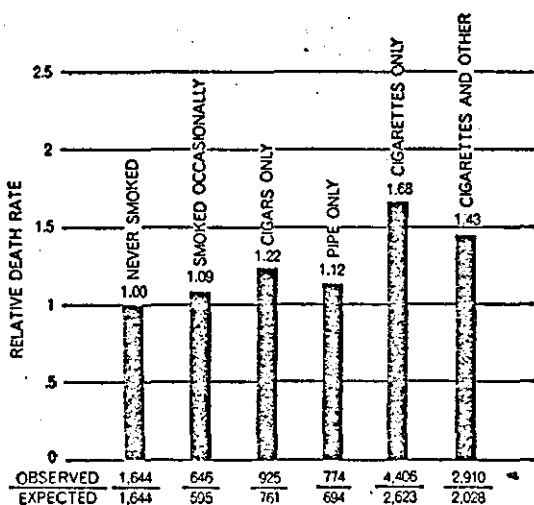
cancer death rates are about twice as high in Britain as they are in the U.S.; chronic bronchitis is reported to be a common cause of death by British physicians but is seldom mentioned as a cause of death in the U.S.; death rates from coronary artery disease (as reported on death certificates) are far lower in Britain than they are in the U.S. No one really knows the reasons for these differences. Speculations on the subject may be briefly summarized as follows.

Climate, the method of heating houses, exposure to air pollutants and occupational exposure to dusts and fumes have all been suggested as possible reasons why both lung cancer and chronic bronchitis appear to occur more frequently in Britain than in this country. Differences in smoking habits have also been suggested as a possible factor. Doll and Hill have studied the length of discarded cigarette butts in England and Wales, and Ernest L. Wynder of the Sloan-Kettering Institute for Cancer Research and I have made similar studies on this side of the Atlantic. The average length of the butts was found to be 18.7 millimeters in England and Wales (where cigarettes are quite expensive), compared with 27.9 mm. in Canada and 30.9 mm. in the U.S. Therefore British smokers consume more of each cigarette and so receive a higher amount of nicotine and tobacco tar than Canadian and U.S. smokers do.

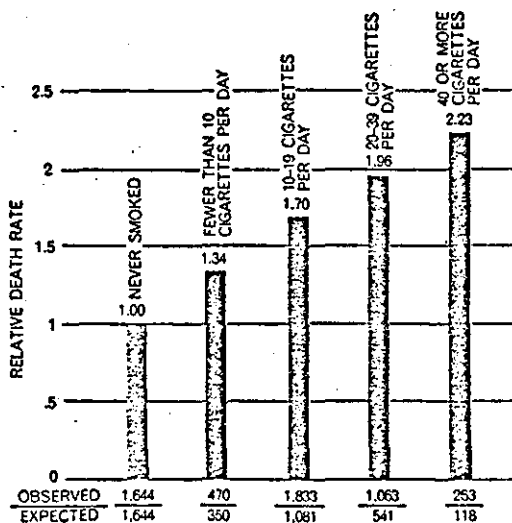
Diet has been suggested as a possible

reason why death rates from coronary artery disease appear to be higher in the U.S. than they are in Britain. This apparent difference may be at least partly due to difference in diagnosis of the cause of death. Death can result from the combined effects of heart disease and lung ailments, particularly in older people. In the case of heart failure in a person suffering from a lung disease it is sometimes difficult to decide which to record as the principal cause of death. Thus the apparent high death rate reported as due to chronic bronchitis in Britain may be related to the comparatively low death rate reported as due to coronary artery disease in that country. Be that as it may, the Doll and Hill study showed less of a relation between smoking and coronary artery disease than did our U.S. study [see lower illustration on page 42]. On the other hand, Doll and Hill found a very high relation between smoking and death from chronic bronchitis.

In recent years considerable attention has been given to the chemical composition of tobacco smoke. A great many compounds have been identified, most of which are present in very small amounts. Some are distilled out of the tobacco and others are products of combustion. Included are numerous poisons (such as nicotine), various agents that are highly irritating to mammalian tissues, several carcinogenic (cancer-



DEATH RATE FROM ALL CAUSES in Hammond and Horn study was far higher among cigarette smokers than among men who never smoked, but only slightly higher among pipe and cigar smokers.



DAILY CIGARETTE CONSUMPTION showed a direct correlation with relative death rate from all causes. The study followed 187,783 men between the ages of 50 and 69 for 44 months.

producing) compounds and some co-carcinogenic compounds (materials that increase the potency of carcinogens). Most of this material is suspended in small particles, which together with carbon monoxide, air and other gases constitute tobacco smoke.

Ernest Wynder and his various collaborators have shown that tobacco-smoke condensate, or "tar," produces cancer in mice and rabbits if applied repeatedly to the skin over a long period of time. A number of investigators have confirmed these findings. The cancers so produced in rodents are of a type known as epidermoid carcinoma. (A synonym is squamous cell carcinoma, because the cells tend to be flattened, or squamous.) Different strains of animals vary in susceptibility, some being highly susceptible and others highly resistant.

Many investigators who have tried to produce lung cancer in rodents by exposing them to tobacco smoke have not succeeded in doing so. This may be because of two serious difficulties. Whereas a human smoker takes in smoke through his mouth, mice and other small rodents breathe through their noses, and in rodents this organ has developed into a remarkably efficient filter for preventing particulate matter from being drawn into the lung. Moreover, mice are sensitive to the acute toxic effects of tobacco smoke.

Several years ago I exposed mice to cigarette smoke under such conditions

that they were forced to breathe smoke of approximately the same concentration as that of smoke taken in by human cigarette smokers. Unfortunately many of my animals went into convulsions and died within a few minutes. The remaining animals lived only a short time. By reducing the concentration of smoke the animals can be kept alive, but under such conditions it is doubtful whether or not their lungs are any more heavily exposed to the particulate matter of cigarette smoke than are the lungs of a nonsmoker sitting in a small room with several heavy smokers.

Nevertheless, by subjecting mice to tolerable concentrations of tobacco smoke Cecilie and Rudolph Leuchtenberger and Paul F. Doolon of the Children's Cancer Research Foundation in Boston have succeeded in producing various changes in the lining of the bronchial tubes of mice. These changes are similar to changes found in the bronchial tubes of human cigarette smokers. So far no cancers have been produced in mice thereby. This is consistent with the finding that lung cancer rarely occurs in human beings who are only slightly exposed to tobacco smoke.

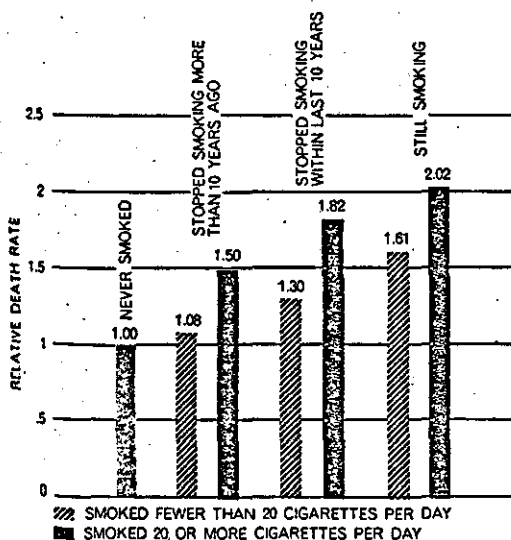
During smoking the tissues first exposed to tobacco smoke are the lips, the tongue and the mucous membrane of the mouth. Some of the components of tobacco smoke (including known carcinogens) fluoresce under ultraviolet light. Robert C. Mellors of the Cornell

University Medical College has shown that this material penetrates the cells of the lining of the mouth. The type of cancer that arises in this tissue is epidermoid carcinoma—the same type of cancer that is produced when tobacco tar is applied to the skin of experimental animals. Furthermore, the amount of tar required to produce epidermoid carcinoma of the skin in mice is roughly comparable to the exposure of a heavy smoker who develops epidermoid carcinoma of the lip or mouth.

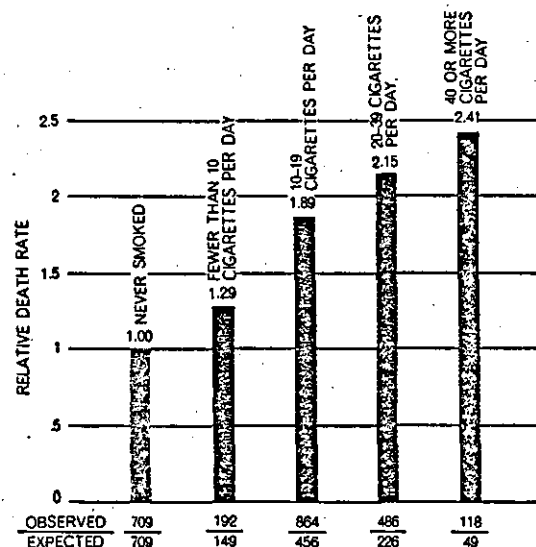
In study after study a high degree of association has been found between smoking of all types (as well as the chewing of tobacco) and the occurrence of cancer of these tissues. It is hard to escape the conclusion that this association reflects a direct causal relation. This does not preclude the possibility that other factors (such as host susceptibility or exposure to other carcinogenic materials) are involved in at least some cases.

What has just been said of smoking in relation to cancer of the lips, mouth and tongue also applies to cancer of the pharynx and cancer of the larynx. The situation is slightly different in cancer of the esophagus; this passageway is exposed to ingested tobacco-smoke condensate but not directly to the smoke. The strong association between smoking and epidermoid carcinoma of the esophagus, however, would seem to point to the same conclusion.

When inhaled, tobacco smoke travels



FORMER SMOKERS had a lower relative death rate than those still smoking, particularly if they had smoked fewer than 20 cigarettes a day and had stopped smoking for at least 10 years.



CORONARY ARTERY DISEASE, which accounted for 52.1 per cent of excess deaths among regular smokers of cigarettes, was also correlated very closely with the smoker's daily cigarette consumption.

down the trachea to the bronchial tubes of the lungs. All but a few cases of lung cancer originate in the lining, or epithelium, of these tubes. This is remarkable tissue, well worth describing here. Normally it consists of just two layers of cells that rest on a thin mat of tiny fibers called the basement membrane. This membrane separates the epithelium from the underlying tissue. Directly on top of the basement membrane is a layer of small, round cells with relatively small nuclei. They are called basal cells. On top of the basal cells is a single layer of cells known as columnar cells (because from the side they look like columns) interspersed with a few goblet cells (which look like little wine goblets). The goblet cells secrete a sticky fluid onto the surface. This is augmented by fluid secreted by glands located below the basement membrane. Protruding from the top of the columnar cells are short, hairlike cilia, which constantly move in a whiplike manner. This causes fluid on the epithelium to move up through the bronchial tubes and the trachea into the mouth, where it is either swallowed or expectorated.

The cilia and the fluid perform an extremely important function in cleansing the lungs. Small particles of dust or smoke that settle on the surface of the bronchial tubes are trapped in the fluid and, together with the fluid, are moved up and out of the lungs.

It has been shown by Anderson C. Hilding of St. Luke's Hospital in Duluth,

Minn., by Paul Kotin of the University of Southern California School of Medicine and by others that tobacco smoke inhibits the movement of the cilia to such a degree that the flow of fluid is slowed down, if not stopped altogether. This allows an accumulation of tobacco-smoke products and whatever other material happens to fall on the lining of the bronchial tubes. Smokers and nonsmokers alike—particularly those living in cities with polluted air and those engaged in certain occupations—inhalate dust of various types, and some of the dusts contain carcinogenic substances.

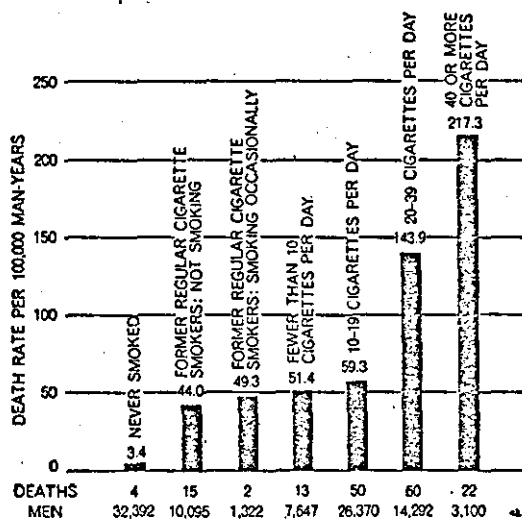
For a number of years I have been cooperating in an extensive study of human lung tissue with Oscar Auerbach, a pathologist at the Veterans Administration Hospital in East Orange, N.J., and with Arthur Purdy Stout of the Columbia University College of Physicians and Surgeons. Some of our findings can be summarized as follows.

At the East Orange Veterans Hospital and at a number of hospitals in upstate New York the lungs are routinely removed at autopsy. The trachea and bronchial tubes are dissected out of the lungs and systematically divided into 208 portions, each of which is embedded in paraffin. A thin section of tissue is cut from each of these portions, mounted on a glass slide and stained with a suitable dye for microscopic examination. Independently, under the supervision of Lawrence Garfinkel of my staff, an interviewer is sent to the home of each patient

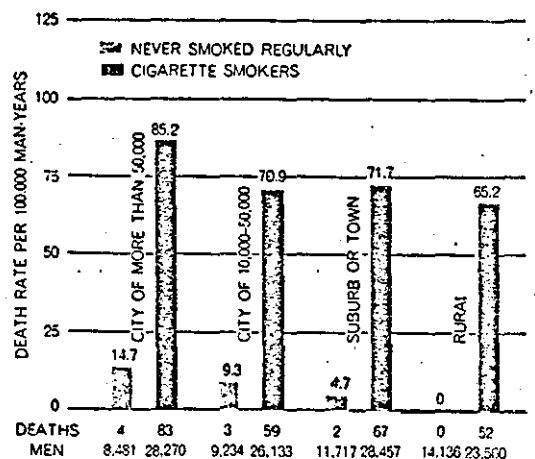
to obtain information on his or her occupational history, residence history and smoking habits. We do not include a case unless this information can be obtained. All told we have studied tissue from the bronchial tubes of more than 1,000 individuals.

In each of our studies microscope slides from a number of different patients have been put in completely random order by the use of a table of random numbers. They are then labeled with a serial number that gives no clue to their identity. All the slides are studied microscopically by Auerbach and samples of them are checked by Stout. After the slides are examined, the serial numbers are decoded so that the microscopic findings can be analyzed in relation to other information about the subjects.

Three major types of change occur in bronchial epithelium: hyperplasia (an increase in the number of layers of cells), loss of ciliated columnar cells and changes in the nuclei of cells [see illustration on page 50]. Hyperplasia is the usual reaction of surface tissues to almost any type of irritation, either chemical or mechanical. A familiar example is the formation of calluses on the hands. We found some degree of hyperplasia in 10 to 18 per cent of slides from nonsmokers, in more than 80 per cent of slides from light cigarette smokers and in more than 95 per cent of slides from heavy cigarette smokers. Extensive hyperplasia (defined as five or more layers of cells between the basement mem-



LUNG CANCER DEATH RATES, age-standardized and based on well-established cases exclusive of adenocarcinoma, rose sharply for men smoking more than a pack a day in the Hammond and Horn study. But the death rate among former smokers was much lower.



NONSMOKERS IN THE CITY sometimes die of lung cancer, but the death rate was only a fraction of that found among cigarette smokers who lived in the country. The death rates are based on well-established cases of lung cancer, exclusive of adenocarcinoma.

brane and the columnar cells) was frequently found in heavy cigarette smokers but rarely in other subjects.

Loss of ciliated columnar cells was observed in nonsmokers but far more frequently in cigarette smokers, and the frequency of this observation increased with the amount of cigarette smoking. The implication is that foreign material tends not to be removed, and thus can accumulate where the cilia have been destroyed.

An important finding was the occurrence of cells with atypical nuclei. The nuclei of cancer cells are usually large, irregular in shape and characteristically have many more than the normal number of chromosomes. A few cells with nuclei that have such an appearance are occasionally found in the bronchial epithelium of men and women who have never smoked. Presumably they result from somatic mutation or some similar process. In nonsmokers the frequency of such cells does not increase with age.

Large numbers of cells with atypical nuclei of this kind were found in slides from cigarette smokers, and the number increased greatly with the amount of smoking. In heavy cigarette smokers we found many lesions composed entirely of cells with atypical nuclei and lacking cilia. Fewer such lesions were found in light cigarette smokers and none were found in nonsmokers. Among heavy cigarette smokers the number of cells with atypical nuclei increased markedly with advancing age.

In our latest study of bronchial epithelium we matched 72 ex-cigarette smokers, 72 men who had smoked cigarettes regularly up to the time of their terminal illness and 72 men who had never smoked. None of the men had died of lung cancer. Within each of the 72 triads, the three men were the same age, had similar employment histories and similar residence histories. Somewhat more changes were found in slides from ex-cigarette smokers than in slides from men who had never smoked. The important finding, however, was that the cellular changes, particularly the occurrence of cells with atypical nuclei, were fairly rare in ex-cigarette smokers compared with men who had smoked up to the time of their terminal illness. The study indicated that the number of cells with atypical nuclei declines when a cigarette smoker gives up the habit. This probably occurs slowly over a period of years.

The location of lesions is also significant and correlates with an observation one can make by passing cigarette smoke through glass tubing. Some years ago I

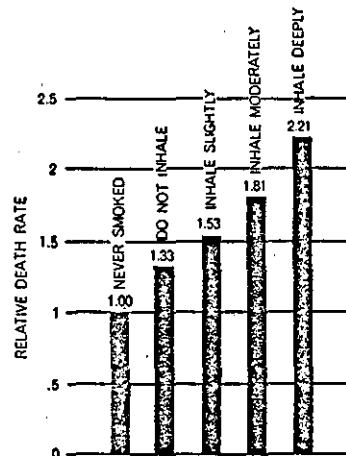
found that when smoke was passed through a tube with a Y-shaped bifurcation, more tar precipitated where the tube branched than elsewhere. Acting on this lead, we have studied changes in bronchial epithelium in relation to bifurcations. There are numerous such points in the bronchial tree, because the tubes divide and redivide into smaller and smaller tubes. We found that lesions composed entirely of cells with atypical nuclei occur far more frequently at bifurcations than elsewhere.

In order to determine the significance of these changes we studied the bronchial epithelium of men who had died of bronchogenic carcinoma. Carcinoma is defined as a tumor, composed of cells with atypical nuclei, that originated in the epithelium and has penetrated the basement membrane and "invaded" the underlying tissue. Once such an invasion has occurred, the tumor grows—often to considerable size—and spreads to many parts of the body. In men who had died of lung cancer we found large numbers of cells with atypical nuclei, as well as many lesions composed entirely of such cells, scattered throughout the epithelium of the bronchial tubes of both lungs. In a few instances we found tiny independent carcinomas in which the tumor cells had broken through the basement membrane at just one small spot. These carcinomas looked exactly like many of the other lesions composed entirely of cells with atypical nuclei, except that in the other lesions we did not find any cells that had broken through the basement membrane. We are of the opinion that many, if not all, of the lesions composed entirely of atypical cells represent an early, preinvasive stage of carcinoma. This is a well-known occurrence in the cervix of the uteri of women and is called carcinoma *in situ*.

Judging from experimental evidence as well as from our findings in human beings, we are of the opinion that carcinoma of bronchial epithelium originates with a change in the nuclei of a few cells; that by cell division the number of such cells gradually increases; that finally lesions composed entirely of atypical cells are formed; and that occasionally cells in such a lesion penetrate the basement membrane, producing the disease known as carcinoma. Apparently the process is reversible up to the time the cells with atypical nuclei break through the basement membrane.

Where does the inhalation of tobacco smoke fit into this picture? There appear to be three possibilities:

1. It may be that exposure to tobacco smoke induces changes in the nuclei of

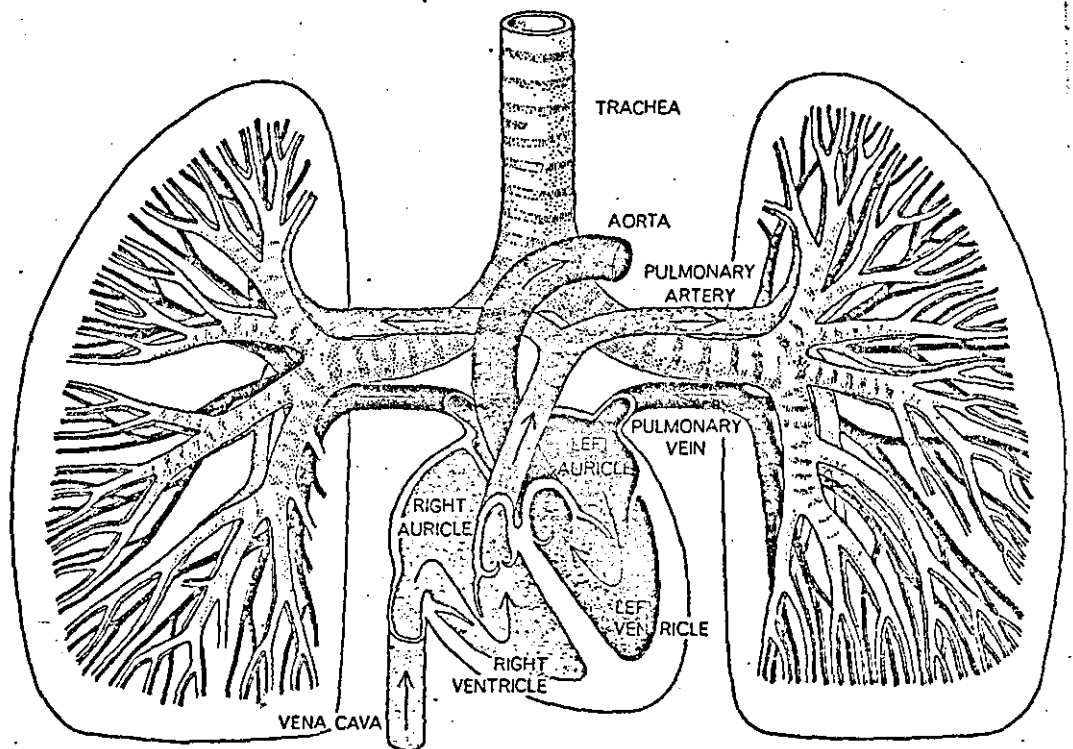


DEGREE OF INHALATION among cigarette smokers is charted against relative death rates from all causes. Rates are based on the author's new study of 1,079,000 men and women, which was begun in 1959.

cells. This would account for the increase of such cells both with the amount of smoking and with the number of years of smoking. It would not, however, in itself account for the finding of a decrease in the number of such cells when a cigarette smoker gives up the habit.

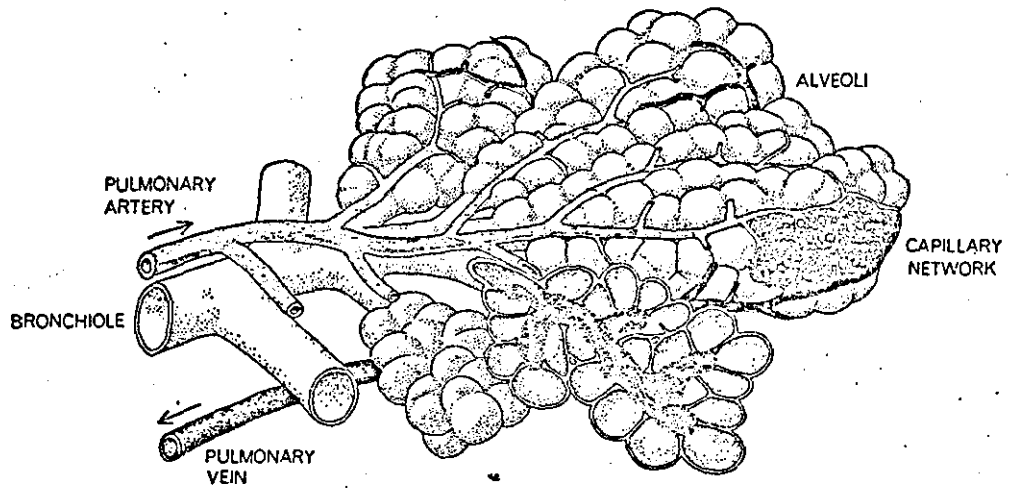
2. It may be that exposure to tobacco smoke simply increases the probability of changes taking place in the nuclei of cells as a result of exposure to inhaled carcinogenic agents other than those in tobacco smoke. The inhibition of ciliary movement by tobacco smoke may be the major factor involved in such a relation. Again this would not in itself account for the decrease in cells with atypical nuclei following cessation of cigarette smoking.

3. It may be that exposure to tobacco smoke produces a change in the local environment of bronchial epithelium so as to favor the survival and reproduction of certain mutant cells that have atypical nuclei of the type observed, as opposed to the survival and reproduction of normal cells. On this hypothesis the development of cancer results from natural selection under conditions of greatly altered environment. It is unnecessary to assume that tobacco smoke causes mutations, since a few cells with atypical nuclei are sometimes found in the bronchial epithelium of nonsmokers. This hypothesis suggests that normal cells are best adapted to an environment free of tobacco smoke, whereas cells with atypical nuclei are best adapted to an environment that includes smoke. The hypothesis thus accounts for the decline in the number of cells with atypical nu-



HEART AND LUNGS are both affected by inhaled tobacco smoke, which travels down the trachea, through the bronchial tubes to the alveoli. "Tars" deposit on the epithelium and lead to clogging of

alveoli. These and the capillaries are often ruptured by coughing. The heart must then pump blood through a smaller number of capillaries, against increased pressure, on a reduced oxygen supply.



ALVEOLI of the lungs are air sacs formed by terminal expansion of the bronchioles. Oxygen is supplied to the blood through the

capillaries embedded in the alveolar walls. Destruction of this tissue thus reduces the rate at which the lungs can take up oxygen.

clei on the cessation of cigarette smoking.

I favor the last of these three hypotheses. It appears to account for all the findings, whereas the other two hypotheses account for only some of them. The three hypotheses are not, however, mutually exclusive.

To account for the association between cigarette smoking and certain other diseases, such as lung infections and coronary artery disease, other plausible mechanisms exist. On inhalation, air and any smoke it may contain passes through bronchial tubes of decreasing diameter, which finally deliver it to the tiny sacs called alveoli. The alveoli have thin walls supported by fibers of connective tissue. These walls contain capillary tubes through which blood flows from the pulmonary arteries to the pulmonary veins. During its passage through these capillaries the blood releases carbon dioxide and absorbs oxygen. At the same time carbon monoxide, nicotine and other impurities that may be present in the air or smoke are absorbed into the blood.

The small bronchial tubes are subject to being plugged with mucus. This frequently occurs in infectious diseases of the lung, with the result that secretions and bacteria are trapped in the alveolar spaces, thereby producing pneumonia. In cigarette smokers the interior diameter of the small bronchial tubes is considerably reduced by hyperplasia, so that the opening is very small indeed. In addition we find that smoking results in increased activity of the glands that secrete mucus into the bronchial tubes. This combination almost certainly increases the likelihood of the tubes being plugged by mucus. In my opinion this is enough to explain the finding that death rates from infectious diseases of the lung are considerably higher among cigarette smokers than among nonsmokers.

The occlusion of a bronchial tube by mucus (or by a spasm) often traps air in the alveoli to which that tube leads. If the person then happens to cough, the pressure of the trapped air can be increased to such a degree that the thin walls of the alveoli rupture. Coughing, excess mucus and reduction in the diameter of the small bronchial tubes increase the likelihood of such rupture.

Recently we have studied the alveoli in relation to cigarette smoking. We found extensive rupturing of the walls of a great many alveoli in the lungs of heavy cigarette smokers, a considerable amount in lighter cigarette smokers and very little in nonsmokers. The rupturing of the walls is usually accompanied by

a fibrous thickening of the remaining alveolar walls, together with a fibrous thickening of the walls of the small blood vessels in the vicinity. This probably results from the mechanism outlined above, since cigarette smoking produces coughing as well as hyperplasia of the bronchial tubes and increased secretion of mucus.

Ruptures in the walls of the alveoli destroy the capillary tubes located in the walls. If many are destroyed, far greater pressure is required to force the same quantity of blood through the remaining capillaries. All the blood must pass through them each time it circulates through the body, and the right ventricle of the heart has to supply the pressure. As a result the work load of the heart is increased in proportion to the degree of destruction of the alveoli.

Since oxygen is supplied to the blood through the capillaries in the alveoli, destruction of this tissue reduces the oxygen supply on which all the tissues of the body depend. In smokers this is compounded by the inhalation of carbon monoxide, which combines with hemoglobin more readily than oxygen does. This combination is enough to account for the shortness of breath often reported by cigarette smokers.

Because of its great activity heart muscle requires an abundant supply of oxygen. The inhalation of tobacco smoke increases the work load of this muscle and at the same time reduces the quantity of oxygen available to the muscle. In addition the action of nicotine on the

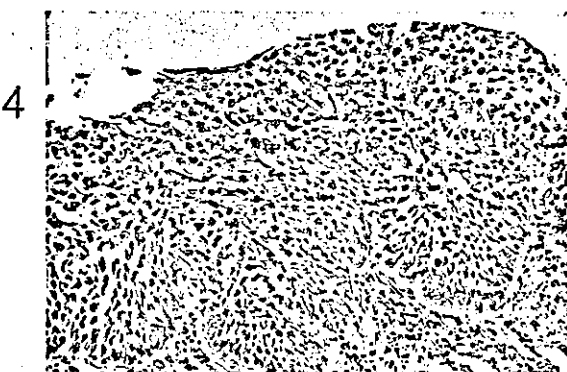
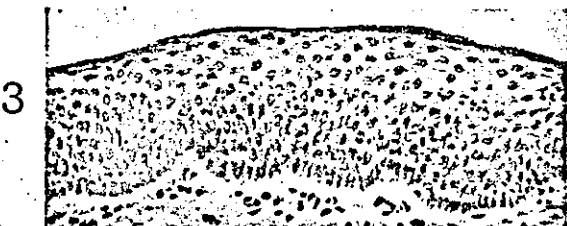
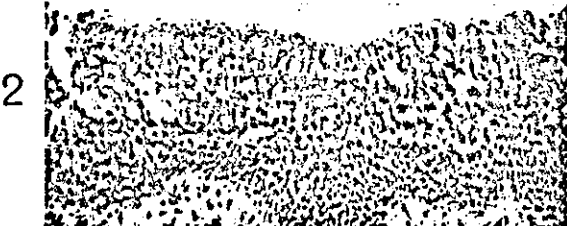
nervous system produces a temporary increase in the heart rate and a constriction of the peripheral blood vessels, which in turn produces a temporary increase in blood pressure. This also puts an added strain on the heart. Since a normal heart has extraordinary reserve powers, it can probably withstand these effects of smoking. A diseased heart may not be able to do so.

Autopsy studies (including a study of young men killed in the Korean war) have shown that the great majority of American men have at least some degree of atherosclerosis of the coronary arteries that supply blood to the muscle of the heart. Atherosclerosis consists of the progressive development of plaques (composed largely of cholesterol) within the walls of these relatively small blood vessels, which thereby reduces their interior diameter. This in turn reduces the supply of blood to the heart muscle. Eventually it may completely cut off the supply of blood to a portion of the heart muscle, and this portion dies. Moreover, blood clots often form in diseased coronary arteries. This can also shut off the blood and cause the death of heart tissues. The common symptom of a stoppage in coronary blood flow is a heart attack.

As described above, cigarette smoking decreases the quantity of oxygen per unit volume of blood. Atherosclerosis of the coronary arteries tends to reduce the volume of blood delivered to the heart muscle per minute. Therefore if a person with atherosclerosis of the coronary

COMPLAINT	CIGARETTE SMOKERS (PER CENT)	NONSMOKERS (PER CENT)	RATIO (SMOKERS TO NONSMOKERS)
COUGH	33.2	5.6	5.9
LOSS OF APPETITE	3.3	0.9	3.7
SHORTNESS OF BREATH	16.3	4.7	3.5
CHEST PAINS	7.0	3.7	1.9
DIARRHEA	3.3	1.7	1.9
EASILY FATIGUED	26.1	14.9	1.8
ABDOMINAL PAINS	6.7	3.8	1.8
HOARSENESS	4.8	2.6	1.8
LOSS OF WEIGHT	7.3	4.5	1.6
STOMACH PAINS	6.0	3.8	1.6
INSOMNIA	10.2	6.8	1.5
DIFFICULTY IN SWALLOWING	1.4	1.0	1.4

PHYSICAL COMPLAINTS are more frequent among people who smoke a pack of cigarettes or more a day than among nonsmokers. The figures are from the author's large new study.



CILIA
 COLUMNAR CELLS
 GOBLET CELLS
 BASAL CELLS
 BASEMENT MEMBRANE
 CONNECTIVE TISSUE

CILIA
 COLUMNAR AND
 GOBLET CELLS
 BASAL CELLS
 BASEMENT MEMBRANE
 CONNECTIVE TISSUE

SQUAMOUS CELLS
 BASEMENT MEMBRANE
 CONNECTIVE TISSUE

CELLS WITH ATYPICAL
 NUCLEI
 BASEMENT MEMBRANE
 CONNECTIVE TISSUE

CELLS WITH ATYPICAL
 NUCLEI
 BASEMENT MEMBRANE
 EARLY CANCEROUS
 INVASION
 CONNECTIVE TISSUE

arteries is also a cigarette smoker, his heart muscle receives far less than the normal supply of oxygen per minute. At the same time, because of the effects of smoking, a heavy work load is placed on his heart muscle. In my opinion this combination of conditions is sufficient to account for the finding that the death rate from coronary artery disease is higher in cigarette smokers than it is in men who never smoked, that the rate increases with the amount of cigarette smoking, and that it is lower in ex-cigarette smokers than it is in men who continue to smoke cigarettes.

Not only the heart but also all other organs of the body require oxygen obtained through the alveoli of the lungs and distributed by the blood. Thus a reduction in oxygen supply resulting from smoking may have a serious effect on any diseased organ, and in some instances it can make the difference between life and death. Perhaps this accounts for the finding that death rates from a multiplicity of chronic diseases are slightly higher among cigarette smokers than among nonsmokers.

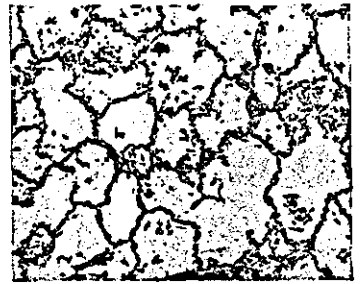
I shall touch only briefly on two other diseases that appear to be significantly associated with cigarette smoking: gastric and duodenal ulcers and cancer of the bladder. In our first study cigarette smokers, compared with nonsmokers, had four times the relative death rate from the two kinds of ulcer and twice the death rate from cancer of the bladder. Doll and his associates in England recently performed a controlled clinical experiment demonstrating that smoking is indeed harmful to patients with gastric ulcer. Eighty patients who were regular smokers were divided at random into two groups, one allowed to continue smoking, the other advised to stop. Among the 40 patients who con-

tinued to smoke, the ulcers healed at a significantly slower rate than they did among the 40 patients who cut down on their smoking or stopped altogether. The mechanism by which smoking evidently retards recovery is unknown. It may be due to indirect effects, such as the effect of nicotine in the bloodstream, or to direct action of ingested tobacco smoke on the lining of the stomach.

As for cancer of the bladder, it is well known that exposure to carcinogenic agents can produce cancer in parts of the body remote from the tissue to which the agent is applied. For example, prolonged exposure to beta-naphthylamine often produced cancer of the bladder in workers in aniline dye plants. Conceivably some agent in tobacco smoke works in the same way, but until the problem is thoroughly investigated judgment should be deferred.

After reviewing the evidence, the mildest statement I can make is that, in my opinion, the inhalation of tobacco smoke produces a number of very harmful effects and shortens the life span of human beings. The simplest way to avoid these possible consequences is not to smoke at all. But one can avoid the most serious of them by smoking cigars or a pipe instead of cigarettes, provided that one does not inhale the smoke. An individual who chooses to smoke cigarettes can minimize the risks by restricting his consumption and by not inhaling.

The individual solution to the problem apparently requires more will power than many cigarette smokers have or are inclined to exert. I am confident, however, that more generally acceptable solutions can be found. There is good reason to suppose that the composition of tobacco smoke, both qualitative and quantitative, is a matter of considerable importance. Until several years ago the mainstream smoke of most U.S. cigarettes contained about 35 milligrams of "tar" per cigarette, of which about 2.5 milligrams was nicotine. The smoke from filter-tip cigarettes now on the market ranges in tar content from as low as 5.7 milligrams per cigarette to nearly 30 milligrams and the nicotine content from .4 to 2.5 milligrams. It is apparent that by selection of tobacco and by means of an effective filter, the nicotine and tar content of cigarette smoke can be markedly reduced. Some filters are selective in their action. For example, Wynder and Dietrich Hoffmann have recently found that a certain type of filter, which passes a reasonable amount of smoke, removes almost all the phenols. This may be important, since the same in-



RUPTURE OF ALVEOLAR WALLS is a progressive process, from the normal state (top) to the rupture of some walls (middle) to the disappearance in certain areas of all the alveolar tissue (bottom). These photomicrographs, made by Auerbach, magnify the tissue approximately 120 diameters.

BRONCHIAL EPITHELIUM is the original site of almost all lung cancer, which often develops as shown on the opposite page. The photomicrographs (1 through 5), made by Oscar Auerbach of the East Orange, N.J., Veterans Administration Hospital, magnify human epithelial tissue 325, 250, 250, 75 and 110 diameters respectively. One of the first effects of smoking on normal epithelium (1) is hyperplasia (2), an increase in the number of basal cells. The epithelium is lost and the cells become squamous, or flattened (3). When the cells develop atypical nuclei and become disordered (4), the result is called carcinoma *in situ*. When these cells break through the basement membrane (5), the cancer may spread through lungs and to the rest of the body.

investigators have reported that the phenols in cigarette smoke strongly inhibit the action of cilia in the bronchial tubes, and that some phenols increase the action of known carcinogenic agents. Furthermore, by various processes it is possible to alter the chemical composition of the smoke before it reaches the filter.

Considering this, I believe that extensive research should be undertaken to determine the effects of various constituents of cigarette smoke and to find means of removing those that are most harmful. Until this has been accomplished it seems advisable to reduce the total tar and nicotine content of cigarette smoke by the means now available.

APPENDIX 2(a) (ii)

IS THERE ANY CAUSAL RELATIONSHIP BETWEEN
CIGARETTE SMOKING AND LUNG CANCER?

KOOMSON, R.T. & ZASOVSKY, P.A.
Institute for Cancer and Pulmonary Research, Hamburg.

(Extract from The 1979 Geneva Conference
on Health-Related Habits.)

Most studies on the effects of cigarette smoking conclude that cigarette smoking leads to an early death as a result of the numerous diseases purported to be associated with the habit. These diseases include: lung cancer, coronary heart disease, circulatory diseases such as hypertension (high blood pressure), and respiratory disease such as bronchitis etc.

The bias in such conclusions can be seen in the manner in which anti-smoking agencies present their data, i.e. they underplay the importance of other factors closely associated with all these diseases. These factors include industrial pollution, carbonmonoxide from traffic, chemical pollution, e.g. exposure to asbestos and certain pesticides, environmental stress, etc. So far no study has reported conclusively that lung cancer is exclusively the cause of cigarette smoking. In other words no study into the relationship between lung cancer, for instance, and cigarette smoking has been able to eliminate all the other variables associated with the disease. Similarly, no study done on the relationship between cigarette smoking and heart diseases or circulatory diseases has been able to control for such variables as emotional stress, home environment, genetic make-up, amount of physical exercise taken by subjects, etc. which are also very closely associated with these and similar diseases.

It seems therefore that the dangers of cigarette smoking to health are over-emphasized. For instance it is claimed by various studies and agencies that in any one of the Western nations more than 1,700 people die each year from lung cancer chiefly caused by cigarette smoking. About the same number of people, in fact if not more, die from road accidents each year; and these accidents claim more young lives than cigarette smoking does. However, this fact is often concealed by anti-cigarette smokers when they talk of cigarette smoking and early death. Perhaps, in this sense, every motor vehicle should carry a government warning sign: "Motor Vehicles can kill you or, at best, seriously damage your health".

One can put forward as many arguments in favour of cigarette smoking as there are against it. Obesity, for example, is as dangerous to health as cigarette smoking. If a cigarette smoker prone to obesity gave up the habit, s/he would have better appetite and would tend to eat more and consequently put on weight. This would result in the substitution of one bad habit for another.

In short, one should take little notice of the despondency mongers. The results of the studies on the effects of cigarette smoking only suggest statistical relationships between cigarette smoking and lung cancer, heart diseases, circulatory diseases, etc., i.e. they do not show that cigarette smoking is the cause of these diseases, let alone early deaths. It is a well-known epidemiological fact that the cause of every disease is multi-factorial in nature, hence one cannot say conclusively that any disease, be it lung cancer or coronary heart disease, etc. is the cause of one specific factor, e.g. cigarette smoking.

That cigarette smoking is not the sole cause of lung cancer can be demonstrated by the fact that:

- (1) not everyone who smokes cigarettes dies of lung cancer;
- (2) not every lung cancer victim is a cigarette smoker;
- (3) there are many people in their 70s and 80s in most Western countries, who have been smoking on average 20 cigarettes or more per day since they were about 13 years old and are still enjoying their smoke.

APPENDIX 2(b): OBSERVED DATA BY SUBJECT, ATTITUDE AND INFORMATION

(i) Amount of Tobacco Consumed (in grams)

CONSONANT SUBJECTS EXPOSED TO CONSONANT INFORMATION				DISSONANT SUBJECTS EXPOSED TO CONSONANT INFORMATION			
Subject (N = 9)	Pre-Test	Post-Test	Difference	Subject (N = 9)	Pre-Test	Post-Test	Difference
1	.6715	.7351	.0636	1	.5844	.6105	.0261
2	.5437	.5420	-.0017	2	.6814	.4562	-.2252
3	.7238	.7328	.009	3	.6689	.6589	-.01
4	.6445	.6822	.0377	4	.6360	.6733	.0373
5	.7020	.7521	.0501	5	.6995	.7149	.0154
6	.6913	.7541	.0628	6	.3905	.4677	.0772
7	.7184	.7446	.0262	7	.6724	.6889	.0165
8	.3107	.3758	.0651	8	.2946	.4665	.1719
9	.5698	.6485	.0787	9	.5595	.6841	.1246
CONSONANT SUBJECTS EXPOSED TO DISSONANT INFORMATION				DISSONANT SUBJECTS EXPOSED TO DISSONANT INFORMATION			
Subject (N = 9)	Pre-Test	Post-Test	Difference	Subject (N = 9)	Pre-Test	Post-Test	Difference
1	.6057	.7351	.1294	1	.6617	.7089	.0472
2	.6489	.5937	-.0552	2	.6720	.5655	-.1065
3	.5296	.4654	-.0642	3	.6233	.5189	-.1044
4	.6807	.6640	-.0167	4	.5389	.4489	-.09
5	.5252	.3746	-.1506	5	.7941	.7022	-.0919
6	.7358	.7345	-.0013	6	.7236	.7397	.0161
7	.7679	.6548	-.1131	7	.5548	.4488	-.106
8	.4998	.4306	-.0692	8	.5716	.4870	-.0846
9	.6206	.4742	-.1464	9	.4439	.2989	-.145

(ii) Amount of Time (seconds) Lit Cigarette Stayed in Subjects' Mouths

CONSONANT SUBJECTS EXPOSED TO CONSONANT INFORMATION				DISSONANT SUBJECTS EXPOSED TO CONSONANT INFORMATION			
Subject (N = 9)	Pre-Test	Post-Test	Difference	Subject (N = 9)	Pre-Test	Post-Test	Difference
1	39.71	58.69	18.98	1	37.79	38.67	0.88
2	32.46	38.00	5.54	2	38.49	37.25	-1.24
3	38.26	41.32	3.06	3	39.85	41.00	1.15
4	29.64	34.30	4.66	4	20.08	16.93	-3.15
5	34.17	34.19	0.02	5	45.69	58.38	12.69
6	29.11	40.29	11.18	6	30.47	33.38	2.91
7	23.53	26.43	2.9	7	27.34	41.40	14.06
8	15.82	21.92	6.1	8	40.00	43.84	3.84
9	32.61	38.05	5.44	9	26.63	30.09	3.46
CONSONANT SUBJECTS EXPOSED TO DISSONANT INFORMATION				DISSONANT SUBJECTS EXPOSED TO DISSONANT INFORMATION			
Subject (N = 9)	Pre-Test	Post-Test	Difference	Subject (N = 9)	Pre-Test	Post-Test	Difference
1	29.09	24.49	-4.6	1	28.18	32.32	4.14
2	41.37	39.81	-1.56	2	34.27	33.71	-0.56
3	28.31	28.00	-0.31	3	30.00	30.42	0.42
4	18.90	18.69	-0.21	4	24.31	24.65	0.34
5	38.84	36.00	-2.84	5	30.00	28.45	-1.55
6	43.49	29.06	-14.43	6	48.42	43.21	-5.21
7	30.03	23.28	-6.75	7	31.19	34.01	2.82
8	41.95	40.01	-1.94	8	29.98	23.04	-6.94
9	38.53	39.91	1.38	9	22.76	21.13	-1.63

(iii) Subjects' Emotional Arousal (Mean GSR)

CONSONANT SUBJECTS EXPOSED TO CONSONANT INFORMATION				DISSONANT SUBJECTS EXPOSED TO CONSONANT INFORMATION			
Subject (N = 9)	Pre-Test	Post-Test	Difference	Subject (N = 9)	Pre-Test	Post-Test	Difference
1	3.14	2.00	1.14	1	3.62	1.14	2.48
2	4.00	2.29	1.17	2	1.14	0.29	0.85
3	8.29	2.86	5.43	3	6.29	3.14	3.15
4	2.00	1.14	0.86	4	8.00	0.71	7.29
5	4.29	1.14	3.15	5	2.86	0.57	2.29
6	5.71	2.57	3.14	6	5.43	2.86	2.57
7	4.29	0.86	3.43	7	4.86	2.00	2.86
8	4.57	2.57	2.00	8	4.86	2.86	2.00
9	4.29	4.57	-0.28	9	3.43	4.00	-0.57

CONSONANT SUBJECTS EXPOSED TO DISSONANT INFORMATION				DISSONANT SUBJECTS EXPOSED TO DISSONANT INFORMATION			
Subject (N = 9)	Pre-Test	Post-Test	Difference	Subject (N = 9)	Pre-Test	Post-Test	Difference
1	4.57	4.00	0.57	1	1.00	2.43	-1.43
2	1.57	3.14	-1.57	2	3.14	3.71	-0.57
3	4.29	6.57	-2.28	3	3.43	8.29	-4.86
4	4.57	4.43	0.14	4	2.00	6.68	-4.86
5	4.57	5.71	-1.14	5	3.14	5.43	-2.29
6	5.43	8.57	-3.14	6	2.29	3.14	-0.85
7	2.57	5.71	-3.14	7	4.29	7.14	-2.85
8	6.00	5.71	0.29	8	4.00	5.71	-1.71
9	3.43	6.86	-3.43	9	5.71	7.43	-1.72

APPENDIX 2(c): SUMMARY OF 2-WAY ANOVA ON DATA: BY VARIABLE

(i) Amount of Cigarettes Consumed

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	F-RATIO	EXPECTED F	PROB.
A (Category of S)	.0024	1	.0024	.3934		>.05
B (Information)	.0876	1	.0876	14.3607	<u>>4.15</u>	<0.01
AB (Interaction)	.0007	1	.0007	.1148		>.05
Within cell	.1957	32	.0061			
Total	.2865	35	.0082			

(ii) Amount of Time Cigarette Stayed in Mouth

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	F-RATIO	EXPECTED F	PROB.
A (Category of S)	-	1	-	-		>.05
B (Information)	483.4135	1	483.4135	19.1969	<u>>4.15</u>	<0.01
AB (Interaction)	59.7538	1	59.7538	2.37289		>.05
Within cell	805.8213	32	25.1819			
Total	1348.9886	35	38.542431			

(iii) GSR

SOURCE OF VARIATION	SUM OF SQUARES	DEGREE OF FREEDOM	MEAN SQUARE	F-RATIO	EXPECTED F	PROB.
A (Category of S)	.4512	1	.4512	.1516		>.05
B (Information)	173.4371	1	173.4371	58.2903	<u>>4.15</u>	<.01
AB (Interaction)	3.2868	1	3.2868	1.1046		>.05
Within cell	95.2125	32	2.9754			
Total	272.3876	35	7.7825			

APPENDIX 2(d): SUMMARY OF UNRELATED T-TEST ON PRE-TEST DATA: CONSONANT SMOKERS VS. DISSONANT SMOKERS

(i) Amount of Tobacco Consumed (in grams)

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Smokers (N = 18)	.6217	.111	.026	34	.59	.557
Dissonant Smokers (N = 18)	.5984	.124	.029			

(ii) Amount of Time (Seconds) Subjects Left Lit Cigarettes in Their Mouths

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Smokers (N = 18)	32.7122	7.515	1.771	34	.07	.942
Dissonant Smokers (N = 18)	32.5250	7.766	1.830			

(iii) Subjects' Emotional Arousal (as measured by GSR)

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Smokers (N = 18)	4.1989	1.591	.375	34	.60	.554
Dissonant Smokers (N = 18)	3.8606	1.800	.424			

APPENDIX 2(e): SUMMARY OF UNRELATED T-TESTS: INTERGROUP COMPARISONS

Consonant Subjects Exposed to Consonant Information Vs. Consonant Subjects Exposed to Dissonant Information.

(i) *Difference in amount of tobacco consumed (in grams) between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	-.0435	.028	.009	16	-3.24	.005
Consonant Subjects Exposed to Dissonant Information (N = 9)	.0541	.086	.029			

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(ii) *Difference in amount of time (seconds) lit cigarettes stayed in subjects' mouths between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	-6.0978	5.701	1.900	16	-3.86	.001
Consonant Subjects Exposed to Dissonant Information (N = 9)	3.4733	4.779	1.593			

(iii) *Difference in subjects' emotional arousal (GSR) between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	2.2867	1.696	.565	16	5.41	.000
Consonant Subjects Exposed to Dissonant Information (N = 9)	-1.7444	1.455	.485			

APPENDIX 2(f): SUMMARY OF UNRELATED T-TESTS: INTERGROUP COMPARISONS

Consonant Subjects Exposed to Consonant Information Vs. Dissonant Subjects Exposed to Consonant Information

(i) Difference in amount of tobacco consumed (in grams) between pre- and post-test conditions

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	-.0435	.028	.009	16	-.20	.778
Dissonant Subjects Exposed to Consonant Information (N = 9)	-.0260	.111	.037			

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(ii) Difference in amount of time (seconds) lit cigarettes stayed in subjects' mouths between pre- and post-test conditions

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	-6.0978	5.701	1.900	16	-.83	.420
Dissonant Subjects Exposed to Consonant Information (N = 9)	-3.8444	5.857	1.952			

(iii) Difference in subjects' emotional arousal (GSR) between pre- and post-test conditions

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	2.2867	1.696	.565	16	-.29	.778
Dissonant Subjects Exposed to Consonant Information (N = 9)	2.5467	2.119	.706			

APPENDIX 2(g): SUMMARY OF UNRELATED T-TESTS: INTERGROUP COMPARISONS

Consonant Subjects Exposed to Consonant Information Vs. Dissonant Subjects Exposed to Dissonant Information

(i) *Difference in amount of tobacco consumed (in grams) between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	-.0435	.028	.009	16	-5.15	.000
Dissonant Subjects Exposed to Dissonant Information (N = 9)	.0739	.063	.021			

(ii) *Difference in amount of time (seconds) lit cigarettes stayed in subjects' mouths between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	-6.0978	5.701	1.900	16	-3.15	.006
Dissonant Subjects Exposed to Dissonant Information (N = 9)	.9078	3.512	1.171			

(iii) *Difference in subjects' emotional arousal (GSR) between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Consonant Information (N = 9)	2.2867	1.696	.565	16	6.04	.000
Dissonant Subjects Exposed to Dissonant Information (N = 9)	-2.3289	1.543	.514			

APPENDIX 2(h): SUMMARY OF UNRELATED T-TESTS: INTERGROUP COMPARISONS

Consonant Subjects Exposed to Dissonant Information Vs. Dissonant Subjects Exposed to Consonant Information

(i) *Difference in amount of tobacco consumed (in grams) between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Dissonant Information (N = 9)	.0541	.086	.029	16	1.71	.106
Dissonant Subjects Exposed to Consonant Information (N = 9)	-.0260	.111	.037			

(ii) *Difference in amount of time (seconds) lit cigarettes stayed in subjects' mouths between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Dissonant Information (N = 9)	3.4733	4.779	1.593	16	2.90	.01
Dissonant Subjects Exposed to Consonant Information (N = 9)	-3.8444	5.857	1.952			

(iii) *Difference in subjects' emotional arousal (GSR) between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Dissonant Information (N = 9)	-1.7444	1.455	.485	16	-5.01	.000
Dissonant Subjects Exposed to Consonant Information (N = 9)	2.5462	2.119	.706			

APPENDIX 2(j): SUMMARY OF UNRELATED T-TESTS: INTERGROUP COMPARISONS

Dissonant Subjects Exposed to Consonant Information Vs. Dissonant Subjects Exposed to Dissonant Information

(i) *Difference in amount of tobacco consumed (in grams) between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Dissonant Subjects Exposed to Consonant Information (N = 9)	-.0260	.111	.037	16	-2.35	.032
Dissonant Subjects Exposed to Dissonant Information (N = 9)	.0739	.063	.021			

(ii) *Difference in amount of time (seconds) lit cigarettes stayed in subjects' mouths between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Dissonant Subjects Exposed to Consonant Information (N = 9)	-3.8444	5.857	1.952	16	-2.09	.053
Dissonant Subjects Exposed to Dissonant Information (N = 9)	.9078	3.512	1.171			

(iii) *Difference in subjects' emotional arousal (GSR) between pre- and post-test conditions*

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Dissonant Subjects Exposed to Consonant Information (N = 9)	2.5467	2.119	.706	16	5.58	.000
Dissonant Subjects Exposed to Dissonant Information (N = 9)	-2.3289	1.543	.514			

APPENDIX 2 (K): SUMMARY OF UNRELATED T-TESTS: INTERGROUP COMPARISONS

Consonant Subjects Exposed to Dissonant Information Vs. Dissonant Smokers Exposed to Dissonant Information

(i) Difference in amount of tobacco consumed (in grams) between pre- and post-test conditions

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Dissonant Information (N = 9)	.0541	.086	.029	16	-.56	.586
Dissonant Subjects Exposed to Dissonant Information (N = 9)	.0739	.063	.021			

(ii) Difference in amount of time (seconds) lit cigarettes stayed in subjects' mouths between pre- and post-test conditions

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Dissonant Information (N = 9)	3.4733	4.779	1.593	16	1.30	.213
Dissonant Subjects Exposed to Dissonant Information (N = 9)	.9078	3.512	1.171			

(iii) Difference in subjects' emotional arousal (GSR) between pre- and post-test conditions

	MEAN	STANDARD DEVIATION	STANDARD ERROR	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB.
Consonant Subjects Exposed to Dissonant Information (N = 9)	-1.7444	1.455	.485	16	.83	.421
Dissonant Subjects Exposed to Dissonant Information (N = 9)	-2.3289	1.543	.514			

APPENDIX 2(2): PEARSON CORRELATION COEFFICIENTS ON AMOUNT OF CIGARETTES (IN GRAMS) CONSUMED, TIME (IN SECONDS) CIGARETTES WERE IN MOUTHS AND SUBJECTS' GSR

	AMOUNT	TIME	GSR
AMOUNT	*****	r = .3525 p = .035	r = -.5223 p = .001
TIME	r = .3525 p = .035	*****	r = .3725 p = .024
GSR	r = -.5223 p = .001	r = -.3752 p = .024	*****

APPENDIX TO STUDY TWO

APPENDIX 3(a): OBSERVED DATA BY CONDITION, SUBJECT AND SEX

(i) Experimental Subjects (N = 28)

SUBJECT	SEX	No. OF TRIALS TO EXTINCTION
1	M	36
2	M	39
3	M	23
4	M	12
5	M	25
6	M	21
7	M	18
8	M	27
9	M	25
10	M	25
11	M	26
12	M	11
13	M	13
14	M	13
15	F	32
16	F	38
17	F	29
18	F	20
19	F	27
20	F	22
21	F	22
22	F	4
23	F	13
24	F	21
25	F	28
26	F	12
27	F	4
28	F	8
Σ		594
\bar{X}		21.214

APPENDIX 3(a): Continued

(ii) Control Subjects (N = 28)

Subject	Sex	No. OF TRIALS TO EXTINCTION
1	M	21
2	M	19
3	M	11
4	M	12
5	M	4
6	M	22
7	M	27
8	M	52
9	M	27
10	M	47
11	M	40
12	M	17
13	M	11
14	M	23
15	F	16
16	F	38
17	F	26
18	F	63
19	F	53
20	F	23
21	F	39
22	F	18
23	F	15
24	F	24
25	F	24
26	F	41
27	F	39
28	F	41
Σ		793
\bar{x}		28.312

APPENDIX 3(b): SUMMARY OF UNRELATED T-TESTS

(i) *Experimental male subjects vs. control male subjects¹*

	MEAN	STANDARD DEVIATION	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB
Experimental Males (N = 14)	22.429	8.55	26	-0.309	> .05
Control Males (N = 14)	23.786	14.00			

(ii) *Experimental female subjects vs. Control female subjects²*

	MEAN	STANDARD DEVIATION	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB
Experimental Females (N = 14)	20.00	10.5	26	-2.704	< .05
Control Females (N = 14)	32.857	14.3			

APPENDIX 3(b): Continued

(iii) *Experimental male subjects vs. Experimental female subjects*³.

	MEAN	STANDARD DEVIATION	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB
Experimental Males (N = 14)	22.429	8.55	26	0.670	> .05
Experimental Females (N = 14)	20.00	10.5			

(iv) *Control male subjects vs. Control female subjects*⁴.

	MEAN	STANDARD DEVIATION	DEGREES OF FREEDOM	T-VALUE	2-TAIL PROB
Control Males (N = 14)	23.786	14.00	26	-1.692	> .05
Control Females (N = 14)	32.857	14.3			

NOTES

1. There was no significant difference between male subjects of both experimental conditions in their rate of extinction.
2. Female experimental subjects extinguished quick than their control counterparts.
3. There was no significant difference between the experimental male subjects compared with their female counterparts.
4. There was no significant difference between the control male subjects and their female counterparts.

APPENDIX 4: APPENDIX TO STUDY THREE

APPENDIX 4(a): PRE-EXPERIMENTAL QUESTIONNAIRE

Please complete this questionnaire as honestly as possible and return it next week. Any information given will be treated as strictly confidential.

NAME:

1. Which of the following reasons made you decide to lose weight?
(Please tick which is applicable.)
 - (a) personal
 - (b) health
 - (c) physical appearance
 - (d) family or marital pressure
 - (e) pressure from friends

2. What is your desired weight? _____

3. What is your present weight? _____

4. What was your weight before you joined the slimming club? _____

5. What kind of image did you have of yourself before you decided on weight loss? (Underline which applies.)
 - (a) positive (satisfied with yourself)
 - (b) negative (dissatisfied with yourself)
 - (c) ambivalent (neutral)

6. How much satisfaction do you think you will derive from your desired weight when you have achieved it?
 - (a) a lot
 - (b) a fair amount
 - (c) a little

7. How would you describe your self-image now? (Underline which applies.)
 - (a) positive
 - (b) negative
 - (c) ambivalent

8. When you were an adolescent, would you describe yourself as being:

- (a) overweight
- (b) cuddly
- (c) thin

9. At what age, as far as you can remember, did you become aware of your weight problem?

10. Please describe briefly the circumstances leading to your weight problem, e.g. loss of a job, boredom, always been overweight.

11. Since joining the slimming club, would you describe your resistance to temptations to eat big meals or rich foods, such as ice cream, cakes, chocolates, etc., as:

- (a) very good
- (b) good
- (c) poor
- (d) very poor

(Underline which applies.)

12. Since you joined the slimming club, have you lost, gained, or had no change in weight?

13. To whom or to what would you attribute this loss or gain or 'no change' in weight, e.g., through dieting, eating less than you used to, exercise, still eating too much, or your own efforts?

14. Since you joined the slimming club, have you gained or not lost weight?

YES / NO

15. If the answer to Question 14 is YES, do you get upset about it?

- (a) never
- (b) sometimes
- (c) often
- (d) most of the time
- (e) all the time

(Underline which applies.)

16. If you do get upset about it, what do you think the cause might be?

17. Before you joined the club, did you use to get upset about your weight?

YES / NO

18. If YES to Question 17, did you do so:

- (a) sometimes
 - (b) often
 - (c) most of the time
 - (d) all the time
- (Underline which applies.)

19. If you have lost some weight since you joined the slimming club, do you get upset less frequently than you used to?

YES / NO

20. If YES to Question 19, why?

21. During the year before joining the slimming club:

- (a) would you walk to the store rather than drive?
YES / NO
- (b) would you take the lift rather than walk up the stairs?
YES / NO
- (c) would you get up and take something from another part of the house rather than ask someone else to fetch it for you?
YES / NO
- (d) how often did you go for long walks of at least three miles?
 - (i) never
 - (ii) once a week
 - (iii) twice a week
 - (iv) once a month

(Please specify.)

- (e) did you take part in any exercise or sports, e.g. badminton, netball, cycling, etc?
YES / NO

If YES, how often? _____

22. Before joining the slimming club, did you or your family possess a car?

YES / NO

23. Since you joined the slimming club:

- (a) do you walk to the store more often than you used to?
YES / NO
- (b) do you walk up the stairs more often than you used to?
YES / NO
- (c) would you rather ask someone else to fetch something from another part of the house for you rather than fetch it yourself?
YES / NO
- (d) how often do you go for long walks of at least three miles?
(i) never
(ii) once a week
(iii) twice a week (Please specify.)
(iv) once a month
- (e) do you take part in any exercise or sports, e.g. badminton, swimming, cycling, etc?
YES / NO

If YES, how often? _____

24. How long have you or your family possessed a car? _____

25. How long ago did you join the slimming club? _____

26. Before joining a slimming club, would you describe your resistance to temptations to eat big meals or rich foods such as cakes, chocolates, ice creams, etc., as:

- (a) very good
(b) good
(c) poor
(d) very poor

(Underline which applies.)

27. Before you joined the slimming club, how did you use to feel emotionally after eating a big meal or rich foods, such as ice cream, cakes, puddings, etc?

(a) happy

(b) sad

(c) neutral

(Underline which applies.)

28. Since you joined the club, how do you feel emotionally after eating a big meal or rich foods, such as chocolates, cream biscuits, etc?

(a) happy

(b) sad

(c) guilty

(Underline which applies.)

29. Why do you think you feel happy, sad or guilty?

30. How old are you? _____

31. Do you think you could lose weight through your own efforts, without the help of a slimming club, friends or relatives?

YES / NO

32. Before joining a slimming club, did you ever look at your body either in the nude or half-clothed in a full-length mirror?

YES / NO

33. If YES to Question 32, how often?

(a) occasionally

(b) every day

(c) once a week

(d) more than once a week

(Underline which applies.)

34. If YES to Question 32, what were your feelings about yourself?

(a) positive (pleased with yourself)

(b) negative (ashamed of yourself)

(c) neutral (did not care)

(Underline which applies.)

APPENDIX 4 (b): SUMMARY OF SUBJECTS' RESPONSES TO
PRE-EXPERIMENTAL QUESTIONNAIRE

QUESTION	ANSWER	PERCENTAGE RESPONSE, BY EXPERIMENTAL CONDITION		
		Experimental Subjects (N = 12)	Control Group I Subjects (N = 9)	Control Group II Subjects (N = 11)
1	Personal Health	-	-	-
	Physical Appearance	100	78	100
	Family/Marital	-	-	-
	Friends	-	-	-
5	Positive	8	-	-
	Negative	84	78	73
	Neutral	8	22	27
6	A lot	75	66	82
	A fair amount	25	34	18
	A little	-	-	-
7	Positive	50	45	36
	Negative	50	22	36
	Neutral	-	33	28
11	Very good	8	-	9
	Good	67	67	64
	Poor	25	22	27
	Very poor	-	11	-
17	Yes	83	78	82
	No	17	22	18
18	Sometimes	70	72	56
	Often	-	14	22
	Most of the time	20	14	11
	All the time	10	-	11
21(d)	Never	50	11	9
	Once a week	25	45	55
	Twice a week	-	22	18
	Once a month	25	22	18
21(e)	Yes	50	56	64
	No	50	44	36
23(d)	Never	41	11	7
	Once a week	25	33	42
	Twice a week	17	33	22
	Once a month	17	23	29
23(e)	Yes	67	78	65
	No	33	22	35
27	Happy	25	11	18
	Sad	25	11	20
	Neutral	50	78	62
28	Happy	-	-	-
	Sad	8	-	-
	Neutral	72	100	100
29	I only cheat myself	46	60	62
	I'll never lose weight if I eat too much	50	40	30
	Other reasons	4	-	8
32	Yes	75	72	90
	No	25	28	10
33	Occasionally	67	56	60
	Everyday	33	-	20
	Once a week	-	33	20
	More than once a week	-	11	-
34	Positive	8	11	20
	Negative	67	78	60
	Neutral	25	11	20

APPENDIX 4(c): POST-EXPERIMENTAL QUESTIONNAIRE

Please complete this questionnaire as honestly as you can. Be assured that any personal information you give in the questionnaire will be treated as strictly confidential.

Thank you for your co-operation.

1. Name: _____

2. Occupation: _____

3. How many serious attempts have you made in the past to reduce your weight? (Please tick which applies.)
 - (a) one attempt
 - (b) two attempts
 - (c) more than two attempts

4. Do you still attend weekly meetings held by the slimming club? (Please tick which applies.)
 - (a) Yes
 - (b) No

5. How long have you been or were you with the club? _____

6. If you don't attend weekly meetings any more:
 - (a) what was your weight when you started _____
 - (b) what is your weight now (please give weight to the nearest pound) _____
 - (c) please state briefly why you stopped attending meetings

7. Would you describe your body image now as: (please tick which applies):
 - (a) satisfactory
 - (b) unsatisfactory
 - (c) neutral

8. During the past 10 weeks, would you describe your resistance to temptations to eat big meals and unessential fattening foods such as chocolates, ice cream, etc. as: (please tick which applies)
- (a) very good
 - (b) good
 - (c) poor
 - (d) very poor
9. Have you lost some weight during the past 10 weeks? (Please tick which applies.)
- (a) Yes
 - (b) No
10. If you have lost some weight during the past 10 weeks, which of the following do you think is or are responsible for your weight loss: (please tick which applies)
- (a) planned dieting
 - (b) eating less than you used to
 - (c) physical exercise
 - (d) eating less and physical exercise
11. If you have gained weight or have not lost weight during the past 10 weeks, which of the following do you think is or are responsible for your weight problem: (please tick which applies)
- (a) eating too much
 - (b) lack of physical exercise
 - (c) eating too much and lack of physical exercise
 - (d) not motivated enough to reduce weight
12. If you have gained or have not lost weight during the past 10 weeks, do you get upset about it? (Please tick which applies.)
- (a) Yes
 - (b) No
13. If answer to Question 12 is yes, how often do you get upset about it? (Please tick which applies.)
- (a) sometimes
 - (b) often
 - (c) most of the time
 - (d) all of the time

14. During the past 10 weeks, how often do you go for walks of at least one mile or take part in exercise or sports such as cycling, swimming, squash, tennis or badminton, etc.? (Please tick which applies.)
- (a) never
 - (b) once a week
 - (c) twice a week
 - (d) more than twice a week
15. Which of the following emotions applies to you after eating a big meal or chocolates, cakes, etc.? (Please tick which applies.)
- (a) happy
 - (b) guilty
 - (c) neutral
16. Do you look at your body, at home, either in the nude or half-clothed in a full-length mirror? (Please tick which applies.)
- (a) Yes
 - (b) No
17. If answer to Question 16 is yes, how often do you do so? (Please tick which applies.)
- (a) occasionally
 - (b) everyday
 - (c) once a week
 - (d) more than once a week
18. If answer to Question 16 is yes, would you describe your feelings, after viewing yourself in the mirror, as: (please tick which applies)
- (a) positive (pleased with your body)
 - (b) negative (ashamed of your body)
 - (c) neutral (don't care)
19. Were you one of the club members who looked at themselves in the mirror-room weekly? (Please tick which applies.)
- (a) Yes
 - (b) No

20. If you visited the mirror-room weekly, which of the following best describes your emotional reaction on your first visit? (Please tick which applies.)
- (a) surprised that you looked more overweight than you thought
 - (b) surprised that you looked less overweight than you thought
 - (c) no reaction (you looked the same as you thought anyway)
 - (d) other:
-
21. On your first visit to the mirror-room, which of the following best describes your feelings about your body image: (please tick which applies)
- (a) happy
 - (b) upset
 - (c) frightened
 - (d) neutral
22. If you visited the mirror-room, do you think that you have benefited from it, as far as your weight is concerned? (Please tick which applies.)
- (a) Yes
 - (b) No
23. If answer to the above question is yes, which of the following reasons applies to you? (Please tick which applies.)
- (a) because it has helped you to come to terms with your body
 - (b) because it offered you the opportunity of seeing your entire body from all angles
 - (c) because it enabled you to see for yourself which parts of your body you were losing or putting on weight
 - (d) other reasons:
-
24. As a result of your visits to the mirror-room, did you become more motivated to lose weight? (Please tick which applies.)
- (a) Yes
 - (b) No

APPENDIX 4(d): SUMMARY OF SUBJECTS' RESPONSES TO
POST-EXPERIMENTAL QUESTIONNAIRE

QUESTION	ANSWER	RESPONSE, BY EXPERIMENTAL CONDITION		
		Experimental Subjects (N = 12)	Control Group I Subjects (N = 9)	Control Group II Subjects (N = 11)
7	Satisfactory	18	22	9
	Unsatisfactory	27	67	64
	Neutral	55	11	27
8	Very good	-	11	-
	Good	18	56	36
	Poor	73	21	55
	Very poor	9	12	9
10	Planned dieting	-	-	-
	Eating less than used to	30	90	45
	Physical Exercise	-	-	-
	Eating less and physical exercise	70	10	35
14	Other	-	-	20
	Never	-	11	-
	Once a week	28	11	36.5
	Twice a week	36	33	27
15	More than twice a week	36	45	36.5
	Happy	-	-	-
	Guilty	73	78	82
	Neutral	27	22	18
16	Yes	100	74	86
	No	-	26	14
17	Occasionally	37	60	71
	Everyday	18	-	29
	Once a week	9	40	-
	More than once a month	36	-	-
18	Positive	64	40	-
	Negative	36	60	71
	Neutral	-	-	29
20	.. more overweight ..	64	-	-
	.. less overweight ..	9	-	-
	no reaction	27	-	-
	other	-	-	-
21	Happy	-	-	-
	Upset	45	-	-
	Frightened	-	-	-
	Neutral	55	-	-
22	Yes	64	-	-
	No	36	-	-
23	.. come to terms with body	-	-	-
	.. seeing entire body	29	-	-
	.. parts of body ..	71	-	-
	losing/putting on weight	-	-	-
	other	-	-	-
24	Yes	64	-	-
	No	36	-	-
25	Yes	90	-	-
	No	10	-	-

continued on next page

APPENDIX 4(d): continued

The following are some extracts from the Experimental Subjects' responses to Question 26:

"The use of mirrors is a very good idea, but it would be more effective if combined with dieting."

"The mirror-room was a good idea because you could see your body all round."

"In general, I suppose the mirror-room is a good idea but it is not enough as a motivator for losing weight."

"I did not like the mirror-room too much because I always looked fatter in it than I actually was. I also looked distorted every time I went into it. It did not make me lose much weight anyway."

"I enjoyed taking part in the experiment. I did like going into the mirror-room, although it was frightening at first, because it enabled me to see the parts of my body which needed shaping up. I think the mirror-room is a good idea because it helped me in my effort to lose weight."

"It was embarrassing to see myself the first time I was in the mirror-room but I got used to it. It did not make me lose weight but I realise that I look at myself in the mirror more at home."

"I think the experiment was OK. I did not mind going into the mirror-room but those forms we had to fill in were a nuisance, next time try to do without them."

APPENDIX 4(e): INDIVIDUAL WEEKLY ABSOLUTE WEIGHT LOSS/GAIN (IN POUNDAGE), BY EXPERIMENTAL CONDITION

(i) *Experimental Subjects (N = 12)*

SUBJECT	GOAL	PRE-TREATMENT WEIGHT	TREATMENT WEEK										(TREATMENT) TOTAL LOSS/GAIN
			1	2	3	4	5	6	7	8	9	10	
1	122	136	133	131	131	129	-	131	-	-	-	-	-5
2	150	164	161	157	158	157	156	-	154	154	151	-	-13
3	119	131	128	130	129	128	128	131	130	132	133	131	0
4	133	144	142	142	143	142	143	142	-	142	144	142	-2
5	133	167	163	160	158	-	158	-	160	157	-	-	-10
6	133	149	149	146	145	145	143	142	145	143	143	141	-8
7	117	134	133	131	131	131	129	128	127	128	129	128	-6
8	140	158	155	156	151	145	145	144	-	-	-	-	-14
9	133	145	142	142	140	149	140	141	-	-	-	-	-4
10	112	120	119	118	-	-	-	-	-	-	-	-	-2
11	140	166	163	164	166	168	166	164	167	156	168	167	1
12	140	157	154	153	-	-	-	-	-	-	-	-	-4
Σ	1572	1753											-67
\bar{x}	131	146.08											-5.58

APPENDIX 4(e): continued

(ii) Control Group I Subjects (N = 9)

SUBJECT	GOAL	PRE-TREATMENT WEIGHT	TREATMENT WEEK										TREATMENT TOTAL LOSS/GAIN
			1	2	3	4	5	6	7	8	9	10	
1	154	163	163	161	159	158	159	159	156	161	-	-	-2
2	110	114	114	115	-	115	113	116	112	-	-	113	-1
3	126	168	166	163	159	159	158	-	-	-	-	-	-10
4	140	176	170	171	168	168	163	164	161	161	160	-	-16
5	112	128	125	124	124	123	124	123	-	126	125	125	-3
6	126	145	143	142	144	146	-	-	-	-	-	-	+1
7	140	148	147	148	148	148	150	149	147	147	-	-	-1
8	119	127	125	122	124	123	-	122	-	120	120	119	-8
9	147	176	174	177	175	177	177	177	176	-	-	-	0
Σ	1174	1347											-40
\bar{x}	130	149.66											-4.44

APPENDIX 4(e): continued

(iii) Control Group II Subjects (N = 11)

SUBJECT	GOAL	PRE-TREATMENT WEIGHT	TREATMENT WEEK										TREATMENT TOTAL LOSS/GAIN
			1	2	3	4	5	6	7	8	9	10	
1	129	140	144	151	152	140	139	139	142	140	-	143	+3
2	107	122	118	116	116	116	116	116	-	-	118	-	-4
3	147	156	156	157	-	-	-	157	158	-	-	-	+2
4	105	135	130	130	129	130	-	-	130	130	-	-	-5
5	147	175	172	165	168	166	166	163	163	161	-	-	-14
6	126	136	136	132	135	133	135	133	133	-	133	-	-3
7	112	126	125	130	128	-	-	-	-	-	-	-	+2
8	112	125	121	121	120	122	-	121	121	-	-	-	-4
9	161	182	178	178	179	179	182	178	-	179	177	178	-4
10	147	195	191	190	189	188	181	-	180	177	177	-	-18
11	108	122	120	-	118	-	117	115	115	113	-	-	-9
Σ	1399	1614											-54
\bar{x}	127	146.72											-4.91

APPENDIX 4(f): SUMMARY OF ONEWAY ANOVA ON WEEKLY ABSOLUTE DATA (WEEK 7-WEEK 10)

(i) Week 7

<u>Source</u>	<u>D.F.</u>	<u>Sum of Squares</u>	<u>Mean Squares</u>	<u>F. Ratio</u>	<u>F. Prob.</u>
Between Groups	2	29.4444	14.7222	7.6408	.0043
Within Groups	17	32.7556	1.9268		
Total	19	62.2000			

(ii) Week 8

<u>Source</u>	<u>D.F.</u>	<u>Sum of Squares</u>	<u>Mean Squares</u>	<u>F. Ratio</u>	<u>F. Prob.</u>
Between Groups	2	18.7159	9.3579	2.2801	.1366
Within Groups	15	61.5619	4.1041		
Total	17	80.2778			

(iii) Week 9

<u>Source</u>	<u>D.F.</u>	<u>Sum of Squares</u>	<u>Mean Squares</u>	<u>F. Ratio</u>	<u>F. Prob.</u>
Between Groups	2	3.1667	1.5833	.9194	.4332
Within Groups	9	15.5000	1.7222		
Total	11	18.6667			

(iv) Week 10

<u>Source</u>	<u>D.F.</u>	<u>Sum of Squares</u>	<u>Mean Squares</u>	<u>F. Ratio</u>	<u>F. Prob.</u>
Between Groups	2	19.0222	9.5111	10.9744	.0099
Within Groups	6	5.2000	.8667		
Total	8	24.2222			

APPENDIX 4(g): FOLLOW-UP INDIVIDUAL DATA (IN POUNDAGE)

(i) Experimental Subjects (N = 11)

	<u>Pre-Treatment Weight</u>	<u>Follow-Up Weight</u>	<u>Absolute Difference</u>	<u>% Absolute Difference</u>
Subject 1*	136	126	10	-7
2	164	153	11	-7
3	131	126	5	-4
4	144	140	4	-3
5	167	152	15	-9
6	149	142	7	-5
7	134	124	10	-7
8*	158	133	25	-16
9	145	140	5	-3
10*	157	156	1	1
11	166	168	-2	1
Σ	1651	1560	-91	59
\bar{x}	150.09	141.81	-8.27	-5.36

NOTE: *Represents drop-outs at follow-up (excluding pregnant Experimental Subject).

(ii) Control Group I Subjects (N = 9)

	<u>Pre-Treatment Weight</u>	<u>Follow-Up Weight</u>	<u>Absolute Difference</u>	<u>% Absolute Difference</u>
Subject 1*	145	147	+2	1
2*	163	162	-1	-1
3	114	112	-2	-2
4	168	163	-5	-3
5	176	158	-18	-10
6	128	126	-2	-2
7	148	151	+3	2
8	127	123	-4	-3
9	176	178	+2	1
Σ	1345	1314	-27	17
\bar{x}	149.44	146	-3	-1.9

(iii) Control Group II Subjects (N = 11)

	<u>Pre-Treatment Weight</u>	<u>Follow-Up Weight</u>	<u>Absolute Difference</u>	<u>% Absolute Difference</u>
Subject 1	140	142	-2	1
2*	122	124	-2	2
3*	156	163	-7	-4
4	135	128	7	-5
5	175	167	8	-5
6	136	133	3	-2
7	126	134	-8	6
8	125	126	-1	1
9*	182	180	2	-1
10	195	178	17	-9
11*	122	117	5	-4
Σ	1614	1578	-22	-20
\bar{x}	146.73	144.72	-2	-1.82

APPENDIX 4(g): continued

(iv) Summary of Oneway ANOVA on Follow-up Absolute Difference Data¹

<u>Source of Variation</u>	<u>D.F.</u>	<u>Sum of Squares</u>	<u>Mean Squares</u>	<u>F. Ratio</u>	<u>F. Prob.</u>
Between Groups	2	251.9400	125.9700	2.5601	.0953
Within Groups	28	1377.7374	49.2049		
Total	30	1629.6776			

(v) Summary of Oneway ANOVA % Absolute Difference at Follow-up²

<u>Source of Variation</u>	<u>D.F.</u>	<u>Sum of Squares</u>	<u>Mean Squares</u>	<u>F. Ratio</u>	<u>F. Prob.</u>
Between Groups	2	125.1421	62.5711	3.3608	.0492
Within Groups	28	521.2937	18.6176		
Total	30	646.4359			

NOTE:

¹ Represents the net difference between Subjects' pre-treatment weights and their weights at follow-up.

² Represents the percent difference between Subjects' pre-treatment weights and their weights at follow-up.

APPENDIX 5: APPENDIX TO STUDY FOUR

APPENDIX 5(a): ANTI-SMOKING LITERATURE GIVEN TO SUBJECTS THREE DAYS BEFORE POST-TEST SESSION

THE HEALTH CONSEQUENCES OF CIGARETTE SMOKING*

The applied significance of smoking behaviour is hard to overestimate. Cigarette smoking has been found to be responsible for roughly 325,000 premature deaths each year from cancer of the lung, bladder and oral cavity, cardiovascular disorders including coronary heart disease (CHD) and hypertension (high blood pressure), and pulmonary diseases such as bronchitis, and pneumonia. Smoking is directly linked to approximately 90% of all lung cancer, 75% of all bronchitis, 80% of all heart diseases (CHD), and 85% of all respiratory disorders. Further, it is closely associated with a decrease in exercise tolerance, especially in angina patients (Jones & Johnson, 1979).

The economic costs of smoking are equally staggering. It is estimated that smoking is related to over one-fifth of the total hospital and medical expenses in the United States, and one-third of the total National Health Service expenses in the UK, with the combined cost of smoking-related sickness and decreased productivity (lost work output and absenteeism) raising this total into billions of dollars. In addition, the health risk to smokers as well as non-smokers (passive smokers) such as fetal damage, sudden death from coronary heart disease (CHD), and impaired survival rate in smokers with cardiovascular disorders (e.g. high blood pressure) cannot be evaluated in monetary terms. Taking these, and other facts into account, the World Health Organisation has concluded that the life expectancy of the average cigarette smoker is ten years shorter than his/her non-smoking counterpart (WHO, 1978), and hence has suggested that the control of smoking is the single most important preventive health measure that the developed nations can take.

The Expert Committee (WHO) realises that while there may be moral or aesthetic objections to smoking, it is clear that the overwhelming problem with this behaviour is one of health risk. The health risks associated with cigarette smoking are due mainly to two classes of elements in cigarette smoke: particulate matter and gases. The most harmful particulate substances are "tar", the most probable carcinogen and compound most responsible for lung tissue damage (lung cancer), and nicotine, a contributor to cardiovascular diseases (e.g. hypertension). However, 90% of tobacco smoke consists of a number of gases, the most harmful of which is carbon monoxide (CO). This gas which results from incomplete combustion of the tobacco has been identified as the agent most responsible for the various heart diseases associated with smoking.

Smoking risk is intimately related to the dose of these harmful elements, that is, the greater amount of tar, nicotine, and carbon monoxide (CO)

* Excerpt from the Report of a World Health Organisation Expert Committee on Smoking: Geneva, Switzerland, 1980.

introduced into and retained by the body, the greater the health risk assumed by the smoker. Dosage is typically assessed by counting the number of cigarettes smoked, e.g. per day. This alone is not enough to calculate dosage accurately. Tobacco products differ widely in their yields of tar, nicotine, and harmful gases such as carbon monoxide. Furthermore, the way in which a person smokes is just as important when assessing dosage. For instance, two smokers may smoke the same brand of cigarettes, at the same rate, but differ significantly in the way of consumption. One smoker may take four times as many puffs, each of which are three times as long and inhale deeply. These two smokers, assuming they are of the same or similar constitution, would clearly not suffer the same health risks.

The World Health Organisation (WHO) on the basis of the conclusive findings of the Expert Committee, has suggested that the developed nations could improve the health of their citizens and increase their average life expectancy by at least ten years by abolishing the tobacco industry. The individual smoker, on the other hand, can improve his/her own health and life expectancy tremendously by kicking the habit completely. Failing this, the cigarette smoker may achieve a relatively good health and longer life expectancy by reducing dosage in terms of the amount of tar, nicotine and other harmful gases such as carbon monoxide introduced into the body, e.g. by smoking low tar brands of cigarettes, or by taking shorter puffs, or inhaling less deeply. However, it must be noted that total abstinence is the ultimate answer to all the health risks closely associated with cigarette smoking such as cancer of the lungs, throat, bladder, and heart diseases, respiratory diseases, etc., etc., all of which combined account for over 90% of all the premature deaths that occur each year in developed nations.

APPENDIX 5(b): OBSERVED DATA, BY SUBJECT AND CONDITION

(i) Self-modelling Subjects (N = 9)

SUBJECT	SEX	AMOUNT OF TOBACCO CONSUMED (IN GRAMS)			AMOUNT OF TIME (SECONDS) CIGARETTES WERE IN SUBJECTS' MOUTHS		
		Pre-Test	Post-Test	Difference	Pre-Test	Post-Test	Difference
1	m	.6294	.3081	.3212	31.20	20.60	10.60
2	m	.5758	.4118	.1643	20.01	24.28	-4.27
3	m	.6833	.5845	.0988	38.03	37.86	0.17
4	m	.6443	.6716	-.0273	27.38	39.75	-12.37
5	m	1.2238	.5700	.6538	100.23*	49.35	50.88
6	f	.4652	.3019	.1633	25.53	20.09	5.44
7	f	.5680	.4109	.1571	29.63	20.49	9.14
8	f	.5302	.5012	.0290	56.12	49.56	6.65
9	f	.5053	.6100	-.1047	27.61	30.60	-2.99
Σ		5.8302	4.3697	1.4661	355.77	292.58	63.16
\bar{x}		.6478	.4855	.1629	39.53	32.51	7.0178

* Note: subject smoked two cigarettes in the pre-test session.

APPENDIX 5(b): continued

(ii) *Negative Modelling Subjects (N = 9)*

SUBJECT	SEX	AMOUNT OF TOBACCO CONSUMED (IN GRAMS)			AMOUNT OF TIME (SECONDS) CIGARETTES WERE IN SUBJECTS' MOUTHS		
		Pre-Test	Post-Test	Difference	Pre-Test	Post-Test	Difference
1	M	.6118	.6424	-.0306	24.03	27.91	-3.88
2	M	.6654	.6966	-.0279	23.98	28.35	-4.37
3	M	.7531	.7416	.0115	23.66	23.30	0.36
4	M	.6682	.6858	-.0176	28.30	33.35	-5.05
5	M	.5896	.6900	-.1004	22.51	23.39	-0.88
6	f	.6637	.5890	.0747	25.65	23.09	2.56
7	f	.7008	.6787	.0221	20.07	27.70	-7.63
8	f	.6424	.5742	.0682	31.75	34.56	-2.81
9	f	.7091	.6591	.0500	32.14	38.44	-6.30
Σ		6.0039	5.9541	0.05	232.09	260.09	-28.00
\bar{x}		.6671	.6617	.0056	25.79	28.90	-3.1111

APPENDIX 5(b): continued

(iii) Biofeedback Subjects (N = 9)

SUBJECT	SEX	AMOUNT OF TOBACCO CONSUMED (IN GRAMS)			AMOUNT OF TIME (SECONDS) CIGARETTES WERE IN SUBJECTS' MOUTHS		
		Pre-Test	Post-Test	Difference	Pre-Test	Post-Test	Difference
1	M	.5876	.5775	.0101	31.65	27.14	4.51
2	M	.5558	.5953	-.0395	33.05	30.79	2.26
3	M	.6602	.7209	-.0607	34.06	60.27	-26.21
4	M	.5587	.3613	.1974	29.56	23.69	5.87
5	M	.7747	.6846	.0900	30.98	40.89	-9.91
6	F	.6103	.4585	.1523	27.61	16.80	10.81
7	F	.5475	.6018	-.0543	24.69	29.23	-4.54
8	F	.6476	.6908	-.0430	35.92	24.62	11.30
9	F	.5279	.5000	.0279	36.04	34.41	1.63
Σ		5.4711	5.1907	.2802	283.56	287.84	-4.28
\bar{x}		.6079	.5767	.0311	31.51	31.9822	-.4756

APPENDIX 5(b): continued

(iv) Control Subjects (N = 9)

SUBJECT	SEX	AMOUNT OF TOBACCO CONSUMED (IN GRAMS)			AMOUNT OF TIME (SECONDS) CIGARETTES WERE IN SUBJECTS' MOUTHS		
		Pre-Test	Post-Test	Difference	Pre-Test	Post-Test	Difference
1	m	.5912	.5321	.0591	26.81	22.24	4.57
2	m	.8381	.6515	.1866	49.80	60.27	-10.47
3	m	.5527	.5894	-.0367	34.70	38.72	-4.02
4	m	.6553	.6856	.0303	32.63	20.65	11.98
5	f	.6924	.6954	-.0030	39.41	42.79	-3.38
6	f	.5500	.6586	-.1086	34.24	50.99	-16.75
7	f	.7009	.7017	-.0008	50.87	58.91	-8.04
8	f	.5078	.5465	-.0387	20.99	20.06	0.93
9	f	.6661	.7197	-.0536	21.50	30.19	-8.69
Σ		5.7545	5.7805	-.026	310.95	344.8197	-33.8697
\bar{x}		.6394	.6423	-.0029	34.55	38.3133	-3.7633

APPENDIX 5(c): SUMMARY OF A ONE-WAY ANOVA ON OBSERVED DATA, BY

VARIABLE

(i) Amount of Tobacco Consumed (Pre-Test Condition)¹

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F-RATIO	F-PROB.
Between Groups	3	.0164	.0055	.3091	.8186
Within Groups	32	.5675	.0177		
TOTAL	35	.5840			

(ii) Amount of Tobacco Consumed (Post-Test Condition)²

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F-RATIO	F-PROB.
Between Groups	3	.1715	.0572	5.7311	.0030
Within Groups	32	.3192	.0100		
TOTAL	35	.4908			

(iii) Amount of Time Cigarettes were in Subjects' Mouths (Pre-Test Condition)³

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F-RATIO	F-PROB.
Between Groups	3	892.3248	297.4416	1.5382	.2236
Within Groups	32	6187.7390	193.3668		
TOTAL	35	7080.0637			

(iv) Amount of Time Cigarettes were in Subjects' Mouths (Post-Test Condition)³

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F-RATIO	F-PROB.
Between Groups	3	416.7511	138.9170	.9385	.4334
Within Groups	32	4736.4297	148.0134		
TOTAL	35	5153.1808			

(v) Difference in Amount Consumed (Pre-Test-Post-Test)⁴

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F-RATIO	F-PROB.
Between Groups	3	.1607	.0536	3.0791	.0413
Within Groups	32	.5566	.0174		
TOTAL	35	.7173			

(vi) Difference in Time (Pre-Test-Post-Test)⁵

SOURCE OF VARIATION	DEGREES OF FREEDOM	SUM OF SQUARES	MEAN SQUARES	F-RATIO	F-PROB.
Between Groups	3	659.6051	219.8684	1.6039	.2078
Within Groups	32	4386.6685	137.0834		
TOTAL	35	5046.2736			

APPENDIX 5(c): continued

Notes to Appendix 5(c)

- 1 There was no significant difference between the group means in the amount of tobacco the subjects consumed in the pre-test condition.
- 2 There was a statistically significant difference between the group means in the amount of tobacco the subjects consumed in the post-test condition.
- 3 The groups did not differ significantly from each other in terms of the amount of time lit cigarettes stayed in the subjects' mouths in the pre-test condition nor in the post-test condition.
- 4 There was a significant difference between the group means with regard to the difference between the amount of tobacco consumed in the pre-test and post-test conditions.
- 5 There was no significant difference between the group means as far as the difference between the amount of time lit cigarettes stayed in the subjects' mouths in the pre-test and post-test conditions was concerned.

APPENDIX 5(d): SUMMARY OF PEARSON'S CORRELATION COEFFICIENT

AMTPRE, AMIPOST, DIFFAMT and DIFFTIME

	AMTPRE	AMIPOST	DIFFAMT
TIMEPRE	$r = .7069$ $p = .001$		
TIMEPOST		$r = .41$ $p = .007$	
DIFFTIME			$r = .7172$ $p = .001$

NOTES

1. AMTPRE denotes amount consumed in pre-test condition.
2. TIMEPRE denotes amount of time lit cigarettes stayed in subjects' mouths in pre-test condition.
3. AMIPOST denotes amount consumed in post-test condition.
4. TIMEPOST denotes amount of time lit cigarettes stayed in the subjects' mouths in post-test condition.
5. DIFFAMT denotes the difference between the amount consumed in the pre-test and post-test conditions.
6. DIFFTIME denotes the difference between the amount of time lit cigarettes stayed in the subjects' mouths in the pre-test and post-test conditions.

APPENDIX 6: APPENDIX TO APPARATUS AND
EXPERIMENTAL SITUATIONS

DIAGRAM 1: DIAGRAMS OF STUDY ONE AND STUDY TWO

Diagram 1(a)

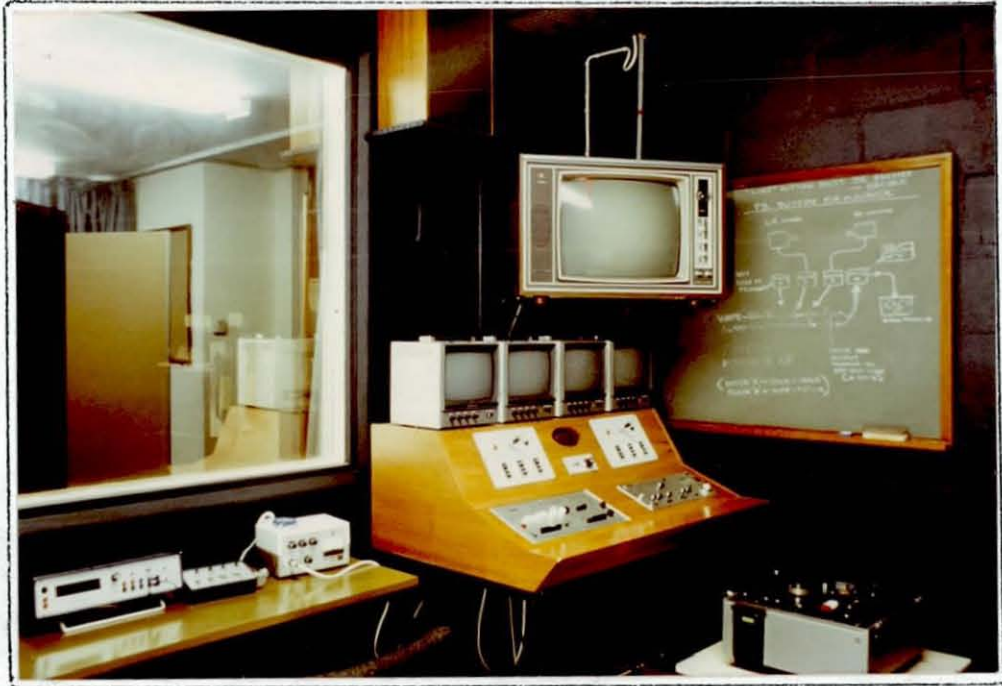


Diagram 1(a) shows the Observation Room and the following apparatus (from left to right):

- (1) Timer Counter;
- (2) Time Counter push button control;
- (3) Galvanometer (with the electrodes passed through the wall into the Experimental Room);
- (4) Video console with 4 TV monitors;
- (5) TV monitor (top right) attached to the console;
- (6) Reel-to-reel video recorder (bottom right).

Diagram also shows part of one-way screen (top left) between the Observation Room and the Experimental Room.

Diagram 1(b)



Diagram 1(c)



Diagram 1(b) shows the same Observation Room with the following apparatus: a U-matic video cassette recorder with an attached TV monitor.

Diagram 1(c) shows a subject in an experimental situation (in the Experimental Room) being observed on the TV monitors attached to the video console in the Observation Room.

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Diagram 1(d)



Diagram 1(d) shows a subject (a cigarette smoker) in a self-modelling condition. The subject is enclosed in a cubicle situated inside the Experimental Room. On two fingers of the subject's left hand are attached electrodes. The electrodes are connected (through the wall between the Observation Room and the Experimental Room) to the galvanometer situated inside the Observation Room. Also attached to the wall is a video camera focusing on the subject (through a small gap between the screens). In this condition, through the video system, the subject is watching himself on a TV monitor while smoking.

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DIAGRAM 2: DIAGRAMS OF STUDY THREE

Diagram 2(a)



Diagram 2(a) shows the subject (on the left) and the experimenter (on the right). The experimenter and two items of the apparatus used are out of the subject's sight by means of a screen enclosing the subject. In front of the experimenter are the following apparatus (left to right): (1) oscillograph and (2) Birbeck Laboratory Timer and Signal Source. Facing the subject are: (1) a mirror (with a white circular spot in the centre of it and the subject's reflection in it; (2) a flash unit (just above the mirror) mounted on a tripod. The subject is wearing headphones.

The flash unit which provided the UCS and the headphones through which the CS was presented to the subject were connected to and controlled by the Timer and Signal Source. The oscillograph recorded CS-UCS presentations as events.

Diagram 2(b)



Diagram 2(b) shows the same subject in the same experimental situation as Diagram 2(a). The electrodes attached to appropriate areas of the subject are also connected to the oscillograph which recorded the subject's responses (eyeblinks).

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DIAGRAM 3: DIAGRAMS TO STUDY FIVE

Diagram 3(a)



Diagram 3(a) shows a subject in the biofeedback condition lighting up a cigarette. Attached to the subject's left hand fingers are two electrodes from the galvanometer. On the table next to the subject are:

- (a) a galvanometer with audio and visual outputs
- (b) a microphone
- (c) a packet of cigarettes (Benson and Hedges Special Filter King Size)
- (d) an ashtray
- (e) a glass sample tube for the cigarette butt.

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Diagram 3(b)



Diagram 3(c)



Diagram 3(b) shows a subject in the biofeedback condition taking a puff out of a cigarette.

Diagram 3(c) shows a subject dropping a cigarette butt (still burning) into a glass sample tube.

Diagram 3(d)



Diagram 3(d) shows a subject in a self-modelling condition smoking in a mirror room.

