

1991

Development and evaluation of a new scale to measure motivation

Thacker, Clive

<http://hdl.handle.net/10026.1/352>

<http://dx.doi.org/10.24382/4942>

University of Plymouth

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THE DEVELOPMENT AND EVALUATION OF
A NEW SCALE TO MEASURE MOTIVATION

By

CLIVE THACKER

Department of Psychology, Polytechnic South West

Thesis submitted to the Council for National Academic
Awards in partial fulfilment of the requirements for the
degree of Doctor of Philosophy September 1991

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ACKNOWLEDGEMENTS

The writer wishes to acknowledge the invaluable encouragement and support provided by his Director of Studies, Dr. Michael Hyland, and by the second supervisors of the research programme, Professor Jonathan Evans and Professor Sidney Irvine.

The writer also wishes to thank the technical and secretarial staff of the Department for their support throughout the research programme, and other friends and colleagues in the Department, particularly Peter Dann, Steve Ray and Keith Clements.

Finally, the writer wishes to acknowledge that throughout the programme of research reported in this thesis, funding was provided by a three year grant from the Science and Engineering Research Council.

DECLARATIONS

- 1 Whilst registered for this degree I have not been a registered candidate for another award of the CNAA or of any university
- 2 None of the material contained herein has been used in any other submission for an academic award
- 3 A programme of advanced study has been completed in partial fulfilment of the requirements for the degree, consisting of guided reading in the areas of motivation and psychometrics, and attendance at relevant research seminars and conferences

THE DEVELOPMENT AND EVALUATION OF
A NEW SCALE TO MEASURE MOTIVATION

by

Clive Thacker

ABSTRACT

This programme of research was undertaken with the aim of using psychometric techniques to develop and evaluate a new scale to measure motivation. An initial hypothesis was stated, proposing that five related factors could be used to describe individual differences in certain motivational determinants. These factors are Goal Coherence, Strength of Will, Planning, Perseverance, and Self Evaluation.

A questionnaire was constructed, and versions administered to 813 subjects over 5 studies. The resultant data were subjected to maximum likelihood factoring, and the solutions rotated obliquely. Results from each study led to successive refinements of the questionnaire, and an eventual rejection of the initial hypothesis in favour of a single factor of future-oriented motivation labelled Goal Coherence, measured by a 15-item questionnaire.

Three further studies were undertaken to test the Goal Coherence questionnaire for convergent and divergent construct validity, internal consistency and test-retest reliability. These studies yielded generally encouraging results.

Two final studies, set in the future-oriented context of contingent versus noncontingent path behaviour, were undertaken to test the validity of the scale against external behavioural criteria. It was predicted that there would be a significant positive relationship between Goal Coherence and problem solving in a contingent path condition. It was further predicted that no such relationship between Goal Coherence and performance would be observed in the noncontingent condition. In the second study, it was predicted that the ability to recognise a contingent path would increase as a function of Goal Coherence scores. Results from both studies appeared to give some support to the predictions.

It is concluded that the Goal Coherence questionnaire possesses potential as a useful measure of future-oriented motivation, and as a platform for continuing research. Current and planned applied uses of the questionnaire are described, and directions for future research are suggested.

THE DEVELOPMENT AND EVALUATION OF A NEW SCALE TO MEASURE MOTIVATION

INTRODUCTION

This thesis is concerned with the identification and measurement of human motivational traits. A primary aim of the programme of research was to use one or more of these traits as the foundation for the development and evaluation of a new scale to measure motivation.

The study of motivation stretches back throughout the history of psychological science, from the work of William James (1890) and Muller (1900), to that of Weiner (1985) and Cattell (1985). As the literature reviewed in the first two chapters of this thesis illustrates, there have been several fundamentally different approaches to understanding motivation. In many cases, these approaches have raised unanswered questions about the nature of motivation, frequently with regard to the comparative influence of personal and situational variables. In addition, certain inconsistencies are reported throughout the research literature.

There are several reasons for the existence of these unresolved issues. In some approaches, such as the measurement of the need to achieve by projective testing, methodological limitations have tended to obscure the clarity of research findings. In other

approaches, such as the attributional theory of motivation, attempts have been made to include the effects of interaction between person and situation. Arguably, the scope of such a theory is too ambitious to support the precisely targeted research likely to result in unequivocal findings.

Cattell (1966, 1980, 1985) has consistently argued that to fully understand human behaviour, one must necessarily understand the interaction between person and situation. He has also argued that, while such an understanding may lie some way in the future, positive steps towards its attainment can be taken by continually improving the body of knowledge about the intrapersonal effects on behaviour. Additions to that body of knowledge may, as Kline (1983) suggests, be more readily obtained through the use of an objective methodology not always present in previous research.

The effects of motivational traits on behaviour are incompletely understood, and, as Cattell (1985) has argued, represent an area worthy of further investigation. The present programme was initiated to undertake research in that area, using the psychometric methodology of factor analysis, with the aim of producing a new questionnaire to measure human motivation.

This thesis describes the procedures undertaken in pursuit of that aim, and their outcomes.

CHAPTER 1

THE SCIENTIFIC STUDY OF MOTIVATION - 1

Instinct and Drive Theories and the Move towards Cognitivism

1.1 Introduction

In his introduction to the annual publication of the Nebraska Symposium on Motivation in 1955, Marshall Jones described the subject matter of motivation as "how behaviour gets started, is energised, is sustained, is directed, is stopped." (Introduction)

Commenting on Jones's remarks, McClelland (1985a) argues that why individuals behave in the way they do and what they do are really two different domains of study. However, it is central to the present thesis that motivation to behave and the outcomes of motivation - McClelland's 'why' and 'what' - rather than being separate areas of interest, are seen to be closely linked. By identifying and studying these links it becomes possible to gain an understanding of behaviour, and to use that understanding as part of a predictive process.

A central argument in this thesis is that certain determinants of motivation are trait-based. There are

measurable motivational structures that remain stable across time and situation. The 'why' of behaviour is represented by individual differences in trait-derived motivation. To predict the 'what' of behaviour, it is necessary to identify and measure those individual differences. The aim of this thesis is to develop and evaluate an instrument that can be used to undertake such a measure.

Before describing the methods adopted in pursuit of this aim, certain areas of the scientific study of motivation are reviewed. This review is important, since theoretical concepts, such as those which underpin the present thesis, rarely exist in isolation. There is almost always dependence on predecessors, however oblique that dependence may at times appear. Of equal importance is the opportunity to point out in the previous research certain inconsistencies and unanswered questions which provide much of the the impetus for the present programme of research.

The first two chapters of this thesis trace the development of motivation theory from the work of McDougall and Freud in the earlier part of the century, to the contemporary contributions of Weiner and Cattell. The major advances that took place over the years that separate the work of Freud and Cattell are considered, including the drive theory of Hull and the field theory of Kurt Lewin. This is followed by a description of the work of Murray, Atkinson and McClelland in the field of

achievement motivation. Finally, before turning to the work of Cattell, Rotter's social learning theory, and the attributional model of Bernard Weiner are addressed.

In reviewing this work, greatest emphasis has been placed on the theoretical content. The empirical evidence, where it exists, has been reviewed previously on numerous occasions (see Weiner, 1980, and McClelland, 1985a).

The remainder of this chapter addresses the work of McDougall, Freud, Hull and Lewin.

1.2 The Instinct Theory of McDougall

In 1908, McDougall proposed that the most important determinants of human behaviour were instincts. His theory was an expansion of James's (1890) conclusions that instincts were purposive, directive, and crucial to the individual's interaction with the environment. McDougall argued a case for ten primary instincts. These were, flight, repulsion, pugnacity, curiosity, self-assertion, self-abasement, reproduction, gregariousness, acquisition, and construction.

The first seven primary instincts, McDougall argued, produce a distinctive emotional state that directly motivates behaviour. For example, curiosity might engender an internal state of inquisitiveness

which in turn would motivate behaviour designed to satisfy that state. Instincts produce emotions which motivate behaviour. They do not directly initiate behaviour. The final three instincts in McDougall's list do not, according to his theory, produce their own distinctive emotion.

McDougall argued that an instinct is an innate predisposition to perceive the presence of a specific object and to react emotionally to that object. The product of an emotional reaction is an impulse. This causes the individual to respond in a particular manner to that object.

A central element in McDougall's approach to motivation is the concept of self-determination. He did not regard an instinct as a mere reflexive response, but rather that the individual's behaviour is the result of a decision. Furthermore, individuals maintain an awareness of the purpose and direction of their behaviour. Finally, McDougall argued that although learning might affect the behavioural response to an instinct and the kind of environment likely to arouse the instinct, learning does not change either the instinct or its subsequent emotional response.

The learning-centred approach of behaviourist psychology found much to criticise in McDougall's theories, and this is discussed later in the chapter. However it is interesting to note, particularly with

reference to a central argument of this thesis, that a teleological motivation was being advocated at the very outset of scientific investigation in the area.

McDougall's view of motivation was only one of several divergent instinct approaches during the early part of the twentieth century (see Troland, 1928, for a review). By far the most comprehensive attempt to unify instinct motivation was the psychoanalytic theory of Sigmund Freud (1915a).

1.3 Freudian Motivation Theory

Darwin's (1869) theory had provided psychology with a difficult problem. Origin of Species contained proposals that eliminated many of the qualitative differences between humans and nonhuman animals. Behaviour in animals and humans was apparently motivated by the need to survive, yet humans were also aware of other motivating forces. Freud's psychoanalytic theory was an attempt to explain the paradox. It stated that motivational determinants of behaviour were not accurately represented by conscious awareness. Instead, Freud proposed that behaviour is motivated by a need to satisfy crucial biological requirements, and that this need operates at an unconscious level. Freud agreed with McDougall on the purposive and directional importance of instinct, but rejected self-determination and teleology.

Freud described his instinct theory in 1915 (Freud 1915b). In it, he proposed that all human behaviour is motivated by instincts that exist to satisfy bodily requirements.

By the pressure of an instinct we understand its motor factor, the amount of force or the measure of the demand for work which it represents. The characteristic of exercising pressure is common to all instincts; it is in fact their very essence. Every instinct is a piece of activity.

(p.118)

Initially, Freud was concerned with the life instinct, Eros, the functions of which are reproduction and the maintenance of life, and the libido, or sexual instinct. Later, he adapted his theory to include Thanatos, the death instinct, where aggression represents the outward expression of the instinct for self-destruction. As he developed his theory, Freud placed increasing importance on the concept of life conflict between these two fundamental instinctual forces, Eros and Thanatos.

Instinct, according to Freud, has four primary components. These are source, impetus, aim and object. The operation of these components describes the process of achieving need satisfaction. Firstly, changes in internal process create a biological need which is the

source of all motivated behaviour. This need creates an internal tension. Freud labelled this tension psychic energy. It is the impetus which motivates behaviour. Freud adopted certain ideas proposed by Brucke (1874) on the subject of exchange and conservation of energy. Freud argued that individuals possess a fixed quantity of internal energy, and that internal biochemical physiological energy may be transformed into psychic energy. The intensity of biological need determines the amount of psychic energy, which in turn affects the strength of motivation. Next, the aim of instinct is to remove internal tension. If this is not possible, behaviour will be directed towards an interim reduction of tension. Finally, Freud proposed that a specific environmental object exists to satisfy an instinct. The aim of the instinct is to reach the object. Despite Freud's belief in the heritability of instincts, he accepted that the object providing satisfaction may change during an individual's life. This allowed for a degree of flexibility in behaviour.

Freud proposed a psychological structure comprising three personality systems, the id, the ego and the superego. He regarded all behaviour to be instinctually motivated by the id. The id is present at birth and produces somatic demands which initiate behaviour as a means of reducing those demands. Demands may be conceptualised as bound energy which is freed when the targeted demand is met. A simple representation of the

id's operation is as follows.

pain -----> behaviour -----> pleasure

The id obtains pleasure by two means, reflex action and primary process. Reflex action is an instinctive reaction which results in immediate tension reduction. Primary process attempts to reduce tension indirectly, by creating an image of the desired object. This mental image is called wish fulfilment, but alone cannot reduce tension.

When the id fails to reduce tension and obtain complete pleasure, the ego develops. The ego operates according to the reality principle, and satisfies the instincts through the secondary process. This process allows the individual to match the mental image produced by the id to an object in reality. Behaviour is initiated which will result in the attainment of the real-world object, thereby reducing the biological need. Thus the ego directs the instinctive demands towards goal-oriented behaviour within the environment.

As well as mediating effectively between the id and the environment, the ego must also deal with the demands of the third personality system, the superego. The superego is an internal representation of societal values, developed partially in response to parental values, and motivates the individual to aim beyond pleasure to perfection.

When functioning properly, the ego satisfies all the conflicting demands of the id, the environment and the superego. If these demands cannot be effectively met, the resultant conflict may produce additional tension. When this tension becomes unmanageable, personality disorders may result. Effective control of the id may be achieved by two processes, identification and displacement. Identification with significant people throughout the formative years of childhood allows the individual to develop socially appropriate behaviour. Behaviour may satisfy the biologically motivated needs through displacement. One object of motivation may be displaced by another as part of the process by which the individual attempts to achieve the gratification demanded by the id.

The instinctive id motives which are activated depend upon proper ego development throughout five psychosexual stages - oral, anal, phallic, latency and genital. If unmanageable levels of tension and conflict are created during any of these stages, the ego will not properly develop its mediating and controlling abilities. As a result, the individual may resort to defence mechanisms. These operate at an unconscious level, and serve to lower the anxiety caused by unreduced tension either by distorting or denying reality. While they may be temporarily effective, a defence mechanism will not eliminate the source of tension, and will eventually fail, allowing the anxiety to reappear. As more reliance is placed on defence

mechanisms, any effective solution to reducing tension is denied, producing even more pathological behaviour leading to severe personality disorder.

However effective the operation of the ego is in preventing such disorder, Freud argued that the failure to obtain complete satisfaction for the demands of the id always causes some tension to remain within the individual. As undischarged tension builds up, so the individual constantly searches for new and better ways to reduce it. It is the concept of undischarged tension which forms much of the basis of the Freudian theory of motivation.

Criticisms of Freudian theory as 'unscientific' or 'untestable' or simply too vague, are numerous and well documented. Kline (1976) deals with the most common of these. Criticisms of instinct theory are equally widespread. For example, the gradual accumulation of anthropological data indicated a variety of cross-cultural beliefs and behaviours not readily explainable by the concept of universal human instincts. Perhaps the most important factor which led to the demise of instinct theory was that the increasingly widespread use of the concept added little to an understanding of human behaviour. This criticism is mirrored in Bernard's (1924) analysis.

It can be argued that the discrediting of instinct theory is not wholly applicable when evaluating Freud's

use of the term. The conventional English translation from the German word 'Triebe' is the word 'instinct'. However Freud uses an alternative noun 'Instinkt' to distinguish animal instinct from the human variety. From this it may be questioned whether his adoption of certain Darwinian principles was as clearcut as is usually suggested. Furthermore, there was an ambiguity in Freud's own explanation of instinct. As Richards (1984) points out, in the earlier papers Freud draws no distinction between an instinct and its 'psychical representative'. The instinct is regarded as the psychical representative of somatic forces. Yet in later papers he makes a very clear distinction between instinct and its psychical representative - 'Triebreprasentanz'- where the instinct is something non-psychical (Richards, 1984).

It may be argued that the apparent contradiction lies in the ambiguity of the concept of instinct itself - an undeterminate entity lying somewhere on the boundary between the mental and the physical. It can surely be argued that the Freudian view of the importance and classification of instincts, however it may have changed, is only remotely linked to the prolific and unproductive use of the concept that receives just criticism.

A main criticism of Freud from a trait-based view of motivation rests in lack of quantifiable structure. Instincts, like any trait, may owe much to heritability.

The psychological structures responsible for directing behaviour, the id, ego and superego, are effectively described. But individual differences in their operations or, for example, the mediating abilities of the ego, are not readily quantifiable. Furthermore, it is difficult to accept Freud's rejection of teleology. A fundamental process in individual differences psychology is to measure in some part the effects of psychological structures. This is often achieved by using a questionnaire to ask the individual about his or her own behaviour, with a clear implication that the individual has some awareness of the motivational determinants of that behaviour. Individual differences psychologists may argue that there are problems with the view that human motivation is composed of unconscious processes, inaccessible via conventional methodological approaches. However, it should be just as firmly argued that if an understanding of how the human mind functions - such as that proposed by Freud - cannot be achieved by current psychological methodologies, then the problem rests with psychologists and their methodologies, not with the functionality of the mind.

Whatever arguments surround Freud's theory of motivation, however, there can be no doubt that it was itself a great motivator of further research in the area. The next major area of that research - drive theory - will now be described.

1.4 Drive Theory

As established in the preceding sections, the use of instinct as an explanatory motivational construct was prevalent by the mid 1920s. As well as major theorists such as Freud, many other psychologists used instinct to account for the entire range of human and nonhuman behaviour. The concept became over-used. Holt (1931) has written an apt satire of the all-pervasive tendency to use instinct as an explanation for everything - even to the point of proposing the existence of an instinct to believe in instincts! Psychologists became dissatisfied by this virtual tautology, and there was a growing desire for a non-speculative, physiological explanation for motivation. Such a change in attitudes provided the spur to find an alternative and more productive explanatory concept. This concept was drive.

From the turn of the century, it had been argued that the determinants of behaviour were dependent upon the principles of association and the laws of learning. An important set of laws governing learning was framed in the early part of this century, deriving theoretical support from the principle of association as the cause of action. It was known as operant or instrumental learning.

This method of learning was described initially by Thorndike (1911). His subjects were animals. In a typical experiment an animal, a cat for example, would

be put into an enclosed box with food placed outside the box. Thorndike noticed that the animal would initially engage in random behaviours, until accidentally making a response that the experimenter had designated to be the one which would result in the animal's release. When it was put back into the box, the animal would make the release response more and more frequently until it eventually became the immediate response following enclosure. The reasons for the apparent restructuring that had taken place within the animal's response hierarchies were encapsulated by Thorndike in his Law of Effect. According to this law, when a stimulus-response sequence is followed by some desired effect, then the strength of that sequence is increased. Similarly, the strength of the sequence will be diminished if it results in some undesirable or unpleasant effect.

There are parallels to be drawn between Thorndike's Law of Effect and the Platonic doctrine of hedonism. The doctrine maintains that voluntary behaviour is guided by the pursuit of pleasure and the avoidance of pain. However, later philosophical consideration of motivation, Cartesian proposals in particular, went on to distinguish clearly between human and animal behaviour as either volitional or the product of a reactive organism (Descartes, 1637, 1649). The work of Thorndike owed much more to Darwinian principles, which destroyed many of the qualitative distinctions traditionally made between human and animal behaviour. Thorndike's work is mechanistic in concept, where

behaviour is determined by sets of links between stimuli and responses. Input from any higher level mental process is not considered, nor is the influence of any motivational construct. It was Thorndike's work, with its emphasis on reinforcement as the corner-stone of stimulus-response links, that was to influence Hull and the formulation of his drive theory.

As outlined above, the concept of drive grew in popularity as a reaction against what were seen to be the outmoded principles of instinct theory. Drive was assumed to be an intense, physiologically based internal arousal which motivated behaviour. In his formal statement of theory, Hull (1943) argued that physiological deficits or needs instigate behaviours which offset those needs. Therefore drive is a motivational characteristic of need states. Need states result from physiological imbalance, and motivate behaviours designed to restore equilibrium. In other words, needs generate the energy that is required for survival.

...an organism will hardly survive unless the state of organismic need and the state of the environment in its relation to the organism are somehow simultaneously brought to bear upon the movement-producing mechanism of the organism (p.18)

Hull's approach to the relationship between need

and drive can be illustrated in the following way.

antecedent operation -----> need -----> drive

Hull was also influenced by Darwin, and the idea of survival-relevant behaviour, where it is adaptive for behaviour to occur if, and only if, a need exists that is not satisfied.

Thus, according to Hull, a survival relevant need represented the antecedent conditions necessary to motivate behaviour designed to restore the biological equilibrium. An example of an antecedent condition proposed by Hull is food-deprivation, and there has been extensive empirical research carried out to study the effects of deprivation-induced drive. In a typical study, Stolurrow (1951) varied the percentage of weight loss through food deprivation in rats, and reported that the level of instrumental behaviour increased as a function of weight loss (Weiner (1980) has reviewed much of the relevant literature). Studies such as this demonstrated that deprivation determined the intensity of motivation to reduce the bodily need.

Hull also proposed that environmental events could become learned or acquired drives through the process of classical conditioning. By this process, events present when the internal drive state is experienced develop the capability of motivating behaviour to reduce drive. The act of reducing drive was also seen to be reinforcing.

In this way, drive reduction has the effect of intensifying habit strength, or the strength of the link between the prevalent stimulus conditions at the time of reinforcement and the particular behaviour which preceded drive reduction. Therefore, environmental events develop the capacity to direct behaviour as the result of drive reduction.

This concept - that stimuli present during reinforcement develop the ability to direct behaviour that preceded reinforcement - has received considerable empirical support. Newman's (1955) study is typical of the studies carried out to demonstrate the importance of stimulus context on instrumental behaviour. Newman trained food-deprived rats to run towards a circle in order to obtain food. Some animals were tested under the same stimulus conditions which prevailed during training; in another condition, the diameter of the circle was changed. Running speed was used as the measure of instrumental performance. Newman reported that instrumental performance decreased as the similarity between the stimulus context of the training and test phases diminished.

A further primary component of Hull's drive theory was the proposition that behavioural inhibition develops when a specific response does not reduce drive. Initially this inhibition temporarily suppresses all behaviour, but the continued failure of a habit to reduce drive results in the permanent inhibition of the

unsuccessful habit. As in the other main propositions of Hullian theory, this argument produced extensive empirical research. According to the drive approach, nonreward in a context where reward was previously experienced produces an intense emotional state described as frustration. Frustration has been put forward as a fundamental motivating influence on human and nonhuman behaviour. Much research has been undertaken to study the relationship between frustration and aggression (Dollard et al, 1939; Miller, 1941). Other frustration theories were put forward by Brown and Farber (1951) and Amsel (1958). Both were concerned with the influence of frustration on appetitive behaviour where an escape response is either similar to or compatible with the attainment of reward. Both approaches are reviewed by Klein (1982).

A related area of study to that carried out on frustration and aggression was Mowrer's (1956) Hullian-based avoidance learning theory. Mowrer proposed that an individual's attempts to cope with aversive experiences are not attempts to prevent the occurrence of a specific painful event, but rather an instrumental escape response to fear; a response that has been reinforced by drive reduction. This view received some initial support, but has been widely criticised since (see Kamin et al, 1963; D'Amato and Schiff, 1964; Bolles, 1975).

In 1952, partly as a response to various

criticisms, Hull added a further major component to his view of drive, that environmental stimuli can develop the capability to motivate behaviour through association with reward as well as with primary drive stimuli. Therefore, incentive motivation, like acquired drive, is established by means of classical conditioning, and depends on the value of the reinforcer.

Thus, Hull's original conceptualisation of drive, represented by the following equation,

$$E \text{ (behavioural potential)} = D \text{ (drive)} \times H \text{ (habit)}$$

had, by 1952, grown to include variables to represent incentive (K) and inhibition (I). Indeed, a common criticism of Hull's theory is that he added a variable to its algebraic form every time someone proposed a major criticism. Nevertheless, Hullian drive theory occupied a place of prominence for over thirty years. It generated extensive research, and its influence spread into the fields of social psychology with the work of Zajonc (1965) in the field of social facilitation, clinical psychology (see Rimm and Masters (1979) for a review of the application of avoidance behaviour principles to therapy), as well as providing the basis for other contemporary approaches to drive theory such as that of D'Amato (1970).

Hull's drive theory of motivation has attracted considerable criticism. While the approach offered clear

and testable hypotheses to its adherents, so was it correspondingly open to critical disconfirmation. An effective line of attack was taken by critics who attempted to demonstrate that motivation did not always involve the reduction of tension or the avoidance of an aversive stimulus. Sheffield and Roby (1950) reported that a non-nutritious sweet taste from saccharin could serve as a reward value for rats. That is, the animals would learn behaviours which, if successfully performed, would lead to their attaining the sweet taste as a reward, even though the saccharin could not reduce their hunger drive.

Harlow, Harlow and Meyer (1950) discovered that monkeys would work to solve a mechanical puzzle even though no primary drive reduction was involved. Furthermore, they reported that by introducing a food reward for solving the puzzle, they actually interfered with the animals' performance.

Sheffield, Wolff and Backer (1951) conducted a series of studies which appeared to demonstrate the willingness of male rats to cross an electrified grid in order to reach and copulate with a female rat. The animals persisted in this behaviour despite being always interrupted from reaching orgasm, thereby disallowing drive reduction.

Another major source of criticism of Hullian theory stemmed from the work of Olds (Olds and Milner, 1954;

Olds, 1955), who reported that direct stimulation of certain areas of a rat's brain could act as a positive reinforcement. By direct implantation of an electrode at various sites in the animal's brain, Olds and his co-workers were able to leave the animal relatively free to move around and behave as it wished. Exploratory investigations had revealed that stimulation at particular electrode sites could act as a positive reinforcing effect on behaviour. Subsequent studies used a Skinner-box, constructed in such a way that an animal could stimulate its own brain electrically by pressing a bar. Other studies involved maze-running animals where the goal contained a bar which, when pressed, would give direct electrical stimulation to the animal's brain.

Results from these studies were quite dramatic. The rate of bar pressing in the Skinner-box, when reinforced by electrical stimulation to particular neural sites, far exceeded that recorded for severely food-deprived animals rewarded by food. Similarly, the maze studies appeared to demonstrate that the stimulation-seeking behaviour was unlikely to be a compulsive stereotyped response. The animals were all given regular supplies of food and drink in the periods prior to experimentation, and no food or drink stimuli were present during the experiments. Nevertheless, animals exhibited robust and purposive behaviour in pursuit of electrical stimulation. These studies would appear to provide compelling evidence that other sources of motivation exist than those linked to stimulus or drive reduction.

A final important criticism of the drive-dependent model of motivation that must be considered, lies in its approach to human as distinct from animal motivation. Although, as has been outlined above, efforts were made to transpose Hullian techniques from animal to human studies, the overall approach tended to remain deductive rather than empirical. That is, explanations of human needs and drives were derived from the fundamental principles of drive theory, but never actually studied. An experimenter might argue that a human need, for money, for example, could be explained by the fact that the acquisition of money was likely to be associated with the reduction of various primary and secondary drives, and no further attempts at explanation would be deemed necessary. In this respect particularly, extrapolation from animal to human motivation within a drive theory framework was, as McClelland (1985a) has pointed out, rather more a function of deduction from first principles than the result of tested hypotheses.

From the individual differences viewpoint of the present thesis, Hull's theory has to be regarded as unsatisfactory. Like all behaviourist explanations, little if any regard was given to the role of mental events in drive-related motivation. In this respect there is no difference between Freud or Hull, in that the observer is presented with a motivational fait accompli, due either to the effects of unconscious urges or the inherent necessity to reduce physiological needs. In either case there is nothing to measure and compare

across individuals. Nor is there any point in asking individuals for an assessment of their own motivations. Freud denies access, Hull denies control. To establish a link between Freud and Hull and a more cognitively oriented approach, it is necessary to consider the work of Tolman, and the field theory of Kurt Lewin. The final section of this chapter deals with their work.

1.5 The Move towards Cognitivism

Tolman (1932, 1959) held views that were quite different from the contemporary drive-based approach to motivation. He argued that behaviour is both directional and purposive. He further proposed that behaviour is goal-oriented, and that individuals are motivated either to approach a desired event or object, or to avoid it if aversive. Humans have the ability to understand their environment, and have goals which are obtained by following specific paths and using specific tools. An expectation of how goals may be reached by using these tools and paths is built up through experience. However, despite the use of terms such as expectation and purpose, Tolman stopped short of saying that individuals possess an awareness of the purpose or direction of behaviour. His theory only went so far as to say that behaviour created the impression of awareness.

Tolman also proposed that the attainment of goals is aided by the ability to identify certain indicators

in the environment related to reward or punishment. That is, behaviour is not simply goal-oriented - there is an accumulated expectation that a particular behaviour will produce a particular outcome. Reinforcement may not always be essential for learning, but motivation is essential if behaviour is to follow expectation.

Another aspect of Tolman's theory places a dual role on motivation. It produces a state of internal tension that creates a demand for a goal object, and it directs attention to the appropriate environmental indicators. Tolman also made a case for two types of motivator. The first was deprivation conditions which produce an internal drive state which in turn increases the demand for the goal. The second was incentive motivation, linked to the motivation qualities of the reward offered by a particular goal.

Tolman used the psychoanalytic expression cathexis to represent the capability of environmental events to acquire motivational properties through a reinforcer or a primary drive. Thus, according to Tolman's theory, if a thirsty rugby player sees a pint of beer (the primary drive), the ability of thirst to motivate behaviour is transferred to the beer. This transference is cathexis. Consequently the pint of beer becomes a preferred goal object, and the rugby player will be motivated to obtain beer, even when not thirsty (this example is, of course, designed to be illustrative rather than explanatory). Tolman's cathexis is similiar to Hull's concept of

acquired drive.

In comparison to the immense volume of research generated by Hullian theory, empirical investigation as a consequence of Tolman's propositions was scant. Where it did exist, the evidence produced was conflicting (it is briefly reviewed by Klein, 1982). Nevertheless, Tolman's view was instrumental in changing aspects of Hull's drive theory - the Hullian concept of a conditioned anticipation of a reward which motivates goal-approach behaviour owes much to Tolman's belief that expectation of a reward motivates behaviour associated with obtaining that reward. Yet, despite initiating changes in the Hullian approach, Tolman's cognitively-based theory was largely ignored. Its effects were more pervasive, in persuading a few researchers to continue in the cognitive field, gathering evidence that would eventually prove invaluable to the displacement of behaviourism by cognitivism. Much the same could be said of Lewin's field theory of motivation. Its effects were pervasive, not immediate, although it did subsequently generate a considerable body of research.

The work of Kurt Lewin represents an important transitional stage in the scientific study of motivation. Although some of his theoretical concepts are not dissimilar to those of Hull and Freud, Lewin attempted to place his ideas in a more cognitive framework of motivation. His work also influenced later

research into attributional and humanistic motivation theories.

Lewin belonged to the Gestalt school of psychology. Its adherents believed that the perception of physical phenomena is impossible if perceptions are reduced or studied in component parts. It is vital to consider the whole phenomenon, as the whole is often different from the sum of its parts. To assist in this approach, Gestalt theorists employed the physicists' field theory. In any given physical field, change in any part of that field will affect the remaining parts. Lewin's theory of motivation is essentially a field theory. It assumes that behaviour occurs in a psychological field, and that behaviour is affected by numerous simultaneous interacting forces. Like Hull, but unlike Freud, Lewin's approach is ahistorical. Emphasis is placed on the immediate determinants of behaviour, rather than looking for motivational clues in the individual's past.

The simplest expression of field theory is in the following equation.

$$B = f(P,E)$$

Behaviour (B) is the product of some function (f) of person (P) and environment (E). Together, the person and the environment form the life space. The life space is the psychological reality of any given situation or point in time, and may be different from the

corresponding physical reality.

Lewin (1935, 1936) described structural and dynamic concepts which related to the person. Structurally, 'the person might be either an undifferentiated point in the life space, or a region with its own boundaries and subregions with differing levels of permeability. Permeability determines the effects of tension contained within the regions. Tension is the dynamic inner-personal construct.

The dynamic construct of tension refers to the state of a region. If a need exists, a region is regarded as being in a state of tension. The amount of tension will vary in relation to the magnitude of a particular need. When tension exists within a region, the region attempts to change itself in order to restore equality of tension with surrounding regions. Lewin proposed that within each individual there exists an unspecified number of inner-personal regions, each of which has a corresponding need or intention. When a need or intention arises, a new region is represented as being in a state of tension. Thus, unlike the views of Freud or Hull, Lewin's conception of needs is pluralistic, not dependent on the idea of a nondirective or pooled source of drive.

Once a goal is reached, the level of tension within a region is reduced. Tension reduction need not occur as the result of a physical act - remembering or thinking

about the goal object can reduce tension. Thus Lewin again differs from Freud or Hull, by proposing the existence of needs that are not dependent on biological functions or survival.

Lewin also proposed a similar dynamic structure for the environment, of regions, boundaries and adjacencies. Regions in the environment may act as obstacles to locomotion towards a specific goal, in the same way that boundaries between inner-personal regions may prevent the free flow of tension. Boundaries may exist in the form of environmental or social constraints, or individual abilities where they effect goal attainment.

Field theory contains a mechanism which enables the integration of individual and environmental dynamics. When an inner-personal region is in a state of tension, a related environmental region acquires a valence. An individual's specific need creates tension within a corresponding region. Consequently an object which is perceived to be capable of satisfying that need will become attractive to the individual. In the absence of an appropriate valence within the environment, tension remains unreduced and spreads to surrounding inner-personal regions. In this way objects apparently unrelated to the original need will acquire a positive valence.

Therefore, for every valence there must be a need, but needs may exist without a corresponding valence. The

amount of valence is directly dependent upon the intensity of need, and will vary quantitatively in proportion to the strength of that need and the properties of the goal object. Lewin conceptualised this relationship in the following equation.

$$Va(G) = f(t, G)$$

$Va(G)$ is the valence of the goal, t is tension, and G the properties of the goal object. However, valence itself is not a force. A region which has acquired valence becomes the centre of a force field. It is this field which is responsible for the magnitude and direction of behaviour. At any point in time, an individual is subject to the influence of force from one or another region. This force is also dependent upon the relative distance of the individual from the goal. The force on an individual to reach a goal was expressed by Lewin as follows.

$$\text{force} = f \left[\frac{Va(G)}{e} \right] = \left[\frac{(t, G)}{e} \right]$$

In the above equation e represents the psychological distance between the person and the goal. With this formula, Lewin argued that it becomes possible to calculate the force at any given region in the life space. Force acts on an individual in the direction of the desired goal. When the goal is attained, tension is reduced, valence eliminated, and the motivating effects

of force cause the cessation of activity.

Lewin's theory generated a considerable amount of empirical research into such areas as conflict, frustration, goal substitution, and the study of factors within the environment. Weiner (1980) has reviewed the literature. Research into Lewin's theories has encompassed social psychology (Thibaut and Kelly, 1959), psychoanalytic theory (Henle's (1944) work on substitution) and clinical psychology (Lewin et al, 1944). While by no means providing unequivocal support for Lewin's ideas, the sheer volume of empirical work reflects the contribution made by those ideas to motivation research.

Within the context of the present programme of research, the work of both Tolman and Lewin represents a fundamental shift in emphasis towards the theoretical conditions required by an individual differences approach to motivation. Although tentative, the move is made towards acknowledging the capability of individuals to be aware of and report on the motives for their behaviour. Equally relevant is the more specific attention paid by both theories to the importance of goal-directed behaviour. This relevance is more fully established in Chapter 3 of the present thesis.

1.6 Summary and Conclusions

This chapter has reviewed the contribution to motivation theory of McDougall, Freud, Hull, Tolman and Lewin. For the most part emphasis has been placed on theoretical content rather than empirical reports, attention being given to the theoretical development of a motivational psychology, placing it, where appropriate, within the context of the approach taken in the present programme of research.

The chapter has described the response made by Freud to rationalise the instinct theory of McDougall, and to problems created for psychology by Darwinian thinking. With the creation of psychoanalytic theory, Freud attempted to explain the paradox of motivated behaviour which is apparently independent of survival needs alone. The roots of human motivation were set outside the sphere of consciousness. The speculative, largely untestable psychology which grew from Freud's original ideas and the related tautology of instinct theory, eventually prompted a new approach. Hull's behaviourist model of drive-based motivation, though by no means the polar opposite of Freudian thought, was the result of a desire for a physiologically derived, non-speculative psychology. Using quasi-mathematical terminology and rigorous empirical techniques, Hullian theory dominated motivation research for over thirty years.

During that period of domination, the origins of the next stage in the development of motivation theory were formed by the work of Tolman and Lewin. The theories of both men were responsible for changes in Hullian psychology, but were unable to displace it.

All of the theories described above are important to the development of the scientific study of motivation. They are also important for their contribution to the direction of the present programme of research. For not only do they provide a unique foundation for ongoing research, the early motivation theorists also raised certain questions which, to some extent, have not yet been fully addressed. This is especially so with regard to the need for greater understanding of stable psychological structures in the processes of motivation, and the need to find and apply a precise methodology within which those structures can be measured.

With regard to Tolman and Lewin, there is an additional relevance to the present programme of research in the move towards some acknowledgement of conscious mental events, and particularly their relationship with goal-directed behaviour.

In the wider context, the importance of the work of Tolman and Lewin lies also in the bridge which it forms between behaviourist and cognitive approaches, and its contribution to the efforts of the next generation of

motivation theorists.

The product of these efforts is the subject matter of the following chapter.

CHAPTER 2

THE SCIENTIFIC STUDY OF MOTIVATION - 2

Achievement, Attribution, and Personality Models

2.1 Introduction

Chapter One gave a review of major developments in motivation theory from McDougall's concept of instinct to the more cognitively based work of Tolman and Lewin. The present chapter describes the continuing development of the scientific study of motivation, from the contributions made by achievement motivation theorists, to the work of Weiner and Cattell. As in the previous chapter, emphasis is placed on theoretical rather than empirical contributions, and each area of study is considered in the context of its relationship to the present programme of research.

2.2 Achievement Motivation

2.2.1 Introduction

The concept of achievement motivation is simple and intuitively strong. Behaviour is motivated by an individual's need to achieve. The directions in which such a need is directed may differ, but McClelland's (1985a) 'why' and 'what' of behaviour can be readily explained. Why behaviour occurs, is because individuals

possess the need to achieve. What behaviour occurs, is the behaviour most likely to satisfy that need. There appears to be considerable intuitive evidence in our society for the strength of the explanation. Some people seem to have a greater need to achieve their aims and to succeed in a range of activities, while others seem less need-dependent, and arguably less successful.

The work of Murray is the first to be addressed. This is so, not only because he was the first to propose a theory of achievement motivation, but also because his attempts to incorporate motivation within a personality framework make a significant contribution to the direction of the present programme of research.

2.2.2 The Work of Murray

Murray defined the need to achieve in his (1938) personality theory. He described the need to achieve as a biochemical force which was aroused either by internal visceral processes, or by external situational circumstances. This biochemical force motivates behaviour targeted toward an environment which will satisfy an unsatisfied need. According to Murray, the essential process of motivation is that of need arousal by environmental pressures. Arousability is a personality construct, expressed through the interaction of viscerogenic and psychogenic activity. Murray's approach has roots in McDougall's concept of instinctual

needs, but Murray differed from both Freud and McDougall by arguing for the existence of learned as well as instinctive needs.

The need to achieve was defined by Murray as nAch, the desire "to accomplish something difficult" (1938, p.164). According to the definition, an individual possessing a high level of nAch typically works independently of others and as quickly as possible. Consequently, nAch motivates an individual to overcome severe obstacles, attain a high standard of excellence, and exceed the success level of others. Such an individual is typically competitive, ambitious, and determined to be successful.

Murray's work did not include research into the mechanisms of achievement motivation, but he did provide an important tool for future researchers in that area. The development of his Thematic Apperception Test (TAT) was designed to provide a means of measuring the internal needs of an individual. Responses to the series of ambiguous illustrations which make up the TAT are proposed to reveal salient aspects of the respondent's personality. Widely used in clinical diagnosis, the TAT was also to become frequently used as a means of exploring and measuring the need to achieve.

The use of the TAT as an investigative technique applied to achievement motivation grew with the work of a number of researchers, including Atkinson (1964),

McClelland (1958, 1961), and McClelland and Winter (1969). In a typical study, subjects are shown 4 to 6 pictures and are then required to answer 4 questions related to the pictures in the form of a story, as follows.

- 1 What is happening in the pictures?
- 2 What has led up to this situation?
- 3 What is being thought?
- 4 What will happen?

The responses of each subject are then rated and scored by a trained rater. The eventual total score depends on the rater's assessment of the number of occurrences of specific achievement-related images found in the subject's responses.

There is considerable debate surrounding the use, reliability, validity and value of the TAT in studying achievement motivation. As Kline (1983) has pointed out, reliability levels of projective tests such as the TAT are generally low. Numerous attempts have been made to construct a reliable scoring scheme, that of Zubin et al (1966) being, according to Kline, amongst the more successful. It is not within the scope of this thesis to become involved in the TAT debate, although it may be argued that Kline (1983) makes a valid point when he

suggests that the potential of projective tests such as the TAT should not be ignored because they presently lack suitable scoring schema.

The TAT has been used by a number of researchers who followed Murray's lead. Atkinson in particular has supported its value as a quantifier of nAch and has continued to use the TAT. Other researchers such as Weiner (1982) and Feather (1982) have chosen to seek alternative measures dependent upon more direct methods of assessing individual differences in achievement motivation.

Regardless of the controversy surrounding the TAT, it is recognised that Murray's work has a significant impact upon the present programme of research. His was one of the earliest statements of an individual differences theory of motivation, where the effects of the trait of arousability are central to the shaping of behaviour. Subsequent developments of, and questions raised by that theory are clearly linked to the present programme of research. This is particularly so with regard to the perceived need to approach the identification and measurement of individual differences in motivation from within a precise methodological framework.

2.2.3 Atkinson's Theory of Achievement Motivation

In 1964, Atkinson carried out a review of Hull's

behavioural equations, including the formulations added by Spence in 1956. Spence had agreed with Hull, in that they both emphasised the importance of incentive and its multiplicative relationship with habit and drive strength. However Spence believed that the presence of either drive or incentive would result in some form of behaviour, provided some habit strength existed. Hull had argued that no behaviour would follow in the absence of either incentive or drive. Atkinson's review of this debate was able to draw upon an added set of propositions made by Lewin and Tolman. Thus while the behavioural formula produced by Atkinson was not dissimilar from Hull's, the variables were defined in cognitive terms, and the process of variable quantification referred to humans, not animals. Atkinson's original (1957) formula of achievement tendency is as follows.

$$Ts = Ms \times Ps \times INs$$

The tendency to achieve success (Ts) is a multiplicative function of motive to achieve success (Ms), probability or expectancy of success (Ps), and the incentive value of success (INs). Atkinson's theory was also influenced by the conflict model of Miller (1941). Achievement-oriented behaviour is seen to be the product of a conflict between approach and avoidance tendencies. Every action related to achievement is associated with the possibility of success and the possibility of failure. The strengths of these anticipated emotions

were proposed by Atkinson to determine the likelihood of an individual approaching or avoiding achievement-oriented behaviours. Thus achievement behaviour can be regarded as the product of an emotional conflict between hopes of success and concomitant pride, and fears of failure and concomitant shame.

The determinants of fear of failure, or the likelihood of avoiding achievement-related tasks were proposed by Atkinson as analagous to those of the hope of success. He stated the relationships between the variables in the following way.

$$Taf = Maf \times Pf \times (-If)$$

The tendency to avoid failure (Taf) is a multiplicative function of the motive to avoid failure (Maf), the probability of failure (Pf), and the incentive value of failure (-If).

Atkinson's formulae mark the shift in emphasis that occurred at that time within the study of motivation, as it did within almost all areas of contemporary psychology - the shift from animal/behavioural to human/cognitive.

With the use of the term Ts, Atkinson was substituting 'motivation' for Hull's 'excitatory potential' as a means of describing the product of the determinants of action. In this way, the expression

'motivation' took on determinative aspects which were far broader than Hull's original concepts. Achievement theorists were among the first to argue in favour of using the broader descriptive term 'motivation'. The term can be used when referring to aroused motive states such as the need for achievement, as opposed to the term 'motive' which describes a reason for action which may or may not invoke the arousability which leads to action. McClelland (1985b) has argued as follows.

It seems less confusing to use the term motivation to refer to such states and to use a more general term such as impulse to respond to refer to the final product of all the determinants of behaviour. (p.813)

There are historical reasons for the change in meaning of the term motivation from instinctual drives, to refer to a more determinative, cognitively-oriented concept of behaviour. The work of Spence(1956), Schachter and Singer (1962), and others in the 1950s and early 1960s began to separate the concept of drive from any specific concurrent physiological events, thus enabling motivation to be viewed in a purely cognitive manner. Atkinson and Feather (1966) continued this shift in emphasis with their proposition that the expression $M_s \times I_N$ s defined valence or attractiveness of success. Thus a measure of M_s obtained from TAT responses could be regarded purely as a measure of individual differences in the evaluation of succeeding at a set of

activities - particularly where those activities included the incentive value of judging performance in terms of a standard of excellence.

Hence, the concept of drive or motives as possessors of unique affective or physiological foundations was supplanted by the much more cognitively oriented 'expectancy x value' approach. This approach regarded motives as the outcome of expectations and values, with an attendant state of physiological arousal.

The quantity of literature concerning Atkinson's theory is considerable. McClelland (1985a) has reviewed much of the relevant research. Much of this work has been concerned with the developments of and derivations from achievement theory. These are now briefly considered before addressing the relationship of achievement theory to the present programme of research.

2.2.4 Achievement Theory - Developments and Derivations

Several research areas, each with a substantial literature, have developed from the original achievement theory. These developments and derivations often came about as the result of using certain conceptual constructs as dependent variables in achievement motivation research. Task persistence and choice behaviour are two such constructs frequently explored.

In addition, Atkinson and his co-workers (Atkinson and Birch, 1970) have transformed the original theory into a more general theory of motivation which they call the "dynamics of action", discussed later in the present chapter.

Task persistence has been frequently studied in the context of achievement theory, being used as a dependent variable in motivation research. French and Thomas (1958) reported that almost 50% of subjects who scored high in nAch persisted at an insoluble task up to the time limit, compared with only 2% of low nAch scorers. Feather (1961) argued that persistence ought to depend on probability of success, according to Atkinson's model. Thus, individuals high in nAch should persist longer when they begin to fail at an easy task than when they fail at a much more difficult task. Feather's hypothesised interaction between level of resultant achievement needs and task difficulty appeared to be supported by his data. Subjects who scored low in nAch persisted longer after failure at a more difficult task. These results are also consistent with the element of Atkinson's model which predicts that individuals low in nAch will fear failure and avoid tasks of moderate difficulty.

Level of aspiration, or choice behaviour, is another frequently explored area in the context of Atkinson's original theory. Level of aspiration refers to the setting of a performance goal. The study carried

out by Atkinson & Litwin in 1960 is typical of a series of studies which used choice behaviour in such a role. Subjects were required to throw rings over a peg. They were allowed to choose to stand at varying distances from the peg, and to change position after each attempt. The experimental hypothesis included the assumption that a chosen position close to the target corresponded to a high Ps level which decreased as the chosen distance from the peg increased. Thus distance from the peg represented an observable indicator of subject choice and of task difficulty. Subjects were classified into achievement motivation subgroups on the basis of TAT scores.

Atkinson and Litwin reported that the results of this study gave three indications relating to, but not wholly consistent with predictions based on the original theory. Firstly, subjects high in nAch typically preferred tasks of intermediate difficulty. Secondly, low nAch scorers did not show any preference for comparatively easy or comparatively hard tasks. Finally, subjects high in nAch tended to exhibit a greater preference for tasks of moderate difficulty than did subjects low in nAch. These findings are comparable to those from a number of similar studies, and reviewed in depth by Meyer, Folkes and Weiner (1976).

The somewhat questionable situation in which all subjects, regardless of nAch scores, appeared to prefer tasks of moderate difficulty was answered in two ways by

Atkinson. He initially argued (Atkinson and Feather, 1966) that the large number of college students in the populations tested tended to skew the nAch scores towards the upper level. This answer seems unlikely to account for the data, as subsequent studies using USA secondary school populations of very disparate abilities produced similar results to those reviewed by Meyer et al (1976). It seems more likely, as Atkinson (Atkinson and Birch, 1978) himself later argued, that other motivational determinants apart from nAch are responsible for promoting moderate task difficulty choice.

The concepts of risk preference and choice behaviour continued to play a prominent part in motivation research during the 1970s in the ongoing study of nAch as a cognitive disposition. However, an increasing number of studies were reported which seemed to conflict with predictions based on Atkinson's own work. Entin and Feather (1982), for example, found that in some cases individuals low in nAch would attribute success and failure to effort and ability, rather than to luck and lack of effort, as the conventional interpretation of achievement motivation theory suggests they ought. This research, set in the context of contingent path performance, again raised the question of what other motivational determinants might be active, apart from the need to achieve

There was also a resurgence in approaches which

sought to explain motivation from a different theoretical standpoint to that of Atkinson. Atkinson had conceptualised motivation primarily in terms of anticipation and hedonistic concerns. Alternative arguments began to emerge emphasising the informational aspects of risk preference. Studies by Trope and Brickman (1975), Meyer et al (1976) and others contained reports that high diagnostic value of intermediate difficulty tasks contributed more to choice behaviour than hedonistic determinants.

Interpretation of the data from studies based on an informational theory of intermediate difficulty choice had considerable implications for Atkinson's original theory. It seemed to suggest that individuals highly motivated to succeed made their behavioural decisions more on the basis of information and feedback than on the maximisation of positive affect or the minimisation of negative affect.

Motivation theory had moved in the late 1950s away from behavioural explanations towards more cognitively oriented concepts. The 1970s held a further shift in emphasis from emotionally-based to information processing explanations.

Perhaps as a response to this shift in emphasis, Atkinson and Birch (1970) put forward a more general theory of motivation based on concepts of information processing, mathematical derivations and computer

simulation. The approach marks a transition in Atkinson's thinking away from the traditional episodic view of behaviour to one which is concerned with changes in a constant stream of behaviour, or the "dynamics of action". Atkinson and Birch (1978) describe the context for dynamics of action as follows.

...the simplest and most fundamental decision problem...is not when the human subject is presented a stimulus situation defining possible choice between two options in a simple decision-making experiment. The more fundamental and simpler problem...is this problem of change from one activity to another that is inadequately treated in traditional conceptions of the determinants of initiation of a particular activity..." (p.23)

Atkinson and Birch (1970, 1978) argued that rather than being in or seeking equilibrium or rest, individuals are always active. Thus the major task for motivation theory is to explain and predict the change from one behaviour to another, rather than from rest to behaviour or vice versa. Atkinson and Birch further argued that the changes between behaviours depend upon the involvement of a number of instigating forces such as an increase in a biologically-based deprivation or one or more external cues, and a comparative set of motivation decreasing behaviours such as goal attainment, displacement and substitute activities, or

some other inhibitory force. Thus the strength of motivation or tendency, T, to engage in each of two activities A and B can fluctuate over time as a function of the change in hierarchical ordering of behavioural tendencies effected by instigating or inhibitory forces.

2.2.5 Achievement Motivation Theory - Summary and Conclusions

The present chapter so far has described the development of achievement motivation theory. Emphasis has been placed on the involvement of Atkinson's achievement theory in the major shifts in the concept of motivation from behavioural to cognitive affect to information processing.

There can be no doubt that Atkinson's work has had a significant effect on the study of motivation for more than thirty years. Of particular relevance to the present research programme is the fact that Atkinson directed his efforts towards isolating a motivational trait, a determinant of behaviour which remains relatively stable across time and situation.

It is not within the scope of this thesis to enter into the wider debate surrounding the nature of nAch. There is certainly evidence to suggest, from Lowell's (1952) study onwards, that nAch possesses some of the characteristics of a quantifiable trait. Furthermore,

attempts to categorize nAch not as a trait but as a cognitive affect or an attribution have produced equivocal results. However, there are question marks against the robustness of nAch. Atkinson himself (1978) sounds a note of caution, in referring to studies which have illustrated the apparent instability of nAch as a motivational trait, notably in instances where expectancy of pride in performance for subjects was not cued (Atkinson 1953). This is unsurprising, as Atkinson has always been explicit on the need for awareness of the effects of situation on measures of trait-based behaviour.

Achievement motivation theory has a significant relevance to the present programme of research for two reasons. Firstly, Atkinson has demonstrated that the study of individual differences in motivation can be addressed with considerable success. However, inconsistencies reported in the literature suggest that some benefit may be gained from the application of a more precise, objectively oriented methodology. Secondly, there is present throughout the work of Atkinson and his colleagues, indications that other motivational determinants than nAch are affecting behaviour. This recommends a broader-based initial approach to identifying individual differences in motivation - an approach taken in the present programme of research.

Achievement theory is built upon the idea of

individual differences in motivation, and that personality structures are essential determinants of behaviour. As Atkinson has said,

A most encouraging development in recent experimental analysis of motivation...is the use of tests to assess individual differences in the strength of theoretically-relevant motivational dispositions of humans. Here again, the broad implication of Lewinian ideas is apparent. The guiding hypothesis, $B = f(P, E)$, is now represented in a methodological development that may provide a means of bridging the gap between the study of individual differences in personality and the search for basic explanatory principles.

(1964)

The development may no longer be recent, but the philosophy is still relevant and wholly consistent with that of the present writer.

The next section of the chapter considers the contribution made by some alternatives to achievement motivation.

2.3 Social Learning, Cognitive Evaluation, and Attribution Theories

2.3.1 Introduction

From the early 1960s onwards, several major theories of motivation were developed in parallel with achievement theory. To a great extent they were representative of the continuing growth and diversification of psychology as a whole. Some of these theories, such as Rotter's social learning approach to motivation, have been given the same 'expectancy x value' label as Atkinson's, but they differ from achievement theory in a number of respects. In such theories, greater emphasis is usually placed on the learned determinants of behaviour, the importance of the external world in motivation, and on situational rather than intrapersonal variables. Motivators such as drive, libido, or need for achievement are supplanted by a concern with the individual's cognitive response to a situation.

The following sections of the chapter address the contribution made by three relatively recent theories which have developed into alternative contemporary explanations to achievement motivation. The three chosen are Rotter's social learning theory, Deci's cognitive evaluation theory of intrinsic vs extrinsic motivation, and Weiner's attribution model.

2.3.2 Rotter's Social Learning Theory

A central concern of Rotter's theory is the choice made by individuals when faced with a number of different situations. As an explanation of choice, Rotter (1954) has attempted to integrate elements of stimulus-response behaviourism and cognitivism. He emphasises learned social behaviour rather than biologically determined influences, and substitutes the concept and term 'general beliefs' for that of trait. General beliefs, such as the belief of an individual that he has complete control over his fate, are regarded as variables which interact with specific situational determinants to produce behaviour.

There are four primary concepts in Rotter's model. These are behaviour potential, expectancy, reinforcement value, and the psychological situation. His approach has similarities to that of Hull, Lewin and Atkinson, in that he attempts to identify immediate behavioural influences, and to formulate a model that explains behaviour. His central motivational statement describes the potential of a behaviour to be prescribed by an expectancy that the behaviour will lead to a reinforcement, and by the reinforcing value of the behavioural goal. This statement can be illustrated as follows.

$$\text{behaviour potential} = f(\text{expectancy of reward} + \text{reward value of goal})$$

Rotter describes behaviour potential as the likelihood that a particular behaviour will occur "as calculated in relation to any single reinforcement or set of reinforcements." (Rotter, 1954, p.12). In this context behaviour means any overt act including cognitive activity.

Expectancy is defined as the "probability held by the individual that a particular reinforcement will occur as a function of a specific behaviour on his part in a specific situation" (Rotter, 1954, p.107).

Expectancy is a subjective probability measurable on a scale of 0 (no likelihood of reward) to 1 (certain reward). Rotter's use of the expectancy concept is similar to the way in which Tolman used the same term, to Lewin's concept of potency, and to Atkinson's description of subjective probability. It is probably the most important of the four central concepts in Rotter's theory, as it plays a crucial role in his contention that an adequate theory of motivation must transcend explanations of assumed needs or traits and encompass the likelihood of goal attainment.

Rotter also employs the term 'generalised expectancy' to describe how reinforcement expectancies may be influenced not solely by previous behaviour/outcome expectancies but also by experiences in similar circumstances. Rotter has formally expressed

this argument as follows.

$$Es1 = f(Es1 + GE)$$

The expectancy of reinforcement in situation 1 ($Es1$) is a function of expectancies based on that situation and generalised expectancies (GE) from similar situations.

Reinforcement value is defined as "the degree of preference for any reinforcement...if the possibility of their occurring were all equal" (Rotter, 1954, p.107). Reinforcement value is directly relevant to an individual's personal needs - learned needs according to Rotter - and is an essential element of the concept described as minimal goal level. Rotter has argued that behavioural outcomes can be placed on a scale ranging from strongly negative reinforcement to strongly positive reinforcement. The point on the scale at which, for a particular individual, the outcome changes from negative to positive is the minimal goal level. For example, merely completing the full distance in a marathon race may be the minimal goal for one individual, whereas the minimal goal level for another competitor may be set at an entirely different level, such as finishing the race in a time fast enough to merit representative selection.

The fourth central concept named by Rotter is the psychological situation. This can be construed as the

subjective meaning of an environment. The social context of the behaviour which occurs within this environment must first be described, so that an individual's action can be understood and predicted.

In summary, Rotter has argued that behaviour potential (or motivation) depends on the expectancy of goal attainment and on the value of that goal or of a reinforcer. Expectancy itself is a function of previous reinforcement history in a particular situation and a generalised belief concerning reinforcement from behaviours in similar situations. Expectancy and value are independent constructs, but their interrelationship is crucial to the psychological adjustment of an individual.

Rotter has made a significant contribution to the development of motivation theory. Several research areas of current interest have grown from Rotter's theory, particularly in the areas of personal causation, perceived freedom, reactance, and learned helplessness (McClelland, 1985a, reviews these issues). These research topics have spread into several broader areas of psychology, particularly clinical and social. Another important derivation is the research undertaken by Rotter and others to study locus of control, where rewards to the individual are perceived to be the product either of personal effort or ability, or controlled by external factors. The concept of locus of control has a particular relevance to certain empirical

issues covered in later chapters of the present thesis. The importance placed by Rotter on the goal-oriented determinants of motivation was also influential in shaping the present programme of research, although the approach taken in this programme has fundamental conceptual and methodological differences to that adopted by Rotter.

2.3.3 Cognitive Evaluation Theory

The development of motivation theory by Atkinson, Rotter and others, had broadened the study of behavioural determinants beyond the effects of the reinforcement principle. There was a growing body of evidence to support the view that, although reward played an important part in motivating some behaviours, other determinants were influential. Instrumental in this respect were Atkinson's findings, that individuals appeared to prefer tasks of moderate difficulty rather than instant reward from easy tasks, a proposal first suggested in the early work of Escalona (1940), Festinger (1942) and others.

During the 1970s, research was carried out, particularly with child populations, that questioned the positive effects of reward. In 1975 Deci reported that children who exhibited an initial intrinsic interest in a task, lost interest to some extent when an external extrinsic reward was offered for completing the same

task. There is a clear suggestion that when a goal is judged to be a mere means to an end, this results in the goal being valued less highly. This suggestion is encapsulated in the area of research generally described as 'intrinsic versus extrinsic motivation', or 'the undermining effects of extrinsic motivation on intrinsic interest'. The present section of this chapter describes a major influence on the research area, Deci's theory of cognitive evaluation.

Deci (1975) has proposed the following.

One process by which intrinsic motivation can be affected is a change in the perceived locus of causality from internal to external. This will cause a decrease in intrinsic motivation, and will occur, under certain circumstances, when someone receives extrinsic rewards for engaging in intrinsically motivated activities. (p.139)

In a typical study, Lepper et al (1973) subdivided a population of children into three experimental condition groups. These were expected reward condition, unexpected reward condition, and control condition in which reward was neither expected nor given. Each group was asked to perform a drawing task. Some days later the children were allowed to perform the same drawing task during their normal classroom routine. Alternative activities were also available, no rewards were

mentioned, and no encouragement given which may have influenced any child's choice of activity. Observational data describing the dependent variable, childrens' interest in the task, revealed that children in the expected reward condition were less interested in the task during their free-choice period than the children in the two other experimental groups. Therefore it was argued that expected reward influenced subsequent behaviour, and that behaviour from rewarded children differed from that of children who had unexpectedly received the same reward.

A number of questions relevant to this area of research have been raised, such as the potential effect of extrinsic reward on increasing intrinsic interest among previously disinterested subjects, or the effects of reward when given only as a result of high quality performance. Although research has not fully answered such questions, it has produced a valuable distinction between the informational aspects of reward and the controlling aspects of a reward. Deci (1975) has argued as follows.

Every reward (including feedback) has two aspects, a controlling aspect and an informational aspect which provides the recipient with information about his competence and self-determination...If the controlling aspect is more salient, it will initiate change in perceived locus of

causality...If the informational aspect is more salient, change in feelings of competence and self-determination will be initiated.

(p.142)

The undermining effect of extrinsic reward does appear to be a consistent and powerful phenomenon for which a number of theoretical explanations have been offered. Bem's (1965,1967) theory of self-perception is one of the most prevalent of such explanations. Bem has suggested that individuals' understanding of their personal attitudes and motivations is an event occurring subsequent to behaviour (as in the frequently quoted example, 'I eat brown bread therefore I like brown bread'). According to Bem's explanation, task performance without external reward could lead to a logical inference on the part of the performer that motivation stemmed from intrinsic interest. Similarly, the offer of an external reward could lead to the inference that performance was dependent upon that reward. Whether children are capable of such involved post-behavioural evaluations is open to debate.

The theory of intrinsic versus extrinsic motivation has several related areas of research, involving concepts such as perceived freedom, freedom and choice, and psychological reactance (Weiner, 1982, has reviewed these topics).

Deci's (1975) theory represents a notable

alternative to expectancy x value explanations of motivation, where constructs such as the need for achievement are replaced by a framework of cognitive affect. However, as the reviews by Klein (1982) and Weiner (1982) suggest, the research literature in the area of cognitive evaluation theory contains evidence which is far from unequivocal in support of Deci's theory. It is argued in the present thesis that Deci's approach falls short of addressing certain questions about the nature of intrinsic motivation. There would, for example, appear to be value in attempting to identify and measure determinants of intrinsic motivation, and to investigate whether those determinants differ across individuals. The present programme of research was designed to address issues of this nature.

There is one recent theory, Weiner's attributional model, which attempts to combine the determinants of affect within an expectancy x value framework. This theory is now considered.

2.3.4 Weiner's Attribution Model

Weiner (1966, 1985) proposed a theory of motivation, guided by expectancy x value theory, and which is dependent upon causal ascriptions. He argued that the perceived causes of success and failure in achievement-related contexts have three common properties, locus, stability and controllability. Weiner

also suggested the potential involvement of two further constructs, intentionality and globality. Weiner (1985) has argued as follows.

The perceived stability of causes influences changes in expectancy of success; all three dimensions of causality affect a variety of common emotional experiences, including anger, gratitude, guilt, hopelessness, pity, pride, and shame. Expectancy and affect, in turn, are presumed to guide motivated behaviour. The theory therefore relates the structure of thinking to the dynamics of feeling and action. (p.548)

Weiner's model of motivation is attributional, and is described in the following way by Atkinson and Birch (1978).

The way people perceive causes of success and failure in a particular situation should influence their emotional reaction to the outcomes (the affective values of success and failure) and the degree to which the outcome, a success or failure, will change the expectancy of success for a future occasion.

(p.349)

Weiner locates the roots of his approach in the early attributional work of Heider (1958) and Rotter

(1966). Heider had emphasised the importance of the dual concepts of intrapersonal and environmental determinants of behaviour. These concepts were formalised by Rotter in his classification of individuals into externals and internals. Weiner argues that the logical start for any analysis of the structure of causality is to include a dimension of internal versus external. He simply calls this locus, making a clear distinction between his two dimensions of locus and control, as opposed to Rotter's locus of control.

The dimension of stability relates to the apparent fluctuation of internal and external causes of behaviour. Weiner had originally proposed that this dimension could be expressed in the form of a 2 x 2 internal/external stable/unstable matrix (Weiner 1971). Ability, for example, was classified as internal and stable, while luck was classified as external and unstable. Weiner (1985) has more recently pointed to a number of problems with this simple, somewhat rigid classification. For example, ability may be perceived as unstable if learning is possible. Nevertheless stability is included as a perceived causal property.

The third dimension, controllability, relates to the distinction made between theoretically controllable determinants of behaviour such as effort, and those outside volitional control such as mood or fatigue. Intentionality is considered as a possible addition to the causal taxonomy, and related very closely to

control. Weiner differentiates between intentionality and control by using the legal distinctions that separate murder and manslaughter. Globality refers to the possible existence of a general-specific dimension. For example, failure at a Greek examination may be attributed either to low intelligence (general) or poor classical language skills (specific). Weiner concluded that more research was needed before intentionality or globality could be clearly established as causal attributional properties.

Also central to Weiner's theory are the effects of motivational dynamics of perceived causality in relation to changes in expectancy of goal attainment, and in relation to affective reactions. The former relates to changes in expectancy of success following a behavioural outcome, and the influence of perceived causal stability. The latter relates to the emotional involvement in anticipated goal attainment.

Weiner proposed a sequence in which cognitions of increasing complexity affect the emotional process in a manner that leads to further refinement and differentiation of experience. Following a behavioural outcome, there occurs what Weiner describes as a "primitive" emotion - a general affective response which is either positive or negative. This reaction is determined by success or failure in goal attainment, not by causal properties. A causal ascription will be sought, and the chosen attributions will produce a

different set of emotions. For example, if success in goal attainment is perceived to be due to luck, then the emotion of surprise is produced.

Causal dimensions are essential to the emotion process, and each dimension has a unique relationship with a set of emotions. For example, success and failure internally attributed to ability, personality, or effort will raise feelings of self-worth. External attributions will have no corresponding effect. Thus, self-related feelings are affected by the causal property of locus, rather than by any particular cause itself. Self-worth, anger, pity, guilt, shame, gratitude, and hopelessness are the most frequently implicated emotional experiences reported in relationship to Weiner's model. The model includes a full range of cognitions and emotions. There is explicit concern with the role of the self-concept. The structure of thought, or at least causal thinking, is closely linked to the dynamics of affect and action.

Weiner himself anticipates a common criticism of the attributional approach - that it is little more than 'common sense' - by arguing that what may be common sense nevertheless requires precise conceptual representation. However, empirical support for the cognitive and cognitive/affective aspects of Weiner's theory is far from unequivocal. Factor analytic studies have been used to establish the strength of primary causal properties. Yet in the detailed description of his theory, where Weiner often uses the terms

'personality' and 'trait', there is a noticeable lack of quantification. Constructs are inferred, then used as experimental variables. The same can be said of Weiner's use of emotional constructs. The possible influence of these variables may not be in dispute, but the apparent lack of urgency in attempting to quantify them does seem to weaken Weiner's arguments for precision.

Thus, Weiner's approach to motivation, though generally influential, appears to lack a consistent methodological approach which will support further research into the quantification of inferred constructs. With this in mind, the present programme of research was aimed towards the undertaking of such research, within an appropriate methodological framework.

The issue of quantification is central to the final area of research discussed in this chapter, that explored by Ray Cattell. The present writer shares with Cattell the belief that continually greater effort should be made to quantify motivational determinants, a belief encapsulated in Cattell's work.

2.4 The Cattellian Approach to Motivation

Since all sciences get their first laws from measurement, the foundation of a science of motivation begins with achieving measurement of motivation strengths.

(Cattell, 1985, p.1)

Cattell's approach to motivation has been identical to his approach to the sphere of personality. It has rested on the quantification of a large number of proposed affecting variables and their reduction to a smaller number by factor analysis. Cattell's definition of motivation is not dissimilar to that of McDougall. Cattell has argued that three major elements are involved in human motivation, the tendency to attend to particular stimuli in preference to others, a concurrent emotion, and a causative impulse.

Emphasis has been placed by Cattell and his co-workers (Cattell and Kline, 1977; Cattell 1980) on the identification of factors to describe attitude strength. Contributors to attitude strength, or the strength of motivation to engage in particular behaviours, were identified using reports from (mainly clinical) psychologists. Cattell and Child (1975) list 68 objective test indices. Cattell (1985) has separated them into 4 primary areas, as follows.

1 Psychoanalytic defences such as fantasy and true

and naive projection

- 2 Physiological, such as GSR
- 3 Laboratory measures of variables such as memory, perception and decision time
- 4 Other measures, including distraction and perseveration.

Factor analysis over a number of attitudes using the above devices yielded a pattern of seven first order factors. These are listed below.

- 1 Alpha - or id component, loading on fantasy, distortion of reasoning, spoken preference
- 2 Beta - or ego strength, loading on interest, free association speed, rate of learning a new language, perceptual integration
- 3 Gamma - or superego, loading on superego projection, low perseveration, availability of associations
- 4 Delta - or physiological component, loading on decision speed, GSR, blood pressure change
- 5 Epsilon - or complex indicator, loading on interference in reminiscence, GSR, threat

response, cue memory

- 6 Zeta - or temperamental conduct, loading on
 impulsiveness, low fluency, low hidden figures
- 7 Eta - or expectancy, loading on high action
 persistence and high hidden figures

Cattell (1985) has admitted that the nature of these factors is far from clear, and warns against ascribing a single score to an individual on any particular attitude. There is a clear psychoanalytic influence on the way factors have been labelled. The robustness of the seven primary factors is also open to question. Kline (1983), for example, has argued that zeta and eta have not been clearly identified.

Despite the controversy surrounding the primary factor structure, Cattell carried out second order analysis. This yielded two second order factors which were labelled the integrated component (I) and the unintegrated component (U). (I) loads on beta and gamma and relates to reality-based experience where the ego and superego come together. (U) loads on alpha, delta and epsilon, and relates to the unconscious or non-real part of an interest.

The present theory is that the (I) component represents that part of the interest that has been realised in life, showing itself in

information in the area, rate of new learning, and availability of associations. The (U) component, on the other hand, is that part of an interest that has never come to terms with reality, showing itself in fantasy and physiology (Cattell, 1985, p.4)

There is no current test which measures the seven primary strength of attitude factors, but the Motivational Analysis Test (MAT, Cattell et al, 1970) does give a measure of (I) and (U).

Cattell, like Atkinson and Birch, has placed emphasis on the 'dynamics of action' : the trend in motivation research to view motivated behaviour as a shift from one activity to another, rather than as a shift from a state of resting to a state of activity. Cattell has presented a comprehensive systems model theory to explain the dynamics of behaviour, the Vector-id Analysis Systems, or VIDAS, model (Cattell, 1980, 1985), addressed in more detail in Chapter 9 of the present thesis. Briefly, VIDAS consists of 11 elements in complex interaction, taking into account personality, situation, knowledge, experience and motivation. The quantifiable VIDAS elements that relate to motivation are Cattell's 'dynamic structure factors' - ergs and sems. Ergs are defined by Cattell (1985) in the following way.

...instincts...in which numerous attitudes

(are) brought together, all sharing
subsidiation to the same drive goal and having
the same emotional quantity (p.7)

Cattell names 16 discovered ergs at varying levels
of factor independence, all of which he claims have been
revealed by factor analytic techniques comparable to
those used on the 7 primary strength of attitude
factors. Included in the list of ergs are hunger, sex,
loneliness, curiosity, fear, anger, and greed.

Sems (short for sentiments) are defined by Cattell
as "sets of attitudes that people learn to acquire
around objects important to them" (1985, p.11). Cattell
identifies 27 sems, amongst which are profession,
parental family, business-economic, patriotic-political,
and education-school attachment. As Kline (1983) has
stressed, these structures are particularly
culture-bound. Ergs, sems, and the second order strength
of attitude factors (I) and (U) are all measured by the
Motivation Analysis Test (MAT), in a set of pencil and
paper objective tests.

Given the emphasis on adequate quantification, the
validity of Cattell's work on motivation and behavioural
dynamics must depend, to some extent at least, on
results obtained through use of the MAT. Kline and
Grindley (1974) and Cattell and Child (1975) have
reported some evidence for MAT validity at the
experimental level. More recently, however, Cooper and

Kline (1981) have conducted factor and item analysis of the MAT, and have reported the failure of some items to fall into their appropriate scales. As Cattell (1985) admits, much more research is needed in the area of motivational factors.

It is possible to consider Cattell's work in motivation at three levels, as follows.

- 1 Its relationship with his work in personality.
- 2 Its relationship with other models of motivation.
- 3 Its relationship with the present programme of research.

Cattell's approach to personality is consistent with his work in motivation, and clearly open to the same criticisms. A major area of criticism rests upon the suitability or usefulness of factor analytic techniques in identifying human psychological structures. Related criticisms are concerned with the reliability of factor-derived measures when correlated with behavioural criteria. The question of factor analytic procedures in psychology will be considered in the next chapter, when a rationale for the chosen methodology of the present research programme is given.

Cattell has warned against expecting too much from

individual measures of personality when matched against behavioural criteria. It has been a continuous theme in Cattell's work that, ultimately, no behavioural trait or group of traits can be viewed in isolation from the closely related range of variables that include situation, knowledge, experience and cognitive style. Cattell's first concern has always been to identify as accurately as possible those traits which fell within range of current available methodologies. More recently, the availability of computer processing has increased significantly, and Cattell, with the VIDAS model, has been able to address in theoretical terms at least, the complex relationships between personality and situation. The earlier approach compliments the later. A systems model requires clearly quantified elements. It can be argued that Cattell's work in personality and motivation provides at least an adequate methodology for quantification.

Cattell's approach to motivation differs methodologically from some other approaches, but there are similarities. There is in Cattell's work, as in that of Atkinson, for example, an evident commitment to continuity and development. Like the achievement theorists, Cattell places importance on the identification and measurement of individual differences in intrapersonal motivational determinants. It seems reasonable to argue that aspects of his motivation theory - the nature of the seven primary strength of attitude factors for example - remain largely

speculative. Yet, as may be said for Weiner's theory, conceptual frameworks must be created before research can take place.

As far as the present programme of research is concerned, Cattell's approach to motivation has exercised a primary influence. His insistence on the need for further research into the potential factors of motivation, and his belief in the necessity for their quantification is central to the direction of the present programme of research. Equally important is his faith in multivariate techniques, especially factor analysis, as invaluable research tools.

2.5 Summary and Conclusions

The first two chapters have described the development of motivation theory from the work of McDougall to that of Cattell. By paying greater attention to theoretical input, the intent has been to illustrate continuity as well as development. Where appropriate, each theoretical contribution has been considered from the individual differences perspective of the present programme of research. In addition, attention has been given to issues and approaches which, in the present writer's viewpoint, have been incompletely addressed or followed, and which point to the need for further research.

Motivation theory has moved through a number of

major transitions, from the intrapersonal intrapsychic, to behavioural, to cognitive and to cognitive/affect. In some cases the contributions have been purely speculative, in others, firmly empirical. Latterly, some contributions have tended to emphasise environmental determinants in preference to intrapsychic variables. However, attempts to quantify intrapersonal determinants of behaviour are continuing. Most recently the disparate themes in motivation research have been drawn together, conceptually at least, with the formal statement of behavioural systems such as Cattell's VIDAS.

The contributions of Cattell were the last to be considered, less, perhaps, for reasons of general popularity or acceptance than for person appeal and influence on the present programme of research. However, Cattell's work in the field of motivation, like that of others reviewed in these first two chapters, has its unresolved issues, and demands for further research.

In particular, there appears to be a need to investigate the nature of intrapersonal motivational determinants which have not yet been properly identified or measured. A number of attempts to quantify such determinants have either lacked the appropriate methodological techniques, or have produced inconsistent results. It may be argued that certain inconsistencies exist because the underlying theoretical concepts to the research have been too ambitious. As Cattell (1985) has pointed out, the ideal motivation theory should

eventually incorporate all the necessary effects of the interaction between person and situation. However, it may be inappropriate to address such complex issues as dynamic situational effects, until the more static intrapersonally derived effects on motivation have been further investigated. It is the intent, within the present programme of research, to undertake such an investigation.

The following chapter contains the central hypothesis of the present programme of research, and a rationale for the chosen methodology.

CHAPTER 3

FACTORS OF MOTIVATION

Theory and Methodology

3.1 Introduction

Chapters One and Two reviewed the development of the scientific study of motivation. Where appropriate, each theoretical contribution was considered in the context of its relationship to the present programme of research. It was concluded that a trait-based approach to individual differences in motivation, using objective methodological techniques, would be an appropriate means of addressing some of the questions left unanswered in previous research.

Chapter Three contains a rationale for, and statement of the central hypothesis, and a rationale for the chosen methodology.

3.2 Factors of Motivation

The approach taken in this thesis is that there are relatively stable, measureable motivating determinants of human behaviour. These determinants can be identified by psychometric techniques. The same techniques can also be used to develop and evaluate a scale to measure

individual differences in motivation.

The concept of stable, general motivational dispositions is by no means a recent one. It was formalised in the tripartite psyche described by the Egyptians of the Middle and New Kingdoms (Anhai, 1100 B.C.) considered by Plato, advocated in the 19th century by William James, and supported by Atkinson, Cattell and others for the last forty years. However, any approach to motivation which places emphasis on individual differences is faced with two major problems.

The first problem is methodological. How should one go about the identification and measurement of dispositional motivating structures? It is argued in this chapter that psychometric techniques, particularly factor analysis, are best suited for the purpose. Difficulties encountered using other techniques, such as projective testing, have been discussed in Chapter Two, and supporting arguments for the psychometric methodology are given later in the present chapter.

The second problem concerns behavioural inconsistency, namely that behaviour which is predicted to remain relatively stable across time and situation according to individuals' scores on personality traits, does not accord with such predictions. Feather's work in the early 1960s on persistence and achievement motivation (Feather, 1961) demonstrated the nature of the problem. It is a problem that has been emphasised on

numerous subsequent occasions by several researchers, Mischel (1968) being amongst the most notable. However, it has been frequently argued (Cattell, 1978, 1980) that the nature of the problem of behavioural inconsistency may be more related to the way that the products of factor analysis are used rather than whether those products actually possess any innate usefulness.

For example, the mistake is often made in believing that the products of factor analysis, in personality or motivation research, are all that need to be taken into account in behaviour prediction. In such instances the low correlation of many such products with behavioural indices should not be surprising, leading understandably to Atkinson's "state of despair" (1981, p.125). It may be more appropriate to view the usefulness of factor analytic methods as a means of generating products - factors of personality or motivation - which aid in discovering part of a picture, the whole of which may yet be some way from sight. In other words, factors of motivation must eventually be combined with other central components of behaviour, particularly situation, and including cognitive style and experience, before the complete picture can be formed, and highly accurate behavioural models constructed.

This is not to say, however, that what is revealed through multivariate analysis of motivation should be seen to be lacking in coherence, validity or reliability. Although it is highly unlikely that factors

of motivation will be ever be found to represent the entire range of behavioural determinants, those that are found should nevertheless be valid, reliable, stand-alone indicators of particular behavioural trends.

The exploration, identification and measurement of factors of motivation are the issues addressed by the present programme of research. The central hypothesis, its theoretical and empirical support, and aims of the thesis are now described.

3.3 The Initial Hypothesis

It is argued in this thesis that there are motivational determinants, or traits, of human behaviour that remain relatively stable across time and situation. If shown to be psychometrically valid, such determinants should be quantifiable as predictors of individual differences in given behavioural contexts.

Five correlated factors are hypothesised as cross-situational motivational determinants of certain aspects of human behaviour. These factors are as follows.

- FI Goal Coherence
- FII Planning
- FIII Strength of Will
- FIV Self Evaluation
- FV Perseverance

Each of these five proposed factors is included in the initial hypothesis for one or both of the following reasons.

- 1 There exists some preceding theoretical or empirical contribution which suggests that the factor is a motivational determinant
- 2 There is a perceived need for further empirical investigation into the likelihood that a factor is a motivational determinant

The justification for including each of the factors in the initial hypothesis is as follows.

The concept of goal coherence was developed by Hyland (1984, 1988) within the framework of control theory. Control theory was originally developed in the field of engineering as a means of enabling machines to do things previously done by people (Powers, 1978), and was first applied to psychology over 40 years ago but stimulated little research at the time. Hyland (1988) has argued that control theory provides a fundamental level of description of motivational processes, and can be used as a metatheoretic framework to examine the relationship between the central ideas of different motivation theories.

The central element in control theory is the negative feedback loop. A reference criterion is

compared with a perceptual input, and the difference between the two generates a signal labelled 'detected error'. In motivation/behaviour terms, the reference criterion might be a desired goal, and the perceptual input the individual's perception of events related to goal attainment. Depending on the magnitude of difference between criterion and input, the detected error will initiate behaviour intended to reduce the discrepancy. In other words, the nature of any purposive behaviour elicited, will be perceived as more likely to lead to goal attainment. However it should be pointed out that, unlike Carver and Scheier (1982) for example, Hyland distinguishes between the properties of a reference criterion and a purpose or goal. A reference criterion need not necessarily be a desired end state, but could be just as easily represented by the act of progress monitoring. The perceptual input corresponds to an individual's perception of the environment, and purposive behaviour occurs as a means of eliminating differences between goals and the perception of events.

Further important components of control theory are loop gain and error sensitivity. Loop gain can be mathematically represented as the signal amplification between perceptual input and behaviour, multiplied by the signal amplification between behaviour and sensory input. In behavioural terms, loop gain can determine whether differences between reference criterion and perceptual input are eliminated.

Error sensitivity affects the intensity of behaviour generated to counteract a specific amount of difference between perceptual input and reference criterion. Error sensitivity is variable, and determined by both internal and situational factors, and can be used to represent the salience of an individual's goals. The more salient a given error between reference criterion and perceptual input, the greater the intensity of behaviour elicited to aid goal achievement. Error sensitivity is similar in its properties to McClelland's (1985) concept of the 'aroused motive state' and to Lewin's (1938) goal 'valence'.

One of the many possible determinants of error sensitivity is expectancy. Control theory predicts a curvilinear relationship between expectancy and performance. This relationship consists of a positive component representing the interaction between detected error and intensity of behaviour, and a negative component representing the effects of disengagement at low levels of expectancy. Expectancy may be affected by both personality and situational variables.

Within this framework, a particular concern of control theory is the manner in which an individual goes about the hierarchical organisation of motives or goals. Control theory adopts a view consistent with the idea of causal goals, where the achievement of one or more subgoals is seen to be causally related to the achievement of a higher level goal. It is similar to

Murray's (1938) idea of 'subsidiation'. Each control loop forms part of a hierarchy of loops, and detected error at a higher level control loop activates a reference criterion at lower levels. The higher level control loop represents a higher level goal, and the lower level reference criterion represents a subordinate or lower level subgoal.

For example, a student may regard the attainment of a good class degree as a primary means of securing a well paid job. In order to get a good degree, the student may have to perform well in examinations at the end of each of the three study years. Revision is vital to efficient examination performance. Going out to visit friends or to parties too frequently as examination time approaches, represents a threat to subgoal attainment - good exam marks - and thus to higher level goal attainment - a good degree and ultimately a well paid job. Therefore if the perceptual input contains warnings that an over-busy social life is threatening subgoal attainment and consequently higher level goal attainment, detected error will trigger behavioural change, and the student will stop going out so often and revise more.

In this context, higher level goals are an important determinant of the direction of behaviour. Higher level goals are achieved by satisfying subgoals. Moreover, the hierarchy is arranged 'top down', so an understanding of higher level goals is vital to an

understanding of purposive behaviour.

It is argued in this thesis that there are measurable individual differences in the ability to identify high level goals, and in the ability to relate the achievement of subgoals to the achievement of higher level goals. These individual differences are represented by the first proposed factor of motivation, FI, labelled Goal Coherence.

The second proposed factor is Planning. The tendency for individuals to use planning strategies that shape behaviour has frequently been studied by cognitive scientists (see the review by Anderson, 1975). A case for individual differences in this tendency is considered by Mischel (1973). In his list of five 'cognitive social learning person variables' is the concept of self-regulatory systems and plans. The individual, according to Mischel, will adopt contingency rules to guide behaviour regardless of the potential influence of external situations.

Subjectively, we do seem to generate plans, and once a plan is formed...a whole series of subroutines follows...(the) individual's plans and the hierarchical organisation of his self-regulatory behaviour...(provide) the greatest challenge in personality psychology. (1973)

A related concept of self-imposed achievement standards is found in Rotter's (1954) 'minimal goal' construct. Rotter suggests that individuals will plan out for themselves performance goals irrespective of external constraints. They will respond to their performance either with self-criticism or satisfaction, depending on how appropriate that performance is to goal achievement. The tendency to plan is also considered by Miller et al (1960), who argue for the importance of planning as a hierarchical process which controls the order in which an individual performs a sequence of operations. Miller and colleagues suggest that having formulated a plan, the individual will typically go on to create series of subroutines designed to facilitate the successful execution of the higher level plan.

Thus a strong case can be made for the influence of planning as a motivational determinant of behaviour. As Miller and Rotter have both indicated, the independence of such a construct from situational variables demands more empirical research, and merits inclusion in the hypothesis as a separate factor, FII, labelled Planning.

The decision to include Strength of Will in the list of proposed factors also depends to some degree on similar levels of theoretical support which have so far yet to be accompanied by empirical investigation. William James (1890) made a case for considering strength of will as an important influence on behaviour, regardless of situational constraints. According to

James, many types of behaviour have a specific "mental antecedent, in the shape of a fiat, decision, consent, volitional mandate...before the movement can follow." (James, 1890, p.522). He goes on to consider the implications of individual differences in strength of will, leading to the premise of the 'strong-willed character'. Strength of will is seen as a differing ability across individuals to "attend to a difficult object, and hold it fast before the mind" (James, 1890, p.561). This concept has been reconsidered by several psychologists in the intervening years. Allport (1937) and Cattell (1965) have both presented arguments for a similar construct, but, like James, give little indication as to how such a construct might be quantified. A case may be made for link between James's original concept of the ability to "keep a selected idea uppermost" and the importance of being able to form a hierarchical goal structure, especially where the achievement of a major goal depends upon the individual's awareness of the need to maintain specific behaviours. It is argued that evidence of this link may be revealed by investigation of the factor structure hypothesised at the beginning of this chapter. Therefore it was decided to include in the hypothesised structure the third factor, FIII, labelled Strength of Will.

Support for including Self-Evaluation in the hypothesised structure can again be found in some of the earliest psychological literature. James (1890) dealt with what he saw to be the related issues of

self-perception, physiological activity and emotional experience. The ensuing debate surrounding these issues has involved the more philosophical aspects of self-consciousness, self evaluation and intentionality (from Husserl and Brentano in the earlier part of this century, to Searle, 1984), as well as research into the control of sensory input and motor function by localized parts of the brain (Pribram, 1971). As a result, Pribram went on to formulate a model of self-regulation and self-consciousness. The model falls within the control theory context of feedback and feedforward loop systems which are responsible for the initiation and adjustment of behaviours. Pribram's model is essentially neurophysiological, and there is evident potential for the influence of individual differences in the effectiveness of the model's operation. Such potential may be found in Kahneman's (1973) related concept of information processing competency. Here, a relationship is presumed to exist between physiological arousal, capacity, effort and attention. Meichenbaum's (1972) cognitive model for behaviour change due to the processes of self evaluation and self instruction, suggests the possible influence of individual differences in these processes. The area would appear to merit further investigation, thus it was decided to include the fourth hypothesised factor, FIV, labelled Self-Evaluation.

The final hypothesised factor in the list, Perseverance, was originally described as a personal

trait by Muller (1900). He noticed in himself an inability to leave tasks in the face of interruptions, and believed that this phenomenon was related to his 'dependability' in completing tasks, however trivial. Observation led Muller to believe that there were considerable individual differences in this type of behaviour. In the following years researchers such as Zeigarnik (1927) and Kendig (1936) devoted much effort to investigating perseverance, and, unlike the strength of will concept (to which, as Allport (1937) points out, perseverance ought to be closely related), this effort generated many experimental studies. Zeigarnik (1927), for example, was particularly interested in the gestalt concept of a 'closure tendency', which was proposed to maintain appropriate behaviour until a given task is completed. This concept was based on certain findings which suggested that memory for uncompleted tasks was better than for completed ones. As a consequence of investigations into perseverance, evidence emerged for the existence of a self-consistent factor, perseveration, or 'p', which could be scaled for the general population. However, as Allport (1937) suggests, there was an indication in the evidence that perseveration might only possess a functional unity for children and naive subjects. For other subjects the phenomenon might conceivably be test-specific. Little empirical work has been carried out in the intervening years, and a case can be made for further investigation into the nature of perseverance. Thus, perseverance is hypothesised to be a separate factor of motivation,

independent of situation, and obliquely related to the other four factors described above. It is the fifth and final factor in the hypothesised structure, and is labelled FV, Perseverance.

Thus, a five factor structure of cross-situational determinants of human motivation was hypothesised. From this hypothesis, it will be noted that Goal Coherence, Planning and Perseverance all appear to place a particular emphasis on future-oriented motivation.

Given this emphasis, however, what reasons might there be for believing that future-orientation and its contributory factors are indeed factors of motivation? This question can be answered in two ways. Firstly, there is a body of research, initiated in the 1960s (Atkinson and Feather, 1966, for example) which has established close links between motivation and future-orientation. Certain aspects of this research are relevant to the present programme, and are addressed in detail in Chapter 6 of this thesis. Secondly, there are broader-based arguments in favour of a close link between future-orientation and motivation, as follows.

It is frequently argued in the domains of anthropology and history (Aldred 1965, Romer 1984, for example), that the evolutionary success of our species is in many ways due to our developing ability to conceptualise and anticipate the future. As our species became increasingly aware of that now characteristically

human time 'later', it became increasingly able to undertake the hierarchical arrangement of behaviour. For example, food collection became a matter of gathering supplies not just for instant consumption but for the future - a future known to contain harsher times as the seasons varied.

The same argument, the importance of being able to conceptualise and anticipate the future, can be used to account for social and communal development as a means of mutual protection and eventually for economic, commercial and industrial purposes. Future orientation is arguably a prime motivating force in our present attempts to avert radical climatic change due to global warming and the erosion of the ozone layer. The ability to conceptualise the future, and indeed to perceive different extents of the future and to structure behaviour accordingly, seems essential to motivating many types of behaviour, not least that which will maintain human success.

Not only may a conception of the future be essential to success, but many other types of human behaviour are arguably motivated by concepts of the future. Individuals follow behavioural paths because they believe that successfully negotiating those paths will result in the attainment of a desired future goal. People study for many years to achieve professional or academic qualifications which they believe will lead to a better paid job and a more comfortable existence.

Individuals marry because they envisage a companionable and more pleasant future life. In short, there appear to be compelling reasons to believe that future-orientation and related factors may indeed be factors of motivation. Therefore it was the intent, within the present programme of research, to investigate these factors.

3.4 Summary of Hypothesis and Aims of the Research Programme

A structure of five related factors representing cross-situational determinants of human motivation was hypothesised. The five factors are Goal Coherence, Planning, Strength of Will, Self-Evaluation and Perseverance.

The programme of research had two primary aims, as follows.

- 1 To test the five-factor hypothesis by factor analysis.
- 2 To use one or more of the factors as the foundation for the development and evaluation of a new scale to measure motivation.

The methodology applied in pursuit of these aims is now described.

3.5 Methodology - Description and Rationale

3.5.1 Introduction

The following sections of the chapter contain a rationale for the principal methodology of the research programme, the use of factor analysis within the psychometric model. While it is not within the scope of this thesis to enter too deeply into the wider debate surrounding psychometric techniques (Kline, 1980, Gorsuch 1983, and Briggs and Cheek, 1986 all review the debate), it is intended to explain what the methodology involves, why it was chosen, what the caveats are, and to describe the assumptions and expectations which accompany it.

3.5.2 Factor Analysis

The use of factor analysis as a research tool in psychology, with particular reference to human intelligence, was developed in the earlier part of this century by such notable authorities as Spearman (1904) and Thompson (1939). It has more recently undergone extensive development in the fields of personality and motivation by several researchers, particularly Cattell (1966, 1978, 1985), and Eysenck (1960, 1985). Norusis (1985) describes four primary goals of factor analysis, as listed on the following page.

- 1 To identify underlying constructs or 'factors' that explain the correlations among a set of variables.
- 2 To test hypotheses about the structure of variables.
- 3 To summarise a large number of variables with a smaller number of 'derived' variables.
- 4 To determine the number of dimensions required to represent a set of variables.

These goals are achieved by expressing each variable as a linear combination of a small number of common factors, which are shared by all the variables, and a unique factor which is specific to that variable. The correlations between the variables arise from the 'sharing' of the common factors. The common factors themselves are estimated as linear combinations of the original variables.

For example, measures might be taken of a large number of different abilities from several hundred subjects. The scores would then be correlated. Factor analysis could be used to account for the observed correlations between the various tests of ability, and it might be possible to describe a wide range of human abilities using a far smaller number of derived factors. Thus factor analysis is a technique used to simplify correlation matrices. Instead of trying to understand

all the correlations between a large number of variables, the correlation matrix is factor analysed. Linear combinations of the variables (factors) are calculated as an aid to understanding the larger set of intercorrelations.

This understanding is further aided by the calculation of factor loadings. Factor loadings are the correlations of the variables in the data with the factors. For example, if item A has a correlation of 0.7 with factor X1, item B, 0.6 with factor X1 and item C 0.6 with factor X1, these factor loadings may permit the identification of the factor, as a factor is operationally defined by its factor loadings.

Thus a factor solution states that the correlations between variables can be accounted for by X factors, and that each factor is operationally defined by the number of variables correlating with that factor.

Interpretation can be further aided by rotating the factor solution. Factors can be seen as a structure of vectors in hyperspace. The correlation between variables can also be represented by vectors. The cosine of the angle between any variable vector and factor vectors gives the factor loading (Child, 1990, gives a description of the geometric approach to factor analysis). Because there is no method of positioning the vectors absolutely, there is obviously an unlimited number of possible solutions. Vectors are therefore

fixed relatively, within the constraints that the cross-multiplication of the loadings will reproduce the original correlations. However the factor structure can be rotated through hyperspace to reposition the vectors so that each factor has a few high loadings and many more low or zero loadings. This is designed to make each factor simple to interpret (as in Thurstone's 1947 definition of simple structure). As Kline (1983) points out, the rationale for this procedure is the law of parsimony, that is, each factor solution can be seen as a hypothesis used to explain the correlations between variables, therefore the simplest is preferable.

There are several statistical procedures available to aid the decision whether or not to use factor analysis. These include the Kaiser-Meyer-Olkin (see Kaiser, 1974) measure of sampling adequacy and Barlett's test of sphericity (see Bartlett, 1950), both of which give an accurate indication of the likelihood that the correlation matrix will yield a potentially meaningful factor solution. Norusis (1985) describes these procedures in detail. Similarly there are several methods of factor extraction and rotation, each of which depend on a different mathematical algorithm, and each of which may yield a slightly different factor solution. Gorsuch (1983) describes all these methods, and evaluates the various arguments for and against their use. In the present programme of research, maximum likelihood extraction and oblique rotation were used.

Fruchter (1954) describes the maximum likelihood method of factor extraction (Lawley, 1940) as the procedure which "gives the most mathematically efficient estimates of the factor loadings" (p104). This argument is supported by Gorsuch (1983) and Irvine (1988). When principal factors are normally extracted, equations are used for which it is assumed that the population correlation matrix is being factored. When maximum likelihood procedures are used there is recognition that the matrix from a specific sample is being factored. Therefore it is possible to define maximum likelihood procedures as being the ones that best reproduce the population values. Gorsuch (1983) has argued the following.

In the maximum likelihood approach, estimating the population parameters from sample statistics is the central concern. A procedure is sought for generalising from a sample of individuals to the population of individuals...There are numerous ways in which estimates of the population parameters could be made. For the procedure derived to maximise the likelihood function, the method of estimating the population parameters must have two valuable characteristics. First, a maximum likelihood estimate will have the highest probability of converging to the population parameter...second, the estimated parameters will be the most consistent with the smallest

variance across samples. (p. 127)

Gorsuch points out that though maximum likelihood procedures may occasionally lead to biased solutions, the disadvantages are far outweighed by the advantages. Briggs and Cheek (1986) also address the use of the maximum likelihood method, particularly in a confirmatory rather than exploratory framework. They too conclude that it is probably the better choice, particularly for confirmatory work designed to test hypotheses where there are specific parameters derived from existing conceptual work.

The rationale for oblique rotation of the factor solution can be found in Norusis (1985) and Cattell (1966). Cattell gives five reasons for rotating the factor structure obliquely. The first four are concerned with mathematical and procedural concepts. The fifth reason is as follows.

there is no reason why factor influences,
interacting in the same universe, should be
expected to be orthogonal, i.e., independent.

(p. 211)

It is very likely that many human psychological structures are related to each other. It seems, for example, implausible to argue that personality and motivational determinants are not interacting in the "same universe", therefore a very strong case can be

made for rotating obliquely, and looking at the interrelationship between factors of this nature. Cattell himself describes this argument as "surely entirely adequate to dispel recourse to orthogonal factors except in truly odd situations" (p211). It is argued here that this approach is consistent with the five factor structure hypothesised in the present programme of research.

3.5.3 Establishing Dimensionality

A major problem incurred in the use of factor analytic procedures concerns the establishment of dimensionality of factor analytic model that best fits the data. This problem applies both to exploratory factor analysis, where the primary purpose is to generate hypotheses by identifying and classifying data, and to confirmatory factor analysis, where a factor structure has already been hypothesised on the basis of some theoretical or empirical information, as in the case of the present programme.

There are three established categories of procedures that have been developed as a means of attempting to objectively determine the number of factors that should be extracted. These procedures can be described as the statistical category, the mathematical category, and the approach in which factors are extracted which account for nontrivial variance in the data.

It is beyond the scope of this thesis to describe these three approaches in detail, and they are considered in depth by Gorsuch (1983). Briefly, the statistical approach involves testing for statistically significant variance in the residual matrix after the extraction of a particular number of factors. If there is no significant variance, then it can be assumed that the correct number of factors has been extracted. In the mathematical approach, the estimate for the number of factors for an observed correlation matrix is used as an estimation of the number of factors in the underlying population. Mathematical procedures are used to estimate the minimum rank of a correlation matrix, an equivalent process to estimating the number of factors. The third approach, extracting non-trivial factors, may involve a number of procedures, including scrutiny of the cumulative percentage of variance extracted after each factor is removed from the matrix, plotting eigenvalues and applying the scree test (Cattell, 1966), or examining models with different numbers of factors. Further consideration is given to these latter procedures in the following chapter.

The diversity of procedures which have been developed as aids to establishing dimensionality, may serve as an indication that the problem of dimensionality is of primary concern to any researcher proposing to use factor analysis.

In the particular case of confirmatory factor

analysis, Gorsuch (1983) and Child (1990) recommend the use of maximum likelihood extraction, and Cattell (1980) argues a case for establishing dimensionality by extracting non-trivial factors. These are the approaches taken in the present programme and are considered in the following chapter. However, it must be pointed out that there are recent, alternative procedures for establishing dimensionality within a confirmatory framework, to be found particularly in the work of Joreskog (Joreskog and Sorbom, 1982) and the LISREL (Linear Structural Relationships) program.

LISREL is an approach which utilises a relatively new branch of data analysis described as structural equation modelling. This facilitates, within a single theory-testing framework, the investigation of substantive relationships and measurement relationships between variables. Many theory-testing problems in psychology can be formulated in terms of a model expressing causal and measurement relationships, and the LISREL program enables the investigation of such a model in two ways. Firstly, the program estimates the parameters of the model from a given set of data, collected on single or sets of measured variables - frequently in the form of a correlation or covariance matrix. Secondly, by means of a chi square test, LISREL tests the overall fit of the model to the data. In other words, the program gives an indication of how far beyond the boundaries of chance the formulated model fails to reproduce the observed data. Using an iterative maximum

likelihood procedure, the program starts from any set of values assigned to a range of parameters representing quantities including factor loadings, proposed causal relationships, and residuals. The program calculates implied correlations between variables, compares them with the observed correlations, then attempts to reduce discrepancy by changing parameter values. In later versions of LISREL, much of the potentially very time-consuming iterative process is removed by a function that provides a first approximation to the maximum likelihood estimates.

In summary, LISREL analysis enables the achievement of a reasonable fit for a model, in that the structural and measurement relationships proposed for the model conform reasonably well to the data. The parameter estimates for a model provide evidence of the relative importance of different explanatory variables in explaining the variance in dependent variables. LISREL would appear to offer a comprehensive framework within which an identified linear model can be tested, and its parameters estimated.

During the relevant stages of the present research, LISREL was an expensive and uncommon resource unavailable to the current programme of work. It must, however, be emphasised that modern confirmatory techniques such as LISREL represent a valuable addition to the processes of theory development and model testing. This is particularly so, where the best fit of

dimensionality of model to the data is under investigation - a process undertaken within the presently reported programme using traditional multivariate techniques.

3.5.4 Factor Analysis in the Study of Personality and Motivation

Factor analysis in psychology, specifically in the study of personality, was extensively used by Eysenck and Cattell in the 1940s and 1950s. Their work is still continuing. Why factor analysis should be considered as a suitable research tool is probably a more interesting topic for debate than that covered by the numerous attempts to replicate, support or discredit factor analytic techniques during the 1970s (as reviewed by Kline, 1981). There are strong arguments for using factor analysis in personality and motivation psychology.

The first of these arguments rests on the nature of the research traditions in personality psychology. As Briggs and Cheek (1986) point out, one of these primary traditions has been the quantification of individual differences. Researchers in the area have usually concentrated on the measurement of existing variation across individuals rather than trying to create variance between groups by means of manipulating variables in experimental conditions. As a result, the data analysis

from this type of study tends most frequently to be correlational in nature, rather than being concerned with variance analysis which relies on testing mean differences. This being the case, it is clearly necessary to use a statistical technique that enables a thorough examination of a multivariate data set. Factor analysis is such a technique. Briggs and Cheek (1986) make the following point.

Factor analytic procedures have proven to be useful and important tools...because they allow an investigator to augment, refine, and test (in some cases statistically) his or her intuitive grasp of an area and because they provide a means by which to deal with variables that are not only unobserved but unobservable. (pp. 106-107)

The argument that factor analysis provides a valuable means of testing an intuitive description of a psychological structure has also been proposed by Cattell on numerous occasions (Cattell 1966, 1978, 1980).

The second argument in support of factor analysis concerns the technique itself. The potential for numbers of variables that might be included in the study of personality and motivation is immense. Factor analysis can help a researcher to understand possible interrelationships between variables, and, just as

importantly, it can produce factors which represent interpretable concepts.

3.5.5 Criticisms of Factor Analysis

The value of factor analysis as a research tool has been continually questioned. This section of the chapter will discuss some of the criticisms made of the technique. A fuller review of the debate can be found in Gorsuch (1983).

Eight major criticisms of factor analytic procedures were put forward by McNemar in 1951. As well as procedural anomalies, McNemar stresses the general problem of interpretation, both of factor structures and of the factors themselves. As Gorsuch (1983) has argued,

The struggle to interpret factors represents what is probably the prime contribution of factor analysis that has been overlooked. The concepts identified by factor analysis....(could) aid in the development of the substantive area. However many factor analyses are not part of an ongoing research program. So even though a new factor is identified, it is not the target of research studies designed to clarify its nature and meaning (p.371)

Other problems faced by factor analysts include an insufficient amount of attention given to variable selection, an over-tendency to assume that factors from one particular study are the only factors that can be used to summarise the available data (Armstrong, 1967) and the failure to report results and techniques in sufficient detail. Skinner (1980) has addressed the misuse of factor analysis with these issues in mind.

Although individuals such as Heim (1975) have questioned the value of factor analysis on mathematical grounds, most commentators identify the major caveats to be matters of design and procedure. Many of the problems of factor analysis mentioned in the literature seem to be avoidable providing that the technique is used as part of a structured research programme. Careful selection of variables, a considered rationale for extraction and rotation procedures, and, very importantly, a firm theoretical background against which factors can be meaningfully interpreted, are essential precursors to effective factor analysis. The intent to appropriately address these issues was of prime importance in the present programme of research.

3.5.6 The Use of Questionnaires

Questionnaires used in personality research typically consist of lists of questions or statements concerning behaviour. Kline (1983) has argued for the

use of questionnaires on the grounds of achievable reliability, construct validity, and the potential for discrimination across subjects. He makes a particularly strong case for the use of factored personality questionnaires within the parameters of the psychometric model. There are a number of problems associated with the use of questionnaires. These are well-documented, and discussed by Kline (1983). Perhaps two of the most prominent of these problems are related to social desirability and acquiescence. The first problem is addressed in detail in Chapter 5 of the present thesis. Acquiescence, the tendency for subjects to answer 'yes' and to agree with questions irrespective of content, has been shown by Guilford (1959) to be most frequently due to items being vaguely worded or too general. It was determined to avoid this trap in the present programme of research. Further details relevant to the design and construction of the questionnaire which forms a central element in the present research are given in the following chapter.

3.5.7 The Psychometric Model

The psychometric model assumes that all behaviour is a composite function of four primary human psychological variables. Kline (1983) lists these variables as abilities, temperamental traits, dynamic traits and states. They are identified by factor analysis. The model can be tested very easily. The

factors are measured, and compared against behavioural criteria. If required, a multiple correlation can be calculated to include measurements of situational stimuli. The basic equation for the psychometric model is as follows.

$$a_{ij} = b_{j1} F_{1i} + b_{j2} F_{2i} . . . + b_{jN} F_{Ni}$$

In the equation, a_{ij} , the behaviour in situation j for the individual i , is best estimated by the score of i on factors F_1 to F_N and by the weights b_j on the factors for the situation. These weights are the beta weights calculated from multiple regressions of the variables to the criterion behaviour.

The strength of relationship between the factors, the behavioural criteria and the situational stimuli - estimated by the magnitude of the beta weights - will be an indication of the predictive and explanatory value of the factors.

There is a wide and long-standing debate surrounding the use of the psychometric model. It is beyond the scope of this thesis to enter into the debate, which has been reviewed by Kline (1983), and somewhat earlier by Pervin (1978). The approach taken in the present programme of research was that adopted by Kline and Cattell, namely that psychometric techniques are reliable and valid research tools.

3.6 Summary

Chapter Three described the central hypothesis of the research programme, its theoretical underpinning and a rationale for the chosen methodology. A structure of five related factors was proposed to account for certain cross-situational determinants of human motivation. It was determined that these factors would be explored using factor analysis of data generated by self-report questionnaire. It was also determined that, if appropriate, one or more of the factors would be used as the foundation for the development and evaluation of a new scale to measure motivation.

A brief description of factor analytic techniques was given, together with a short discussion of their variations and attendant problems. Particular attention was given to the problems of establishing model dimensionality, and the strengths of recent confirmatory techniques such as LISREL were outlined. The psychometric model was briefly described. Arguments for the use of factor analysis and for the adoption of the psychometric model were considered, and it was concluded that there was suitably robust support for the use of both in the present programme of research.

Chapter Four contains details of questionnaire design and construction, and reports the findings from the first set of five empirical studies undertaken in pursuit of the aims set out above.

CHAPTER 4

THE FACTOR ANALYTIC STUDIES

4.1 Introduction

The primary aim of the present programme of research was to develop and evaluate a new scale to measure motivation, based on one or more of five factors proposed in the initial hypothesis. Chapter 4 describes the design and construction of the first version of the scale, and the refinements made to it as a consequence of five factor analytic studies. These studies were undertaken to test the initial hypothesis, by factoring data generated by administrations of the scale.

4.2 Questionnaire Design

There are many different recommendations as to which strategies should be followed during questionnaire design. This section of the chapter addresses the following related issues.

- 1 The criteria adopted for item generation, and an account of item pool construction
- 2 Number and type of items assigned to each proposed factor
- 3 The total number of items in the questionnaire

The suggested optimum number of items necessary to adequately represent a proposed factor varies from 5 (Child, 1976) to fifteen (Gorsuch, 1983). There is also a long-running debate surrounding item totals. Kline (1988) has argued that data generated by questionnaires with large numbers of items (he mentions Cattell's 16PF with its average of 140 items across forms A and B) are susceptible to distortion, due perhaps in part to increasing boredom among respondents as they plough grimly on through scores of items. Cattell (1980) has argued that any factor solution applied to human characteristic variables is likely to be complex and multi-factorial, and will necessarily command a substantial total number of items to represent each factor. It is unlikely that this debate will ever be resolved.

It was decided, for the present study, simply to generate a number of items which appeared to adequately account for the description and nature of each proposed factor. In the event, numbers of items varied from 7 to 11 per factor.

The procedure adopted for item generation was similar to that used by Cattell (1946) and Guilford (1965), and known as systematic sampling, or facet sampling. It is described in detail by Gorsuch (1983). The procedure involves searching substantial sections of

the domain literature, and extracting descriptive trait terms, thereby enabling an item pool to be assembled. The variation from Cattell's approach being that the assembled pool was derived from scientific psychological sources, rather than lay sources. There is a degree of overlap across item assignment, but it should be made clear that item generation for each factor was carried out independently, with no intention or effort to create a precursive factor solution. The ambiguity of some items is due to the potential interrelationship between factors. This is consistent with the initial hypothesis described above, where any factor structure used to account for human characteristics might reasonably be expected to generate a non-orthogonal solution (see Cattell, 1966, Nunally, 1978, and Norusis, 1985).

Of a less equivocal nature is item type, particularly the semantic content of some items. It was known in advance of questionnaire administration that many of the subjects were likely to be drawn from an undergraduate population. Several items reflect this foreknowledge, and references are made throughout the questionnaire to essays, examinations and project work.

With regard to item pool construction, for each hypothesised factor, a number of core sources in the scientific literature were closely scrutinised. Items were then constructed on the basis of frequently occurring key words or phrases used either to describe or in close conjunction with the target construct.

In the case of Goal Coherence, for example, terms such as 'checking', 'feedback', 'separation into stages', and 'long term consequences' are frequently used to describe or qualify the Goal Coherence construct. These terms, together with others of a similar nature, were used as the basis for constructing the item pool for the hypothesised factor, Goal Coherence. In the case of Planning, for example, terms such as 'will occur', 'planning', 'next or subsequent activities', 'future', 'organised', 'well-organised' were found to be commonly used in a range of sources either to describe or qualify the Planning construct. Consequently, these terms, together with other similar terms, were used as the basis for constructing the item pool for the hypothesised factor Planning. The same procedure was followed for the other three hypothesised factors.

The core sources used for each of the hypothesised factors are as follows.

Goal Coherence (1) Hyland 1984 (2) Hyland 1988
(3) Lewin 1938 (4) McLelland 1985 (5) Powers 1978

Planning (1) Anderson 1975 (2) Miller et al 1960
(3) Mischel 1973

Strength of Will (1) Allport 1937 (2) Cattell 1965
(3) James 1890

Self Evaluation (1) James 1890 (2) Meichenbaum 1972
(3) Kahneman 1973 (4) Pribram 1971

Perseverance (1) Allport 1937 (2) Cattell 1980
(3) Kendig 1936 (4) Muller 1900 (5) Zeigarnik 1927

With regard to the type of scoring scale used, it was decided to follow the strategy adopted by Comrey (1970) and use a rating scale. This also follows Kline's (1983) advice, and avoids the potentially less sensitive yes/no response, while affording a statistical advantage over dichotomous item scoring, in that a more appropriate framework for item intercorrelation required by factor analysis is provided.

Having taken these considerations into account, the subsequent item assignment to each proposed factor was as follows.

Factor I Goal Coherence

- 1 When I'm doing something I've planned myself I
 always keep checking on my progress
- 2 The most useful feedback on something I've done is
 feedback that tells me how well I've done it
- 4 If you're doing a particular piece of work, I think
 it's a good sign to be often thinking about the
 likely outcome

- 5 I usually see a piece of work as consisting of a number of stages
- 9 Acquiring knowledge for its own sake does have long-term benefits
- 14 I feel as bad when I fail a mock exam as I would if I'd failed the real one
- 19 I find it easy to concentrate on research for an essay or project work
- 24 I am often motivated to work by thoughts of long-term outcomes
- 35 I'm attracted by the idea of spending a lot of time researching a project or piece of work
- 37 I tend to tackle a problem by separating it into its smaller component parts
- 40 I find it easy to relate a piece of work to my long-term aims

Factor II Planning

- 3 I daydream a lot about what will happen
- 15 I'm always planning for the future

- 16 Whenever I finish a piece of work I start thinking about what I'm going to do next
- 17 I usually think carefully about the things I'm about to say
- 20 I enjoy planning my holidays or days out
- 22 The most useful feedback on my work is that which gives me pointers for the future
- 23 I usually think about a problem or piece of work for some time before actually starting in on it
- 25 When I'm answering an exam question I always jot down a few notes first
- 26 I admire the way some people seem able to organise their time so well
- 39 I consider myself to be well-organised in most things I do

Factor III Strength of Will

- 6 I often find it hard to make decisions
- 11 I prefer to work to deadlines that others set for me

- 18 I don't usually find it difficult to state a preference for things
- 29 I usually find it easy to justify to myself what I'm doing
- 31 I usually find it easy to explain my ideas to people
- 33 If I'm involved in something that interests me I'm not easily distracted
- 36 Generally speaking, once I've made a decision I know it's the right one
- 38 It's not usually easy to make me change my mind

Factor IV Self-Evaluation

- 7 Whatever I'm doing I'm always aware of the eventual outcomes
- 8 I tend to think a lot about the cause of my successes and failures
- 21 I usually imagine myself in situations before they actually occur

- 27 Whenever I finish a piece of work I think about
what I've just done
- 28 I tend to think about the good consequences when
I'm considering a course of action
- 30 If I'm not working when I should be I often feel
guilty
- 34 I take a lot of pleasure in just looking forward to
something I think might be enjoyable
- 42 I am aware of my abilities in relation to those of
other people
- 43 Whatever the situation I need to feel that I've
done my best
- 45 I feel that I have an accurate awareness of my own
abilities

Factor V Perseverance

- 10 I prefer to set myself specific targets and stick
to them
- 12 I agree with the ethic "it's more important to play
than to win"

- 13 Leaving aside any political or economic considerations, I think people do have a genuine need to work
- 32 I often find things that really hold my interest
- 41 I find it hard to do two things at once, like reading while the radio or tv is on in the same room
- 44 Achieving my aims, however long it takes, is very important to me
- 46 I easily become bored with things

It should be pointed out that the items are numbered as they appeared on the questionnaire. The order of presentation was fixed by blind choice of numbered counters, undertaken by a naive volunteer.

4.3 Analysis Techniques

Consideration was given in the previous chapter to the problem of establishing what dimensionality of model best fits the data, and some analytic techniques were addressed, including the recent development of the LISREL program. Before reporting the five factor analytic studies, it may be appropriate to give an indication of the analysis techniques available for use

within the present programme, and the criteria adopted during the execution of the studies.

Several researchers (Velicer, 1977; Velicer, Peacock and Jackson, 1982) have found maximum likelihood, principal component and image factors to be alike, both for patterns of loadings before and after rotation, and after dropping some variables from the analysis block. However, throughout the early stages of analysis in the present programme, a range of extraction and rotation procedures was used, in addition to maximum likelihood extraction and oblique rotation. As Gorsuch (1983) has argued, it is a useful and necessary precaution that should be taken in the initial phase of confirmatory factor analysis.

With regard to the decision to retain or drop variables as part of the process of scale refinement, a significance criterion for factor loadings of 0.30 was adopted (see Cattell, 1966). However, a degree of flexibility was maintained throughout, depending upon the overall picture created by the factor structures. The communalities of variables were also taken into account during the processes of scale refinement. Generally speaking, factor loadings should become more stable and replicable as communalities increase (Pennell, 1968). However, as Cattell (1966) and Gorsuch (1983) have pointed out, there is an historical problem with obtaining consistently high communalities for items in factor analytic personality research, frequently with

no apparent detriment to the eventual outcome of research. Therefore, item communality has been used as a guide to item retention, rather than an absolute arbiter.

Similarly, the percentage of variance accounted for by each extracted factor, and the eigenvalues of extracted factors, were both used as guides to identifying an appropriate solution, rather than as absolute criteria. Cattell (1966) and Norusis (1985) suggest that attention should be paid to both indices. Briggs and Cheek (1986), on the other hand, do not recommend either procedure as integral to extracting the 'correct' number of factors. They cite 9 comparative factor-analytic studies of the Self-Monitoring Scale (Briggs, Cheek and Buss, 1980), in which only two studies paid any attention to percentage of explained variance, and only three to eigenvalues. It was, however, felt appropriate in the present programme of research, to follow the recommendations of Gorsuch (1983), and use a range of analysis techniques, particularly during the early stages of scale development. Thus, attention was paid to explained variance and to relative eigenvalues throughout the factor-analytic studies. There is further reference to the issue of explained variance in Appendix A, following table A.2.

Principal criteria adopted during the factor analytic studies reported in this thesis were

replicability of factor structure, examination of different factor models, and the scree test (Cattell, 1966). Replicability of factor structure, which may be indicated by a consistent and unambiguous loading of factors on items from study to study, is strongly recommended by Briggs and Cheek (1986) and Cattell (1966, 1980, 1985).

As Briggs and Cheek (1986) point out, " (The) scree test...plots the incremental variance accounted for by each successive factor to determine the point at which the explained variance levels out" (p.119)

A number of studies (Zwick and Velicer, 1982, for example) have reported the relative accuracy of the scree test as a suitable criterion for judging the appropriate number of factors to extract from a correlation matrix. Norusis (1985) also supports Cattell's (1966) contention that the scree test frequently gives an accurate picture of the 'correct' number of factors to extract.

The following sections of the chapter contain reports of the five factor analytic studies

4.4 Study 1

4.4.1 Introduction

The aims of the study were as follows.

- 1 To carry out confirmatory factor analysis as a means of testing the proposed five factor model
- 2 To explore potential areas of interrelationship between factors
- 3 To provide a suitable basis for scale development by carrying out any necessary item refinement

4.4.2 Method

Subjects

There were 80 subjects, all volunteer first and second year undergraduates from Plymouth Polytechnic. The first year students received a participation credit which counted towards their first year assessment mark. The age range of subjects was 18 to 38, with a mean age of 19 years. There were 53 females and 27 males.

Procedure

A group of 10 subjects per test session each

completed a questionnaire in a quiet room under constant supervision. They were asked to read the instructions on the first page of the questionnaire, and to begin work only if they fully understood what was required of them. No time limit was given for completion. An example of the questionnaire is given in Appendix B.

4.4.3 Results

Data were collated and analysed using procedure FACTOR on SPSS-X, maximum likelihood extraction. Analysis was carried out in two phases, as follows.

Phase 1

All variables were entered into the analysis block. The iterate criterion was set to 200 and the factor criterion to 5. Oblimin and Varimax rotation algorithms were used in separate analyses.

Table 4.1, on the next page, shows the structure matrix from oblique rotation for a five factor solution. For this analysis and throughout, Varimax rotation produced no significantly different factor matrices.

The scree plot generated by phase 1 of the analysis is shown as Figure A.1 in Appendix A.

Item	Loadings				
	F1	F2	F3	F4	F5
1	0.11	0.44	0.45	0.10	0.24
2	0.03	0.09	0.14	0.40	0.03
3	0.65	0.10	0.04	0.06	0.13
4	0.14	0.25	0.35	0.08	0.10
5	0.26	0.09	0.62	0.14	0.14
6	0.64	0.03	0.19	0.00	0.04
7	0.03	0.13	0.43	0.09	0.16
8	0.10	0.07	0.35	0.47	0.05
9	0.01	0.11	0.12	0.09	0.63
10	0.22	0.06	0.70	0.13	0.25
11	0.12	0.07	0.02	0.46	0.08
12	0.05	0.13	0.07	0.11	0.79
13	0.15	0.30	0.12	0.22	0.16
14	0.27	0.14	0.51	0.21	0.14
15	0.05	0.19	0.62	0.21	0.06
16	0.23	0.17	0.70	0.13	0.13
17	0.28	0.27	0.41	0.21	0.05
18	0.37	0.55	0.07	0.19	0.27
19	0.05	0.15	0.05	0.65	0.02
20	0.00	0.24	0.17	0.08	0.23
21	0.38	0.12	0.06	0.13	0.18
22	0.71	0.07	0.34	0.11	0.02
23	0.15	0.02	0.06	0.05	0.24
24	0.15	0.19	0.36	0.59	0.00
25	0.22	0.04	0.15	0.30	0.05
26	0.24	0.28	0.17	0.30	0.10
27	0.46	0.27	0.20	0.00	0.21
28	0.02	0.03	0.10	0.32	0.46
29	0.12	0.33	0.13	0.09	0.53
30	0.07	0.04	0.50	0.37	0.14
31	0.58	0.31	0.06	0.06	0.21
32	0.54	0.04	0.33	0.00	0.22
33	0.55	0.14	0.09	0.07	0.41
34	0.06	0.23	0.12	0.24	0.48
35	0.47	0.12	0.42	0.30	0.00
36	0.59	0.11	0.22	0.15	0.38
37	0.50	0.08	0.41	0.03	0.43
38	0.40	0.17	0.18	0.12	0.19
39	0.54	0.44	0.01	0.18	0.15
40	0.58	0.23	0.36	0.16	0.04
41	0.05	0.40	0.10	0.09	0.04
42	0.23	0.58	0.07	0.14	0.06
43	0.37	0.05	0.36	0.28	0.19
44	0.46	0.40	0.25	0.14	0.25
45	0.25	0.48	0.03	0.09	0.07
46	0.55	0.03	0.04	0.25	0.12

Table 4.1. Structure matrix showing all factor loadings from maximum likelihood extraction 5 factor criterion

Table 4.2, below, shows a cross-tabulation of extracted factor loadings and hypothesised factors for phase 1 of the analysis. In the top row, for example, of items originally assigned to hypothesised factor 1, extracted factor 1 has loaded significantly on 4 items, extracted factor 2 on 1, extracted factor 3 on 8, and so on.

hypothesised factors	extracted factors				
	1	2	3	4	5
1	4	1	8	4	1
2	2	1	4	1	0
3	6	3	0	1	3
4	3	2	4	3	2
5	3	2	2	0	2
total	18	9	18	9	8

Table 4.2. Cross-tabulation showing numbers of extracted factor loadings and hypothesised factors (oblique rotation, all variables, 5 factor solution)

In addition to maximum likelihood extraction, principal axis factoring was also carried out. No significant differences between factor patterns or structures were observed. The factor matrices generated by each extraction procedure were rotated orthogonally using Equamax and Quartimax algorithms. The factor matrices generated by each extraction procedure were

also rotated obliquely using the Oblimin algorithm, varying the default delta criterion from zero to -4.000 at 0.500 gradations. None of these exploratory procedures yielded significantly different results from those produced during the initial analytic procedures.

Phase 2

2(a) As a further exploratory measure, items 2,6,11,18,20,25,29,41 and 43 were omitted from the next analysis block on the basis of poor factor loadings. All the operations described in phase 1 were repeated with the reduced item set.

2(b) The same criterion was employed for a further item exclusion on the basis of results generated by phase 2(a). 28 items were eventually included in this analysis block, discarding nos. 2,6,9,11,16,17,18, 21,23, 24,25,26,27,32,39,40,41, and 42. All the operations described in phase 1 were repeated with the reduced item set.

2(c) The sample population was divided into halves, splitting cases alternately 1-3-5 and 2-4-6 etc. The analyses carried out in phase 1 and phases 2(a) and 2(b) were repeated on both groups. These procedures yielded no significant differences from results generated by analysis of the whole sample.

Table 4.3, on the following page, shows the structure matrix from oblique rotation from phase 2(b).

Item	Loadings				
	F1	F2	F3	F4	F5
1	0.15	0.60	0.04	0.17	0.09
3	0.57	0.03	0.12	0.01	0.35
4	0.04	0.40	0.07	0.09	0.41
5	0.31	0.62	0.31	0.14	0.07
7	0.04	0.59	0.03	0.02	0.11
8	0.05	0.37	0.11	0.47	0.20
10	0.26	0.54	0.44	0.11	0.36
12	0.05	0.07	0.23	0.22	0.71
13	0.15	0.05	0.11	0.38	0.12
14	0.23	0.21	0.68	0.08	0.05
15	0.12	0.73	0.13	0.18	0.03
19	0.00	0.06	0.26	0.69	0.10
20	0.00	0.22	0.03	0.41	0.08
22	0.75	0.16	0.33	0.05	0.04
28	0.02	0.22	0.17	0.15	0.47
29	0.20	0.23	0.56	0.26	0.20
30	0.03	0.31	0.59	0.23	0.04
31	0.66	0.20	0.18	0.31	0.05
33	0.61	0.09	0.01	0.33	0.25
34	0.07	0.14	0.08	0.43	0.40
35	0.55	0.22	0.36	0.22	0.02
36	0.62	0.37	0.17	0.23	0.16
37	0.49	0.42	0.12	0.21	0.49
38	0.46	0.27	0.06	0.17	0.03
43	0.41	0.08	0.42	0.20	0.15
44	0.43	0.07	0.35	0.03	0.48
45	0.20	0.18	0.15	0.40	0.20
46	0.60	0.07	0.04	0.11	0.11

Table 4.3 Structure matrix showing factor loadings for reduced item set from phase 2(b) 5 factor criterion

Table 4.4, on the following page, shows a cross-tabulation of extracted factor loadings and hypothesised factors for phase 2(b) of the analysis.

hypothesised factors	extracted factors				
	1	2	3	4	5
1	4	4	3	1	2
2	3	1	1	1	1
3	4	1	1	1	0
4	2	3	2	3	2
5	2	1	2	1	3
total	15	10	9	7	8

Table 4.4 Cross-tabulation showing numbers of extracted factor loadings and hypothesised factors (oblique rotation, reduced item set (phase 2(b)) 5 factor criterion)

The scree plot generated by phase 2(b) of the analysis is shown as Figure A.2, in Appendix A.

The scree plot Figure A.1, from the initial analysis, shows six factors with eigenvalues of 2.000 or above. Evidence from the plot supported a decision to rotate four or five factors. As a precautionary measure, the six factor solution was also rotated. The results from this procedure were not different in any significant respect from those produced by the two phases described above.

From a five factor solution two factors each had 18 significant loadings. Factors loading on assigned items suggested a convergence between Goal Coherence and

Planning in factor 3, and between Strength of Will, Perseverance and Goal Coherence in factor 1. There was a correlation of 0.16 between these two rotated factors, which was the highest absolute value in the factor correlation matrix.

Items assigned to self evaluation were represented across all five factors in the structure matrix, but there was no clear emergent pattern for this hypothesised factor. Similar results were found in phase 2 of the analysis, with Goal Coherence again emerging as the most clearly represented of the five hypothesised factors.

These results have several implications for the initial hypothesis and for the next stage of scale development.

4.4.4 Discussion

Contrary to the initial hypothesis the structure matrices suggested a two factor solution. There was convergence between Goal Coherence and Planning, and between Strength of Will and Perseverance. Of the five originally hypothesised factors, Goal Coherence was the most strongly represented. The possible influence of a third distinct factor relating to Self-Evaluation could not be completely discounted on the basis of these results, but its presence was not clearly indicated by the solution.

The direction of factor convergence, though not predicted, is not without precedent. Recent research (Frese et al, 1987) reports two separate factors which have been used to describe individual differences in goal setting behaviour. These form the basis of Frese's Action Style concept, to which consideration is given in some detail in Chapter 5 of this thesis.

The results generated by the second phase of the analysis using a reduced item set, together with the split sample solutions, appear to support the initial analysis, and suggest a possible approach to scale development. Consequently, it was decided to refine the questionnaire on the basis of a revised hypothesis of a two factor model, provisionally labelling these factors Goal Coherence/Planning and Strength of Will.

This decision having been taken, it must be re-emphasised that, as discussed in the previous chapter, the problem of establishing dimensionality of model is one of the thorniest in factor analytic research. Deciding on the 'correct' number of factors that appear to best fit the data is a difficult and critical process, and will, of course, determine the path and the possible outcome of a research programme. Traditional multivariate techniques were employed throughout all five studies reported in this chapter, to facilitate the establishment of dimensionality. Although these techniques are well-tried and supported in areas of the research and review literature, the process of

deciding how many factors comprise the model which best fits the data remains a contentious one. In this light, therefore, emphasis must again be placed on the value of recently developed confirmatory techniques. A program such as LISREL, for example, permits the researcher to test linear models, estimate their parameters, and to compare different models in terms of goodness of fit. Such a resource has the capability to make a valuable contribution to the problematic area of establishing dimensionality, a contribution which significantly enhances the traditional techniques available to the current programme.

4.4.5 Conclusions

The first study demonstrated a need to review the original hypothesis of a five factor model of cross-situational human motivational determinants. Data were gathered from the administration of a new questionnaire. When analysed, these data could be described by two factors formed from the combination of four originally proposed factors, Goal Coherence and Planning, and Strength of Will and Perseverance. In addition, there was marginal evidence of the influence of a third factor, comprising some of the items assigned to the proposed factor Self-Evaluation. However, the strength of this influence was not judged to be sufficiently great to merit the inclusion of a third factor in the revised hypothesis.

On the basis of these results a decision was taken on the next stage of scale development and analysis, reframing the original hypothesis in favour of a two factor model. The two factors were provisionally labelled Goal Coherence/ Planning and Strength of Will.

4.5 Study 2

4.5.1 Introduction

Interpretation of data from the first study led to a rejection of the initial hypothesis which proposed a five factor model of cross-situational motivation. It was decided to continue development of the scale on the basis of a two factor model, with the factors provisionally labelled Goal Coherence/ Planning and Strength of Will.

The following sections of the chapter describe the processes of scale refinement, item retention and rejection, reassignment and rewording of some items, the generation of new items, and the analysis and interpretation of data generated by the second study.

4.5.2 Scale Refinement

The two factors which formed the basis for scale refinement were provisionally labelled Goal Coherence/Planning, and Strength of Will. The refined

list of item to factor assignment was as follows.

Goal Coherence/Planning

- 2 I prefer to set myself specific targets
- 4 I consider myself to be well-organised in most things I do
- 5 I seldom plan for the future
- 6 If you are doing a particular piece of work, I think it's a good sign to be thinking about the likely outcome
- 9 I don't mind taking personal risks just for a laugh
- 10 I daydream a lot about what will happen
- 11 I tend to tackle a problem by separating it into its component parts
- 12 I am seldom motivated to work by thoughts of long term outcomes
- 13 I feel as bad when I fail a mock exam as I would if I'd failed the real one
- 14 Whenever I finish a piece of work, I think it's a good sign to be thinking about the likely outcome

- 16 I usually get more enjoyment from completing a straightforward crossword quickly, than spending a long time on a more difficult one
- 19 I often do things without really knowing why I'm doing them
- 21 I don't like playing card or board games
- 23 I find it easy to relate a piece of work to my long term aims
- 24 I don't like working to deadlines
- 25 I often do things "just for the hell of it"
- 27 I often do things without giving a lot of thought to the consequences
- 29 If I'm not working when I should be I often feel guilty
- 31 I would never get into more debt than I could handle

Strength of Will

- 1 I easily become bored with things

- 3 If I'm involved in something that interests me, I'm
not easily distracted
- 7 Whatever the situation I need to feel that I've
done my best
- 8 If you don't take an opportunity when it arises,
then you've only got yourself to blame
- 15 It's usually easy to make me change my mind
- 17 I usually find it easy to explain my ideas to
people
- 18 I can work for long periods of time without getting
any feedback
- 20 I am aware of my abilities in relation to those of
other people
- 22 I seldom compare my performance to that of others
- 26 Generally speaking, once I've made a decision I
know it's the right one
- 28 I seldom find things that really interest me
- 30 I seldom think about the cause of my successes and
failures

It may be recalled that items assigned to the originally proposed factors I,II,III and V appeared to converge to form the core structure of the two new factors. Therefore the first step in scale refinement was to identify, with a view to retention, all items with high communalities and high factor loadings from the original list. The criteria for eventual retention or rejection were not, however, entirely founded on mathematical correctness. Some items were retained because of their perceived semantic value. In other cases, items were reworded with an intent to make them more clearly represent the nature of their assigned factor. Some new items were also generated according to the criteria described in Section 4.2. This was done to concur with the recommendation (Gorsuch, 1983) that the early stages of factor-analytic scale development should include some new items to test the interpretations of proposed constructs. The 31 items produced by the refinement techniques may be categorised in their renumbered form as listed below.

Items retained

1 2 3 4 10 11 13 17 23 26

Items reworded for clarification

6 14

Items reworded to maintain polarity balance

5 12 15 28

Items reassigned from original factor IV
(Self-Evaluation)
7 20 29 30

Items reassigned from IV and reworded for clarification
24

New items
8 9 16 18 19 21 22 25 27 31

An area of contention within these categories concerns the items reassigned from the originally hypothesised factor IV, Self-Evaluation. As described above, data analysis from the first study provided marginal evidence to suggest the possible existence of a third factor with a self-evaluation content. A few items assigned to this factor appeared to be independent of the other two dimensions, while the Strength of Will factor loaded on other items from the same assigned list. It was felt that the existence of a separate factor describing self evaluation was not demonstrated with sufficient clarity to merit its inclusion in the present study as a fully independent dimension. Therefore those factor IV items which appeared to be most closely related mathematically and semantically to Strength of Will were retained and reassigned. This was done firstly because it was felt that the strength of their descriptive content was too good to lose, and secondly to offer another opportunity for the emergence of an independent self-evaluation construct.

New items were generated according to the criteria applied in the first study, described in section 4.2. The aims of the second study were as follows.

- 1 To test the strength of the reframed 2 factor model of cross-situational motivation
- 2 To explore the relationship between factors
- 3 To attempt to resolve the ambiguity surrounding the existence of a third factor, self-evaluation
- 4 To provide a suitable basis for scale refinement and development

4.5.3 Method

Subjects

There were 186 subjects, 134 volunteer first and second year undergraduates from Plymouth Polytechnic, and 52 volunteer nurses from Plymouth Nursing College. The age range of subjects was 18 to 37 with a mean age of 21. There were 121 females and 65 males.

Procedure

15 subjects per test session each completed a questionnaire in a quiet room under constant supervision. They were asked to read the instructions on the first page of the questionnaire, and to begin work only when they fully understood what was required of them. No time limit was given for completion. An example of the questionnaire is contained in Appendix B.

4.5.4 Results

Data were collated and analysed using procedure FACTOR, maximum likelihood extraction, on SPSS-X. Analysis was carried out in two phases.

Phase 1

All variables were entered into the analysis block. The factor criterion was set to 2. Oblimin and Varimax rotation algorithms were used in separate analyses.

Table 4.5, on the following page, shows the structure matrix generated by this procedure. Varimax rotation produced no significant differences in factor structure in this analysis and throughout.

Item	Factor	
	1	2
1	0.19	0.29
2	0.51	0.20
3	0.35	0.32
4	0.52	0.44
5	0.57	0.30
6	0.45	0.22
7	0.50	0.27
8	0.21	0.29
9	0.19	0.80
10	0.30	0.34
11	0.45	0.17
12	0.50	0.20
13	0.33	0.30
14	0.46	0.30
15	0.34	0.13
16	0.19	0.17
17	0.43	0.01
18	0.03	0.08
19	0.49	0.27
20	0.23	0.14
21	0.08	0.14
22	0.09	0.03
23	0.55	0.26
24	0.31	0.07
25	0.28	0.85
26	0.39	0.12
27	0.41	0.58
28	0.37	0.09
29	0.33	0.25
30	0.33	0.26
31	0.14	0.33

Table 4.5 Structure matrix showing all factor loadings, maximum likelihood extraction, 2 factor criterion

The scree plot generated by this analysis block is shown as Figure A.3 in Appendix A.

The same analysis was carried out excluding items 18,20,21 and 22 on the basis of poor factor loadings and low communality. Table 4.6, on the following page, shows the structure matrix from this analysis.

Item	Factor	
	1	2
1	0.22	0.30
2	0.51	0.21
3	0.37	0.33
4	0.54	0.46
5	0.58	0.33
6	0.46	0.24
7	0.50	0.29
8	0.20	0.10
9	0.25	0.81
10	0.33	0.34
11	0.45	0.19
12	0.51	0.22
13	0.35	0.30
14	0.47	0.32
15	0.35	0.14
16	0.20	0.18
17	0.41	0.03
19	0.51	0.28
23	0.55	0.29
24	0.30	0.08
25	0.35	0.84
26	0.38	0.15
27	0.45	0.59
28	0.36	0.11
29	0.32	0.27
30	0.35	0.27
31	0.16	0.33

Table 4.6 Structure matrix showing factor loadings for reduced item set maximum likelihood extraction, 2 factor criterion

Phase 2

All variables were entered into the analysis block. The factor criterion was set to 3. The same analyses as in phase 1 were carried out. Table 4.7, on the following page, shows the structure matrix from the complete item set analysis.

Item	Factor		
	1	2	3
1	0.34	0.06	0.38
2	0.43	0.42	0.03
3	0.25	0.43	0.19
4	0.43	0.49	0.28
5	0.52	0.42	0.12
6	0.35	0.47	0.02
7	0.32	0.59	0.07
8	0.01	0.49	0.13
9	0.17	0.34	0.75
10	0.39	0.10	0.38
11	0.42	0.28	0.10
12	0.64	0.11	0.15
13	0.06	0.63	0.13
14	0.26	0.63	0.03
15	0.56	0.01	0.03
16	0.44	0.18	0.23
17	0.48	0.20	0.25
18	0.06	0.13	0.10
19	0.54	0.28	0.09
20	0.22	0.20	0.47
21	0.06	0.07	0.28
22	0.04	0.14	0.13
23	0.53	0.36	0.06
24	0.39	0.08	0.04
25	0.27	0.39	0.73
26	0.37	0.32	0.11
27	0.41	0.33	0.52
28	0.48	0.13	0.07
29	0.13	0.55	0.08
30	0.51	0.03	0.31
31	0.01	0.40	0.28

Table 4.7 Structure matrix showing all factor loadings,
maximum likelihood extraction, 3 factor criterion

Table 4.8, on the following page, shows the
structure matrix from the reduced item set analysis.

Item	Factor		
	1	2	3
1	0.29	0.33	0.07
2	0.45	0.18	0.35
3	0.27	0.30	0.32
4	0.43	0.42	0.42
5	0.52	0.30	0.35
6	0.36	0.18	0.43
7	0.36	0.22	0.53
8	0.06	0.04	0.38
9	0.17	0.80	0.22
10	0.36	0.36	0.07
11	0.43	0.17	0.22
12	0.61	0.24	0.07
13	0.15	0.22	0.57
14	0.31	0.24	0.57
15	0.43	0.17	0.01
16	0.33	0.23	0.16
17	0.41	0.02	0.16
19	0.50	0.28	0.23
23	0.52	0.27	0.28
24	0.33	0.09	0.08
25	0.27	0.83	0.27
26	0.33	0.12	0.26
27	0.41	0.59	0.21
28	0.39	0.12	0.10
29	0.19	0.21	0.42
30	0.46	0.31	0.04
31	0.04	0.29	0.28

Table 4.8 Structure matrix showing factor loadings for reduced item set, maximum likelihood extraction, 3 factor criterion

The subject population was divided into halves as in the first study, and all components of phase 1 and 2 analysis were carried out. These procedures generated no significant differences from results produced by analysis of the whole sample. The same analyses were also carried out on the undergraduate and nurse sub-populations. Again, no significant differences in factor solutions were generated by this procedure.

There was a correlation of 0.201 between factors in the second part of phase 1 analysis.

4.5.5 Discussion

As in the first study, there was some indication from the results that a two-factor solution might be adequate to describe the data. The existence of a third self evaluation factor could not be completely discounted, although no factor loaded cleanly on the retained items originally assigned to factor IV in the first study in any of the matrices, apart from on item 29 in tables 4.7 and 4.8. However, this pattern was not upheld by the other factor loadings. The scree plot showed only 2 factors with eigenvalues of 2.000 or greater, but the eigenvalue of the third extracted factor was 1.995, not indicative of a clear 2 factor solution. However, taken together with the evidence from the structure matrices, especially the amount of cross-loading in the 3 factor solutions, there appeared to be little reason to regard a 3 factor solution as an adequate description of the data.

While there were also evident areas of ambiguity due to cross-loading in the matrices generated by the 2 factor criterion, this solution appeared to demonstrate that the two proposed factors withstood the test of this study tolerably well. The Goal Coherence/Planning dimension again appeared to maintain the strongest

structural unity. While there was some indication of a single factor loading on some of the items assigned to Strength of Will, these items were few in number. This may have been due in part to some influence from reassigned factor IV items, but there is again evidence that the Goal Coherence/Planning construct was strongest of the two.

Also of interest was the considerable difference of 3.6 between the eigenvalues of the first two extracted factors, shown in Figure A.3. Indeed, although it is recognised that the first extracted factor in many solutions tends to be an artefact, a case could possibly be made from the scree plot (A.3) for a unidimensional solution. There was insufficient evidence at this stage to merit unequivocal consideration of a single factor model, as the apparent presence of a second factor was too strong to ignore. Although there was some indication that areas of ambiguity due to factors cross-loading might find resolution within the parameters of a single factor solution, it was decided to continue with scale development on the basis of a two factor model.

These results again serve to emphasise the difficulties encountered when attempting to establish dimensionality. A two factor solution, or possibly even a unidimensional solution seems supportable from the available evidence. Traditional techniques of examining different factor structures together with scree plots do leave areas of unresolved ambiguity, frequently due to

factors cross-loading on assigned items. Consequently there must be sound arguments for looking closely at recently introduced confirmatory techniques, especially where variable parameter estimates and the comparison of different models is enabled, as in the LISREL program. Such techniques, as they are developed, seem likely to provide an appropriate platform from which to address those ambiguities which cannot easily be resolved using traditional methods.

4.5.6 Conclusions

The two factor model exhibited reasonable resilience in this study, although the Goal Coherence/Planning dimension again appeared to be more robust than the Strength of Will factor. Evidence for the existence of a third self evaluation factor was generally negative. Although the imposition of unidimensionality on the model might go some way towards resolving areas of ambiguity due to factors cross-loading on items, it was felt that the evidence for two factors was sufficiently strong to merit continuing scale development on the basis of a two factor model, at least with regard to the next study.

4.6 Study 3

4.6.1 Introduction

The conclusions drawn from analysis of data

generated by Study 2 recommended, for the purposes of the present study at least, the continuing acceptance of a two factor model in favour of the originally proposed five factor hypothesis. The solution to these most recent data indicated that the two dimensional model stood up tolerably well, although areas of ambiguity created by factors cross-loading on items were still apparent and demanded attention. There remained little evidence of the possible influence of a third factor, and some indication emerged of the possible viability of a unidimensional solution. It was decided to address the problems of item ambiguity and third factor involvement concurrently with scale development.

As in Study 2, some items were reworded with the intention of eliminating semantic ambiguity. The polarity of other items was changed to maintain the positive/negative balance. A few items were rejected entirely, either because of very low communalities or very poor factor loadings. It was also decided to review any interpretation of analysis with a unidimensional solution in mind, and to carry out further analysis as appropriate to examine the viability of such a solution

The same labels given to the two factors for scale refinement prior to the second study were retained. They were Goal Coherence/Planning, and Strength of Will. The refined list of item to factor assignment was as follows.

Goal Coherence/Planning

- 2 I don't like being set specific targets
- 4 I'm not very well organised in my work
- 5 I like making plans for the future
- 6 When tackling a particular piece of work, I think it's a good sign to be thinking about the likely outcome
- 9 I daydream a lot about what will happen
- 10 Before starting a problem I like to separate it into its smaller component parts
- 11 I am often motivated to work by thoughts of long-term outcomes
- 12 I feel as disappointed when I do badly in a mock exam as I would in the real one
- 13 Whenever I finish a piece of work, I think it's a good sign to be thinking about what I am going to do next
- 15 I usually get more enjoyment from completing a straightforward task quickly than spending a long time on a more difficult one

- 18 I often do things without really knowing why I'm doing them
- 21 I am conscious of how my work relates to my long-term aims
- 22 I don't like working to deadlines
- 24 I often do things without giving a lot of thought to the consequences
- 26 If I'm not working when I should be I often feel guilty
- 28 I would never get into more debt than I could handle
- 30 I don't tend to plan ahead very often

Strength of Will

- 1 I easily become bored with things
- 3 I can still be easily distracted, even if I'm involved in something that interests me
- 7 Whatever the situation I need to feel that I've done my best

- 8 If you don't take an opportunity when it arises
 then you've only got yourself to blame
- 14 It's usually easy to make me change my mind
- 16 I usually find it easy to explain my ideas to
 people
- 18 If I'm not getting constant feedback I feel unsure
 of myself
- 19 I am aware of my strengths and weaknesses
- 20 A useful way of finding out about my own
 performance is to compare it to that of others
- 23 Once I've made a decision I don't worry if it's th
 right one
- 25 I seldom find things that really interest me
- 27 I seldom think about the cause of my successes and
 failures
- 29 I often hold imaginary conversations with other
 people

Alterations to the questionnaire for the present study were much more of a 'fine tuning' nature than for Study 2. Two items from the previous version of the questionnaire were discarded on the grounds of poor factor loadings, and two new items were generated under the same criteria to those applied in the first two studies. Other alterations took the form of minor rewording.

The self-evaluative content of some of the Strength of Will items was retained in a further attempt to explore the possible influence of a third, self-evaluation factor. As in Study 2, some items were also retained on the basis of perceived semantic strength, despite low communalities.

Items are categorised as follows.

Original items retained

1 7 8 9 14 16 18 22 24 25 26 27 28

Original items reworded to reduce ambiguity

3 6 10 12 13 15 17 19 20

Original items reworded to change polarity

2 4 5 11

New items

29 30

The aims of the third study were as follows.

- 1 To further examine the strength of a two factor model of cross-situational motivation and to give some consideration to the viability of a unidimensional model
- 2 To explore the relationship between factors
- 3 To make further attempts to resolve the ambiguity surrounding a possible third factor
- 4 To move towards a finalised version of the scale

4.6.2 Method

Subjects

There were 200 subjects, all students from Plymouth Polytechnic and Plymouth College of Further Education. Ages ranged from 18 to 39 with a mean age of 20. There were 127 females and 73 males.

Procedure

Subjects were tested in groups of varying sizes from 12 to 20 under supervision in a quiet room. They were asked to read the instructions on the first page of the questionnaire, and to begin only if they fully understood what was required of them. No time limit was set for completion. An example of the questionnaire is contained in Appendix B.

4.6.3 Results

Data were collated and analysed using procedure FACTOR, maximum likelihood extraction, on SPSS-X. Analysis was carried out in three phases.

Phase 1

All variables were entered into the analysis block. The factor criterion was set to 2. Oblimin and Varimax rotation algorithms were used in separate analyses.

Table 4.9, on the following page, shows the resultant structure matrix.

Item	Factor	
	1	2
1	0.13	0.51
2	0.15	0.29
3	0.09	0.56
4	0.36	0.39
5	0.50	0.05
6	0.53	0.13
7	0.44	0.21
8	0.20	0.10
9	0.18	0.63
10	0.40	0.11
11	0.52	0.01
12	0.26	0.18
13	0.44	0.26
14	0.09	0.44
15	0.20	0.28
16	0.31	0.33
17	0.14	0.35
18	0.24	0.45
19	0.25	0.04
20	0.19	0.27
21	0.46	0.01
22	0.27	0.24
23	0.25	0.04
24	0.42	0.38
25	0.22	0.48
26	0.30	0.09
27	0.28	0.08
28	0.08	0.22
29	0.13	0.29
30	0.57	0.10

Table 4.9 Structure matrix showing all factor loadings, maximum likelihood, 2 factor criterion

The scree plot generated by this procedure is shown as Figure A.4 in Appendix A

Phase 2

All variables were entered into the analysis block and the factor criterion set to 3. The same analyses as in phase 1 were carried out. Table 4.10, on the following page, shows the resultant structure matrix.

Item	Factor		
	1	2	3
1	0.10	0.49	0.14
2	0.19	0.31	0.08
3	0.06	0.55	0.13
4	0.35	0.38	0.15
5	0.51	0.06	0.18
6	0.46	0.10	0.37
7	0.38	0.17	0.36
8	0.19	0.10	0.32
9	0.23	0.62	0.08
10	0.38	0.10	0.17
11	0.54	0.11	0.11
12	0.13	0.11	0.59
13	0.33	0.18	0.73
14	0.07	0.42	0.10
15	0.28	0.32	0.18
16	0.30	0.31	0.12
17	0.09	0.38	0.16
18	0.31	0.49	0.10
19	0.25	0.04	0.08
20	0.16	0.28	0.12
21	0.43	0.03	0.22
22	0.34	0.27	0.10
23	0.26	0.04	0.03
24	0.44	0.39	0.07
25	0.19	0.46	0.22
26	0.26	0.07	0.25
27	0.28	0.07	0.08
28	0.07	0.21	0.06
29	0.11	0.31	0.11
30	0.62	0.11	0.10

Table 4.10 Structure matrix showing all factor loadings, maximum likelihood extraction, 3 factor criterion

The subject population was divided into halves as in previous studies. Analyses were carried out as in phases 1 and 2 above. No significant differences from the whole sample results were generated by these procedures. The same analyses were also carried out on the Polytechnic and College of Further Education sub-populations. No significant differences in solutions were observed between the two groups.

Phase 3

The factor criterion was unset, and second-order analysis carried out on the subsequently generated factor correlation matrix. There was evidence of a strong single second order factor underlying the data.

There was a correlation of 0.145 between Goal Coherence/Planning and Strength of Will within a two factor solution.

A single factor loaded on 10 of the original 17 items assigned to Goal Coherence/Planning, while a separate factor loaded on 9 of the original items assigned to Strength of Will. However, factors loaded cleanly on only 8 of the Goal Coherence/Planning items and 7 of the Strength of Will items.

The results appeared to provide little evidence for the influence of a third factor, or that there were any advantages to be gained from continuing to rotate orthogonally as well as obliquely.

4.6.4 Discussion

Unlike the preceding study, the results did not provide the same degree of support for a two factor model. The persistent ambiguity created by factors loading across items suggested that there was further good reason to look at a unidimensional solution of data.

generated by the questionnaire. The difference in robustness of factors was again observed, where the Strength of Will factor loaded on fewer of its assigned items and where the loadings were generally smaller than for Goal Coherence/Planning.

The total number of clean items revealed by the solution was 15. Given that Study 2 only produced 16 such items, there appeared to be a growing body of evidence to suggest that the next stage of scale development might look towards a considerably reduced item set. It was therefore decided that the core of this item set should be constructed using the clean items from Studies 2 and 3, following any minor refinements that might be necessary.

The continuing problems of structural ambiguity due to factors loading across items together with the strong suggestion of underlying unidimensionality from second-order analysis, recommended that further serious consideration be given to a single factor model. There are a number of arguments for merging Goal Coherence and Strength of Will.

Goal coherence is hypothesised as an effective construct, that is to say it is a trait whose function may be expected to manifest itself in differences in performance across a range of behaviours. A mechanism for this effect could arguably be Strength of Will. Individuals high in Goal Coherence might well use

Strength of Will as a servomechanism to enable goal achievement, rather than as a discrete parallel construct.

Support for this argument exists in the close semantic relationship between a number of the Strength of Will and Goal Coherence items. Furthermore, although the scree plot for the present study does not point unequivocally to a single factor solution, the separation between the first and second extracted factors, taken together with the ambiguity of cross-loading and the evidence from second-order analysis, lends mathematical weight to the argument for a unidimensional model.

Additionally, within the context of time and other resources available to the present programme, there are pragmatic reasons for exploring a unidimensional model. Problems of establishing which dimensionality of model best fits the given data exist in this study as in the two previous. Although, largely as a consequence of decisions already taken, the case for a three factor model looks weak, there are still ambiguities caused by factors loading across assigned items with regard to the two factor solution. Furthermore, there is no clear indication that additional administrations of the questionnaire and further comparison of factor models, while time-consuming, would offer any positive steps towards resolving those ambiguities. A unidimensional model, however, represents a sound pragmatic option,

being a reasonable fit to the data, and offering a resolution to existing ambiguities. Therefore, given the unavailability of recently developed and potentially more sophisticated hypothesis-testing procedures, direct investigation of a unidimensional model may be regarded as pragmatically justifiable.

Consequently, although the two factor structure could not be completely rejected following analysis of data from this study, it was decided to proceed with empirical work designed initially to test the strength of a unidimensional model. It was also decided to carry out scale refinement using a considerably reduced item set.

4.6.5 Conclusions

Strong supporting evidence for the two factor model was not forthcoming from Study 3. Goal Coherence / Planning appeared to be robust, but, as in Study 2, factors continued to load across items. This suggested a relationship between the two proposed factors which was too close to be disregarded, and reasons were subsequently put forward for merging them into a single factor.

The total number of 'clean' items from the present and previous studies indicated a need to reduce the total number of items during the next stage of questionnaire development. There appeared to be no good

reason for continuing to give serious consideration to a third, self evaluation factor.

Therefore, while not completely rejecting the two factor model, it was decided that there were sound theoretical, empirical and pragmatic reasons to proceed with a study which would use a reduced item set questionnaire and where data analysis would pay particular attention to testing the strength of a unidimensional model.

4.7 Study 4

4.7.1 Introduction

Following analysis of data from the third study, the direction of research was changed to give primary consideration to a unidimensional model rather than a two factor model. The Goal Coherence factor had loaded significantly on a sufficient number of assigned items to suggest that the construct should be retained. However, the independence of the Strength of Will factor was again less clearly demonstrated. The Goal Coherence/Planning factor appeared to load across onto some items assigned to Strength of Will, and the consequent continuing ambiguity of the factor structure demanded reappraisal of the model. Arguments were put forward for merging the two factors. While it was decided not to completely abandon the two factor model,

concentration on the next stage of scale development was redirected towards the measure of a unidimensional construct, Goal Coherence.

As well as demonstrating the necessity to make further adjustments to the original hypothesis, it may be recalled that evidence from Studies 2 and 3 supported a reduction in the scale item total as part of the next stage of scale refinement. In those two studies, a single factor loaded independently on only 16 and 15 items respectively. It was therefore decided to develop the scale around those consistently independent items.

Item rejection or retention was carried out employing the same criteria as in previous studies. An item was considered for exclusion if a factor did not load significantly and cleanly on it. However mathematical consistency was again not the sole arbiter of item elimination. Further consideration was given to items where it was felt their exclusion from the reconstructed scale would diminish the semantic strength of the factor. Considerable weighting was accorded to retaining those items upon which factors loaded cleanly in Studies 2 and 3.

The reconstructed scale was as follows.

- 1 I don't tend to plan ahead very often

- 2 I easily become bored with things
- 3 I am often motivated to work by thoughts of
long-term outcomes
- 4 I am not easily distracted if I am involved in
something that interests me
- 5 When working on a task I seldom think about how it
will turn out
- 6 I like making plans for the future
- 7 I am often aware that trivial things can have
important consequences
- 8 I daydream a lot about what will happen
- 9 I am seldom conscious of how my work relates to my
long-term aims
- 10 Whatever the situation I like to know that I have
done my best
- 11 It's usually easy to make me change my mind
- 12 Before starting a problem I like to separate it
into its smaller component parts
- 13 I often find things that really interest me

14 I seldom feel unsure of what I'm doing

15 I feel as bad when I fail a mock exam as I would if
I had failed the real one

The aims of the fourth study were as follows.

- 1 To carry out investigation of a unidimensional
model
- 2 To further examine the resultant factor structure
before making a final decision with regard to the
two-factor hypothesis
- 3 To move closer towards finalising the questionnaire

4.7.2 Method

Subjects

There were 140 subjects, all students from Plymouth Polytechnic. Ages ranged from 18 to 39 with a mean age of 20. There were 81 females and 59 males.

Procedure

Subjects were tested in a single session under quiet conditions in the Polytechnic main hall. They were asked to read the instructions on the first page of the

questionnaire, and to begin only when they fully understood what was required of them. No time limit was set for completion. An example of the questionnaire is contained in Appendix B.

4.7.3 Results

Data were collated and analysed using procedure FACTOR, maximum likelihood extraction, in SPSS-X. Analysis was carried out in two phases.

Phase 1

All variables were entered into the analysis block. The factor criterion was set to 2. The factor matrix was rotated obliquely using the Oblimin algorithm. Table 4.11, below, shows the resultant structure matrix.

Item	Factor	
	F1	F2
1	0.70	0.19
2	0.55	0.01
3	0.63	0.12
4	0.40	0.41
5	0.53	0.04
6	0.54	0.18
7	0.40	0.12
8	0.05	0.75
9	0.53	0.38
10	0.53	0.16
11	0.38	0.46
12	0.50	0.14
13	0.55	0.20
14	0.15	0.76
15	0.45	0.16

Table 4.11 Structure matrix showing all factor loadings, maximum likelihood extraction, 2 factor criterion

The correlation between factors in phase 1 was 0.205.

The scree plot generated by this procedure is shown as Figure A.5 in Appendix A.

Phase 2

The factor criterion was set to 1. Table 4.12, below, shows the factor matrix generated by this procedure.

Item	Loading
1	0.69
2	0.51
3	0.61
4	0.47
5	0.50
6	0.55
7	0.40
8	0.22
9	0.58
10	0.52
11	0.46
12	0.49
13	0.56
14	0.32
15	0.38

Table 4.12 Factor matrix showing all factor loadings, maximum likelihood extraction, single factor criterion

4.7.4 Discussion

Results from this analysis were consistent with those from the previous study. The scree plot and the generally high loadings shown in table 4.12 would appear

appear to support the argument for retaining the hypothesis of a unidimensional model. The continuing ambiguity due to factors loading across items demonstrated by the factor structure in table 4.11 suggests that a two factor solution does not adequately fit the data generated by the questionnaire. The correlation between the two extracted factors in phase 1 was higher than for any previous similar analysis. The separation on the scree plot between the first two factors was considerably greater than in Study 3. There was also far less separation between the second and third factors. These results appear to provide evidence for a unidimensional model. The predominance of Goal Coherence was again evident, and the notably subsidiary role played by a Strength of Will construct served to underline the possible suitability of a single factor model.

A single factor loaded significantly on 14 of the 15 items. In addition, item communalities were at an acceptable level, thus it was felt that further scale refinement could be minimal. The single factor loaded relatively poorly on Item 8, but for reasons outlined above, it was decided to retain this item.

As in the the previous studies, problems of establishing dimensionality remain a principal concern. The processes leading to a decision about an appropriate dimensionality must be affected by the decision to disregard a three factor model, and by the use of a

reduced item set questionnaire. Furthermore, as has already been emphasised, any final decision on dimensionality is likely to be contentious. There are still ambiguities left unresolved by comparing the alternative factor solutions, and the artefactual nature of the first extracted factor must place some qualification on any interpretation of the scree plot. There is again a good case to be made for the additional strength of new confirmatory procedures, and the potential contribution which they will offer in solving the problem of identifying the model which best fits the data. However, given the available evidence from the present study, there would again appear to be a supportable argument for the pragmatic choice of accepting a unidimensional solution.

It was consequently decided that a further confirmatory study should be carried out, both to test the inferences drawn from the present study, and to provide the necessary data for the first part of a test-retest procedure.

4.7.5 Conclusions

The results from the present study were not inconsistent with those from the immediately preceding study, and gave some support to the reframed hypothesis. Further evidence was gathered in favour of a single

factor model, and it was felt that there were sound empirical and pragmatic reasons for not retaining the two factor hypothesis. It was decided to proceed with a further confirmatory study using the same version of the scale. Data generated by the next study may be used as the basis for a test-retest analysis.

4.8 Study 5

4.8.1 Introduction

The results from Study 4 led to a decision to proceed with a further confirmatory study to test the adequacy of a single factor model of cross-situational motivation. On the basis of results from the two previous studies and for other reasons of pragmatism, it was concluded that no significant benefit would accrue from continued investigation into a two factor hypothesis. Within a two factor framework, areas of ambiguity persisted owing to factors cross-loading on items. The independence of a separate Strength of Will construct was not demonstrated, with the factor loading significantly on few of its assigned items. In addition, the scree plots for Studies 3 and 4 gave no compelling graphic support for a two factor model. Arguments were presented for proceeding with a further confirmatory study to examine the robustness of the single factor, Goal Coherence.

Following Study 4, it was decided that only minimal alterations to the scale should be necessary. Item 8 appeared to be less robust than others. However, it was generally felt that at this stage of scale construction no item could be replaced without risk to the potentially emergent pattern of structural unity of the Goal Coherence dimension. Furthermore, it was felt necessary to carry out confirmatory analysis using as similar version of the scale as possible to that used in the immediately preceding study. In the event, it was decided to carry out the present study with no alterations to the scale.

The aims of the Study 5 were as follows.

- 1 To conduct confirmatory factor analysis on data generated by a further administration of the questionnaire. This analysis would pay continuing specific attention to the viability of a single factor model.
- 2 To gather data that could also be used as the test half of a test-retest reliability study.

4.8.2 Method

Subjects

There were 207 subjects, students and staff from Plymouth Polytechnic. Ages ranged from 18 to 41 with a mean age of 28. There were 136 females and 71 males.

Procedure

Subjects were tested under quiet conditions in laboratory space, in groups of between 10 and 15. They were asked to read the instructions on the first page of the questionnaire, and to begin only when they fully understood what was required of them. No time limit was set for completion. An example of the questionnaire is contained in Appendix B.

4.8.3 Results

Data were collated and analysed using procedure FACTOR, maximum likelihood extraction, in SPSS-X.

The factor criterion was set at 1. Table 4.13, below, shows the factor matrix generated by this analysis.

Item	Loading
1	0.34
2	0.33
3	0.56
4	0.15
5	0.24
6	0.37
7	0.06
8	0.38
9	0.57
10	0.44
11	0.32
12	0.21
13	0.32
14	0.37
15	0.18

Table 4.13 Factor matrix showing all factor loadings, maximum likelihood extraction, single factor criterion

The scree plot generated by this analysis is shown as Figure A.6 in Appendix A.

4.8.4 Discussion

The results appear to provide some support for a single factor solution. There is evidence to be drawn from the scree plot to support such a solution, where the separation between the first two factors is 1.2, while the second and third factors are separated by only 0.18. In effect, the scree seems to begin with the second extracted factor. As a precaution, the default factor criterion was reset to 2 and the data reanalysed. The resultant structure matrix was very similar to that generated in Study 4 (see table 4.11). There were similar levels of ambiguity, with the second factor loading cleanly on one item only. Thus there was again little evidence to support a two factor model, and again, the scree plot appeared to provide support for this interpretation. Although lower in absolute terms than for Study 4, factor loadings were felt to be acceptable (although the loading on item 7 was low on this occasion), particularly so when viewed in terms of the lack of any coherent structure to the two factor solution.

Nevertheless, it is evident that the results from this study provide a continuing illustration of the difficulties surrounding a decision on dimensionality of

model. While some of the ambiguities appear to have been resolved, at least in part, the choice of a unidimensional model is by no means clear cut, but affected both by decisions made as a consequence of previous studies, and by other influences on the research programme. This issue is readdressed in the general discussion below.

4.8.5 Conclusions

The results from Study 5 provided support for a single factor model of cross-situational motivation. No compelling reason was found to give further consideration to a two factor model. Conventional psychometric support for the scale was reasonably sound. The next stages of the research programme - test-retest reliability and construct validation - will proceed with an unchanged scale, apart from item 14, which is a double negative and will be reworded.

4.9 General Discussion and Conclusions

Five studies have been reported which trace the development of a questionnaire to measure cross-situational motivation. The theoretical and empirical underpinning was given for a five factor model of human motivation, and this was originally hypothesised. A 46 item questionnaire was generated and administered. As a function of factor analysis and questionnaire

refinement, the five factor model was replaced by a two factor hypothesis. The two factors were named Goal Coherence and Strength of Will. Following further analysis and scale refinement, the two factor model was eventually rejected in favour of a unidimensional measure, retaining the title Goal Coherence. Further analysis provided some support for the single factor model, and a finalised version of the questionnaire with an item set of 15 was constructed.

It is clear from each of the five studies that the process of establishing dimensionality is one of the most difficult in factor analysis. Factors frequently load across assigned items, and the resulting ambiguity cannot always be resolved by comparing factor solutions. Deciding on the model which appears to best fit the given data is not just an exercise in factor analytic procedure, but has profound consequences for any sustained programme of research for which factor analysis provides a platform. The traditional criteria adopted to facilitate the choice of model in the five studies so far reported, appear to have produced an supportable set of arguments for accepting a unidimensional solution. But it must be re-emphasised that the final decision to accept a unidimensional model was itself influenced by decisions taken in previous studies to accept or reject particular multi-factor models on the basis of the same traditional criteria. Bluntly stated, these criteria are far from infallible. Any decisions taken as a consequence of adopting such

criteria must therefore remain contentious. It must again be stressed that evidence from hypothesis-testing procedures such as the LISREL program, had the resource been available during relevant stages of the current research, may have brought additional strength (or, indeed, conflicting information) to the issue of dimensionality, with the enabling ability of LISREL to refine parameter values of models, to compare models, to identify parameters where problems may lie, and to test for goodness of fit. Furthermore, the pragmatic aspects of accepting a unidimensional model have been addressed. There were pragmatic considerations both in terms of resolving continued ambiguity in multi-factor models, and in terms of the wider constraints facing most current programmes of research, time being not the least of these. All these considerations must be included in an overview of the programme so far.

Given these caveats, there nevertheless appears to be an acceptable foundation for proceeding with retest reliability and construct validation studies on the basis of a single factor model. There is evidence to support a view that, although individual item validity is not unequivocally established, there are sufficiently sound reasons to maintain the questionnaire in its unaltered state. Cattell (1978) has stressed the dangers of abandoning apparently potentially viable psychological constructs in the face of inconsistent mathematical evidence. Cattell's approach may be followed through to the next stage of the research

programme. If any item represents a weak link in the construct unidimensionality, then this should be reflected in the subsequent reliability and validity studies. However, as an additional safeguard, data generated by the next administration of the scale will be factor analysed, and the single factor model reviewed in the light of factor loadings.

The factor analytic evidence in support of the questionnaire's structural unity was judged to be of a nature that would facilitate progress to the next stages of the research programme. These stages involved further empirical studies to establish levels of construct validity, internal consistency, and test-retest reliability, and are reported in the following chapter.

CHAPTER 5

TESTS OF VALIDITY AND RELIABILITY

5.1 Introduction

Interpretation of data from Study 5 provided support for a single factor model of cross-situational motivation, and gave little reason to consider further a two factor hypothesis. The scree plot appeared to indicate a one factor solution. Factor loadings were generally lower than in Study 4, for item 8 in particular. However, it was judged that Cattell's (1978) arguments in favour of developing potentially useful psychological constructs despite inconsistencies in the factor analytic evidence, were appropriate to the present circumstances. Therefore it was decided to proceed with tests of scale validity and reliability using the unchanged questionnaire. The double negative in item 14 was eliminated before any new administration of the scale.

5.2 Study 6 Construct Validation

5.2.1 Introduction

Cronbach and Meehl (1955) proposed a basis for construct validation which, as Kline (1983) points out, has become generally accepted as a necessary process in the development of new psychological tests. A large

number of hypotheses are formulated with regard to the developing scale and a number of validating measures, and those hypotheses are then tested, usually by correlational techniques. In the present instance the hypotheses were derived from the nature of Goal Coherence as a proposed determinant of future-oriented motivation, measured by the developing scale now named the Hyland-Thacker Questionnaire (HTQ), and its proposed convergent or divergent relationship with six other tests.

The six chosen tests were as follows.

- 1 The Spence-Helmreich (1978) Work and Family Orientation Questionnaire
- 2 The Frese et al (1987) Action Style Questionnaire
- 3 The Marlowe Crowne (1964) Social Desirability scale
- 4 Spielberger's (1979) measure of State/Trait Anxiety
- 5 The Fenigstein et al (1975) measure of Public and Private Self Consciousness
- 6 The Eysenck Personality Inventory (1965)

The reasons for choosing each measure and the hypotheses relating them to Goal Coherence are as follows.

1 The Spence Helmreich (1978) Work and Family Orientation Questionnaire

The Work and Family Orientation (WOFO) is a psychometrically developed questionnaire which measures three dimensions, work, mastery and competitiveness. The work factor represents an effort dimension, the desire to work hard and to make a good job of what one does. The mastery factor represents a preference for difficult tasks and for meeting internally created standards of performance. The competitiveness dimension reflects the enjoyment of competition. All WOFO scales are intended to measure general personality traits. There are parallels to be drawn between aspects of the WOFO and Goal Coherence. An awareness of the value of hard work, and the tendency to set internalised standards are conceptualised in both questionnaires, and this ought to be reflected in a positive relationship between Goal Coherence, work and mastery. There is no direct element of competitiveness in the HTQ, but a positive relationship might be expected, as the degree of determination integral to goal attainment may well be accompanied by a certain amount of competitiveness.

Hypothesis A

There will be a positive and significant relationship between Goal Coherence and all dimensions of the WOFO. This relationship may be greater for work and mastery than for competitiveness.

2 The Frese et al (1987) Action Style Questionnaire

This questionnaire, published some 18 months after the commencement of the present programme of research, is proposed to measure two dimensions, goal orientation and planfulness. Goal orientation is a measure of the ability to structure action into hierarchically arranged goal and subgoals, and the extent to which goals are taken seriously. Planfulness is a conceptually distinct construct which accounts for individuals' ability to construct, improve upon and diversify among plans for future behaviour.

Frese categorises the action style dimensions as follows.

Action styles are neither traits nor aspects of temperament nor abilities : (a) They are conceptualized as propensities to act, (b) they are teachable to a certain degree, and (c) they are bidirectional (p.1183)

There are some major theoretical differences between the Action Style dimensions and Goal Coherence. Firstly, and perhaps most importantly, unlike goal orientation, Goal Coherence is proposed to be a trait. Whether aspects of goal coherent behaviour can be learnt is an area for consideration that falls beyond the scope of this thesis, but the trait itself, by definition, cannot be acquired by any learning process. Secondly,

Frese has suggested that goal orientation and planfulness may be orthogonally related. As Chapter 4 of the present thesis illustrates, the Planning element of the initial hypothesis, far from being orthogonal to Goal Coherence, is closely related to the Goal Coherence construct.

Finally, Frese's concept of a bidirectional goal orientation is situation specific. Conversely, Goal Coherence may be more effective under different circumstances, but it is argued here that goal coherent behaviour is likely to emerge regardless of situation.

Despite the differences in theoretical underpinning between action styles and Goal Coherence, there are obvious areas of overlap between the two measures. In particular, one might expect to observe similar types of behaviour in individuals who score highly on both the Frese questionnaire and the HTQ. Consequently one might expect to observe a positive relationship between the constructs. With this in mind, a positive relationship was predicted between both of the Frese scales and Goal Coherence.

Hypothesis B

There will be a positive relationship between Goal Coherence and goal orientation, and between Goal Coherence and planfulness.

There is frequent use of some measure of social acquiescence or social desirability in the validation of psychological tests. A non-significant or negative relationship between a developing scale and social desirability is usually predicted. It is argued that a positive relationship between a test and a measure of social desirability implies a response bias towards social acquiescence. In other words, the test is measuring social desirability instead of, or as well as its intended target construct.

However, it is argued here that Goal Coherence may be expected to correlate positively with a measure of social desirability. The trait revealed by the HTQ is, in many respects, a socially desirable trait. The successful achievement of a goal as the product of an ability to identify and attain hierarchically structured subgoals may be regarded as a socially positive attribute by many respondents. The ability to successfully plan and execute those plans, together with the perseverative element that may be revealed by some HTQ items is also likely to be regarded as a desirable ability, particularly perhaps by those who possess it. Thus it may be expected that Goal Coherence will correlate positively with a measure of social desirability. There are further arguments supporting this hypothesis to be found in the literature concerning the concept of locus of control.

The locus of control concept concerns individuals' acquisition of a generalised expectation about the source of reinforcement for their actions. Rotter (1966) suggested that this expectation can be represented on a continuum of internal-external control. Hochreich (1975), Stern and Manifold (1977), and Evans (1980) have all argued that internality is of itself a positive societal value, and internality should be expected to correlate positively with social desirability. It has been argued earlier in this thesis that Goal Coherence has dependence on internality (as distinct from self-evaluation), in that individuals high in Goal Coherence will be more likely to attribute their success or failure to the internalised processes inherent to hierarchical goal structuring, rather than to external influences. It may consequently be argued that individuals who score highly on Goal Coherence should also score highly on social desirability. However it would have been unwise to propose this hypothesis and totally disregard the body of evidence favouring a neutral relationship with social desirability. A qualifying hypothesis was therefore framed.

Hypothesis C

A positive significant relationship will be observed between Goal Coherence and social desirability.

If this hypothesis is supported, a further study to test the strength of the proposed relationship between Goal Coherence and internality will be undertaken.

4 The Spielberger (1979) measure of state/trait anxiety.

This scale was developed as a dual measure of state-specific and trait type anxiety. There are two reasons why Goal Coherence should be negatively related to anxiety. Firstly, the theoretical framework of the Goal Coherence construct excludes any influence of anxiety on the processes of hierarchical goal-structuring. Secondly, there is a frequently proposed positive relationship between anxiety and loss of perceived control (Staub, Tursky and Schwartz, 1971; Davison and Neale, 1982). The hypothesised positive relationship between Goal Coherence and locus of control supports the present contention that Goal Coherence should be negatively related to anxiety. This contention was tested by the inclusion of the Spielberger scale in the construct validation study.

Hypothesis D

Goal coherence will have a negative relationship with both scales on the Spielberger questionnaire.

5 The Fenigstein et al (1975) measure of Public and Private Self-Consciousness.

Arguments have been proposed by Fenigstein that self-consciousness plays an important part in shaping an individual's behaviour. Self-consciousness may be defined as the persistent tendency to direct attention

inward or outward. Fenigstein et al (1975) have reported three correlated aspects of the self-consciousness construct, as follows

(a) Private Self-Consciousness

This is proposed to account for the tendency to attend to one's inner thoughts and feelings

(b) Public Self-Consciousness

This relates to an awareness of the self as a social object

(c) Social Anxiety

This measures the level of discomfort felt in the presence of others

The potential influence of self-evaluation was considered at the start of the present programme of research, but evidence from the factor analytic studies led to the almost complete exclusion of the construct from the finalised questionnaire. Only one item in the HTQ, item 10, remains as a reworded version of an item originally assigned to Factor IV, Self-Evaluation. Therefore Goal Coherence should not involve any significant input from self-evaluation. Consequently it was predicted that no significant relationship between private or public self-consciousness and Goal Coherence would be found. Furthermore, a degree of anxiety dependence which is present in both public and private

self consciousness supports the prediction that no significant relationship should exist between Goal Coherence and the two dimensions of self-consciousness. This argument is especially pertinent to any relationship between Fenigstein's social anxiety dimension and Goal Coherence. Here it was predicted that a significant negative relationship would be observed.

Hypothesis E

(i) No significant relationship will exist between Goal Coherence, public self-consciousness and private self-consciousness.

(ii) A significant negative relationship will be observed between Goal Coherence and social anxiety.

6 The Eysenck Personality Inventory (EPI)

There should be no positive relationship between Goal Coherence and either dimension of the EPI. The questionnaire is not designed to measure individual differences in introversion/extraversion or neuroticism. Any positive relationship between the HTQ and the dimensions of the EPI would be undesirable. Taking into account the expected relationship between Goal Coherence and anxiety, it is expected that a negative relationship between Goal Coherence and neuroticism will be found.

Hypothesis F

(i) There will be no significant relationship between Goal Coherence and extraversion/introversion

(ii) There will be a significant negative relationship between Goal Coherence and neuroticism

5.2.2 Summary of Construct Validation Hypotheses

Six measures of construct validation have been chosen, and convergent or divergent relationships predicted between those measures and the HTQ measure of Goal Coherence. The construct validation hypotheses are summarised in table 5.1, on the following page. The rationale for the choice of each measure is dependent upon their being either conceptually parallel to or conceptually distinct from Goal Coherence. The following section of this chapter describes the study undertaken to test the hypotheses.

Measure of construct validity		Predicted relationship with Goal Coherence
1	Spence Helmreich WOFO	
	work	positive
	mastery	positive
	competetiveness	positive
2	Frese Action Style	
	goal orientation	positive
	planfulness	positive
3	Marlowe-Crown	
	Social Desirability	positive
4	Spielberger	
	state anxiety	negative
	trait anxiety	negative
5	Fenigstein	
	private self-consciousness	none
	public self-consciousness	none
	social anxiety	negative
6	EPI	
	extraversion/introversion	none
	neuroticism	negative

Table 5.1 Summary of construct validation hypotheses

5.2.3 Method

Subjects

There were 209 subjects, students and staff from Plymouth Polytechnic. Ages ranged from 18 to 41 with a mean age of 26. There were 125 females and 84 males.

Procedure

Subjects were tested under quiet conditions in laboratory space, in groups of between 10 and 15. The HTQ and validation questionnaires, 1 to 6 in Table 5.1, were administered over two sessions, HTQ and questionnaires 1, 2 and 3 in session one, and questionnaires 4, 5 and 6 in session two. An example of each measure is given in Appendix B. Subjects were asked to read the instructions prefacing the questionnaires, and to begin only when they fully understood what was required of them. No time limits were set for completion of any measure, and no timings were taken. Subjects were told that if they finished a questionnaire quickly, they would have to wait for the rest of the group before beginning the next in order to facilitate easy administration of all measures. They were requested to remain quiet under these circumstances.

5.2.4 Results

Data were collated and analysed using procedure

PEARSON CORR in SPSS-X. Table 5.2, below, shows the correlation matrix for Goal Coherence scale scores and the construct validation measures.

MEASURE		r with Goal Coherence
Spence Helmreich	work	0.491 **
	mastery	0.343 **
	competetiveness	0.202 *
Frese	goal orientation	0.476 **
	planfulness	0.368 **
Marlowe-Crown Social Desirability		0.213 *
Spielberger State Anxiety		- 0.296 *
Trait Anxiety		- 0.228 *
Fenigstein	Private Self C	- 0.020
	Public Self C	- 0.056
	Social Anxiety	- 0.199 *
EPI extraversion/introversion		0.121
neuroticism		- 0.160

* denotes sig, $p < 0.01$, ** denotes sig, $p < 0.001$

Table 5.2 Correlations between Goal Coherence and the six measures used in convergent/divergent construct validation

The full multiple correlation matrix for all measures is shown in Appendix A as table A.1. The factor structure for this administration of the HTQ is shown as table A.2.

5.2.5 Discussion

Results from the construct validation study were encouraging. There appeared to be support for all the hypotheses concerning the convergent or divergent relationships between Goal Coherence and the chosen measures.

The relationships between all three dimensions of the Spence Helmreich WOFO were as predicted. Work and mastery both had positive correlations with Goal Coherence, and competitiveness similarly was positively and significantly correlated, although the absolute value of the coefficient was smaller. This is quite as expected. Although the HTQ is not designed to measure competitiveness, high scorers in Goal Coherence may also demonstrate some competitive element which would be reflected in their WOFO responses.

As predicted, Goal Coherence correlated positively and significantly with both dimensions of the Frese Action Style questionnaire. Both coefficients were of acceptable magnitude, and, despite their conceptual differences, the parallel nature of Goal Coherence and goal orientation was arguably illustrated. As may have been expected, goal orientation and planning correlate

positively and significantly with WOFO work and mastery. It is perhaps interesting to note that although goal orientation has a smaller though still significant positive relationship with competitiveness, the planning dimension of Frese's questionnaire appears to be unrelated. Also, its coefficients with work and mastery are much smaller. There is perhaps some supporting evidence here for the unidimensionality of Goal Coherence. Although elements of planning are present in some items of the HTQ, it does not contain a separate planning dimension. The decision to maintain this structure seems to be justified by the relatively weaker relationships that are observed between Action Style planning and purportedly similar constructs, arguably suggesting that this construct may not be functionally distinct.

There was a positive and significant relationship between Goal Coherence and the Marlowe Crown scale of social desirability. This was predicted, and the reasons for the prediction have been described above. Consequently, it was decided that the proposed further study to test the link between Goal Coherence and internality would be undertaken. It is interesting to note that almost all the other indices which correlate positively and significantly with social desirability are among those for which a similar relationship was proposed with Goal Coherence. Work and mastery from the Fenigstein questionnaire and goal orientation and planfulness from the Frese measure are all positively

related to social desirability. It seems reasonable to consider Kline's (1983) advice, that positive relationships between a measure and social desirability can be ignored, provided the measure demonstrates strong construct validity, as would appear to be so in the case of the HTQ. Nevertheless, the further study to test the HTQ against internal validity was felt to be a prudent undertaking.

As predicted there was a negative relationship between state anxiety, trait anxiety and Goal Coherence. The ability to structure goals and to maintain effort towards goal attainment is not seen to be anxiety-driven in any way.

The predicted relationship between public and private self consciousness was also observed. As discussed earlier, the latter concept is quite distinct from internalisation of control, dependent as it is on the continuous re-examination of motives, mood and emotional state. The significant negative correlation between social anxiety and Goal Coherence is as expected. As the full multiple correlation matrix in Appendix A illustrates, it is interesting to note that there is a positive significant relationship between all three Fenigstein dimensions and the two Spielberger anxiety measures. This would seem to emphasise the anxiety dependent nature of the Fenigstein questionnaire, as well as underlining the major conceptual differences between Goal Coherence and both

measures.

Finally, again as predicted, there was no significant relationship between Goal Coherence and the extraversion/introversion dimension of the EPI, and as suspected, a negative relationship with neuroticism, with the coefficient just outside the 0.01 criterion.

5.2.6 Conclusions

The results from construct validation appear to provide support for all the stated hypotheses relating Goal Coherence to the validating measures. This would seem to indicate an acceptable level of construct validity. Because the literature concerning the Goal Coherence/social desirability hypothesis is not unequivocal, it was decided that a further study should be carried out to test the proposed positive relationship between Goal Coherence and internality. The apparent level of construct validity provided an acceptable foundation for progression to the next stage of the research programme, to investigate the level of internal reliability for the scale.

5.3 Calculating Internal Consistency and Reliability

5.3.1 Introduction

The psychometric development of a new test usually aims towards a high level of self consistency. The

argument being that if part of a test is measuring a variable, then the other parts of that test, if not consistent with it, cannot be measuring the same variable. Subsequently the conventional view taken is that the level of consistency must reach some acceptable point before the test can be considered valid. Guilford (1956) and Nunally (1978) both address this issue in some detail.

However, Cattell and Kline (1977) have proposed an alternative viewpoint. They suggest that high levels of internal consistency are not representative of test validity. The basis of this argument is that any item in a test must account only for a fraction of the construct that is being measured by the whole test. Therefore if all the items in the test are highly consistent, they must also be highly intercorrelated, thus a test with a high reliability coefficient such as Cronbach's alpha (Cronbach, 1951), is likely to measure only a narrow portion of the entire target construct. There is sound statistical evidence to support this argument. Firstly, Cronbach's alpha does increase as a function of item intercorrelations. Secondly, as Kline (1983) has pointed out, in any predictive study dependent on the multivariate model, the maximum multiple correlation between tests and the criterion - in the instance of tests, items and the total score - is obtained when the variables are not highly correlated. For if two variables were perfectly correlated, one of them would not be supplying any new information about the target

construct. Cattell (Cattell and Kline, 1977) adds to this argument by proposing that maximum test validity should be obtained when items in a test do not correlate at all with each other, but do correlate highly with the criterion.

However, Kline is also at pains to point out that a test has yet to be constructed that contains items which correlate with the criterion, but not with each other. In reality, the strength of correlation between individual items and the criterion will be reflected by the inter-item correlations, which in turn, as already discussed, will increase proportionately with Cronbach's alpha. Consequently, there exists a close relationship between item to total correlations and coefficient alpha.

For the purposes of investigating the internal consistency of the HTQ, calculations were made to provide information on item to total correlations, and coefficient alpha.

5.3.2 Method

Procedure

Subjects' responses to the HTQ from study 6 were used for the purpose of creating a multiple correlation matrix between each item and the criterion, total scale scores ($n=209$).

5.3.3 Results

Data were analysed using procedure PEARSON CORR in SPSS-X. The correlation matrix produced by this procedure is shown in table 5.3, below.

Item	Item Pool
1	.407
2	.313
3	.531
4	.300
5	.345
6	.414
7	.211
8	.073
9	.525
10	.447
11	.363
12	.353
13	.367
14	.336
15	.283

Table 5.3 Item to item pool correlations

Data were then analysed using procedure RELIABILITY default ALPHA. The alpha coefficient was 0.49.

5.3.4 Discussion

The results appear to indicate only a moderate level of internal consistency. All the items correlate positively with the criterion, though item 8 gives some reason for concern. As indicated in Section 5.3.1, the

moderate level of item to criterion correlations is reflected in the moderate size of the alpha coefficient.

It is tempting to unequivocally accept Cattell's arguments, and to view the observed level of the alpha coefficient as an indication of moderate internal consistency reliability, and therefore representative of a valid test. In support of this approach, Kline (1983) has argued that in the case of personality questionnaires, high reliability coefficients should be regarded with suspicion, since high coefficients can be obtained simply by constructing a test with items that are virtual paraphrases of each other, with serious consequences for test validity.

However, it must be noted that Cattell's requirement for high correlations between items and criterion was by no means completely satisfied. All the observed item to criterion correlations were positive, but by no means especially high. Two were below 0.30, and one below 0.10. Finally, as previously discussed, there is substantial psychometric evidence in favour of a high coefficient alpha. With these issues in mind, there has to be a note of caution struck with regard to the internal consistency reliability of the HTQ as progression is made towards investigating test-retest reliability.

5.3.5 Conclusions

The item to criterion correlations were positive, but by no means especially high. This would appear to indicate a moderate level of test homogeneity. The alpha coefficient was of a size that accords with Cattell's (1978) criteria, but goes some way only towards satisfying conventional psychometric demands. Consequently, it was concluded that caution should be exercised with regard to the internal consistency reliability of the developing scale, as the programme moves towards an investigation of test-retest reliability.

5.4 Study 7 Test-retest Reliability

5.4.1 Introduction

As described above, it is usually regarded as essential that a scale has test-retest reliability. Particularly in the case of the HTQ which is designed to measure a trait structure, Goal Coherence, it is desirable that individuals' scores for two separate administrations maintain a close positive relationship over time. As in many areas of psychometric investigation, advice varies, in the present case as to the amount of time that should elapse between administrations. Kline (1983) suggests not less than a month.

It was decided that the HTQ should be tested as rigorously as permitted by the time demands of the research programme. Eight months elapsed between the two administrations, from October 1987 to May 1988. This, it was felt, would allow ample time for any radical changes in Goal Coherence scores to emerge, as well as giving subjects ample opportunity to forget the questionnaire.

Thus, it was hypothesised that a significant positive correlation would be found between the October 1987 scores on the HTQ and scores for the same subjects on the HTQ May 1988 administration.

5.4.2 Method

Subjects

There were 82 subjects, all volunteer students at Plymouth Polytechnic. Ages ranged between 18 and 34. There were 51 females and 31 males.

Procedure

Subjects were tested in a single group in a Polytechnic lecture theatre. They were informed that their co-operation would assist in a currently active research programme, but no explicit link was made between the two administrations of the HTQ. Subjects were asked to read the instructions on the first page of the questionnaire, and to begin only when they fully

understood what was required of them. The questionnaire was completed under quiet conditions.

5.4.3 Results

Data were collated and analysed using procedure PEARSON CORR in SPSS-X.

The correlation coefficient between the October 1987 scores and the May 1988 scores for the same subjects was .612, $P < .001$.

5.4.4 Discussion

The size of the coefficient for the two sets of scores appears to demonstrate an acceptable level of test-retest reliability.

As with many other aspects of test development, opinions tend to vary as to what constitutes acceptability in terms of the size of a test-retest correlation. Clearly, the closer the coefficient is to +1.0, the more confident can be the test constructor that the instrument under investigation is demonstrating reliability over time. In the case of the HTQ, the size of the coefficient is by no means high in absolute terms, falling outside Kline's (1983) suggested criterion of 0.7. Conversely, other authorities, such as Rust (1989), simply argue that the test-retest

coefficient must be positive, and the higher the better.

In instances where absolute criteria are lacking, it is probably better to take a conservative viewpoint. Consequently, given the moderate size of the test-retest coefficient for the HTQ, it may be prudent to conclude that, while arguably acceptable according to some criteria, the reliability coefficient is of a magnitude which cautions a guarded acceptance.

5.4.5 Conclusions

A positive relationship was predicted between HTQ scores for the same subjects on two administrations of the questionnaire separated by eight months. 82 of the original subject pool were retested, and the subsequently produced coefficient for the two sets of scores was 0.612.

It was felt that guarded acceptance could be given to the observed level of test-retest reliability. This would permit the final construct validation study to be undertaken, that is to further investigate the relationship between Goal Coherence and internality.

5.5 Study 8 Goal Coherence and Internality

5.5.1 Introduction

In the construct validation procedures described

above, Goal Coherence correlated positively with social desirability. This relationship was not unexpected. However, in accordance with arguments proposed at the time, it was judged necessary to undertake a further investigation into scale validity. The procedure involved measuring the relationship between Goal Coherence and some suitable index of internality. This section of the chapter briefly reviews the arguments relevant to a relationship between Goal Coherence and internality, and describes the final piece of construct validation.

A measure of social acquiescence or social desirability is often used in the validation of psychological tests. A non-significant or negative relationship between social desirability and the target construct is usually predicted and desired. It is argued that any positive relationship implies a response bias towards social acquiescence.

However, it has been argued above that Goal Coherence may be expected to correlate positively with a measure of social desirability. The trait revealed by the HTQ is arguably a socially desirable trait. The successful achievement of a goal as a function of the ability to identify and attain hierarchically structured subgoals may be regarded as a socially positive attribute. The ability to successfully plan and execute those plans may be regarded as a desirable ability. Thus it may be expected that Goal Coherence will correlate

positively with a measure of social desirability.

Further arguments supporting this hypothesis were drawn from work concerning locus of control. This concept maintains that individuals acquire a generalised expectation about the source of reinforcement for their actions. Rotter (1966) suggested that this expectation can be represented on a continuum of internal-external control. Evidence was cited from the work of Hochreich (1975), Stern and Manifold (1977), and Evans (1980) to the effect that internality is of itself a positive societal value, and that internality correlates positively with social desirability. It was argued earlier in this thesis that Goal Coherence depends to some extent on internality. Individuals high in Goal Coherence may be more likely to attribute their success or failure to the internalised processes inherent to hierarchical goal structuring, rather than to external influences. It was consequently argued that if, as predicted, a positive significant relationship was observed between Goal Coherence and social desirability, a similar relationship should exist between Goal Coherence and some suitable measure of internality.

The predicted relationship between Goal Coherence and social desirability was observed. Thus a further validating procedure to establish the nature of relationship between Goal Coherence and internality was undertaken.

For the purposes of the present empirical study, it was hypothesised that a positive and significant relationship would be observed between Goal Coherence and a measure of internality.

5.5.2 Method

Subjects

There were 94 subjects, all students at Plymouth Polytechnic, ages ranging from 18 to 37. There were 63 females and 31 males.

Procedure

Subjects were tested in a single group in a Polytechnic lecture theatre under quiet conditions. They were asked to complete the HTQ and Rotter's (1966) forced-choice locus of control questionnaire. Each scale was prefaced by a set of instructions, and subjects were asked to begin work only when they fully understood what was required of them. No time limits were set for completion of either questionnaire. An example of the Rotter scale is contained in Appendix B.

5.5.3 Results

Data were collated and analysed using procedure PEARSON CORR in SPSS-X. As all subjects in the present

sample also took part in Study 6, it was possible to correlate scores on the Rotter scale with the corresponding Goal Coherence scores for that study as well as for the present.

The observed correlation coefficients were as follows.

For Rotter and HTQ Study 6, $r = .268$, $p < .01$.

For Rotter and HTQ present study, $r = .338$, $p < .001$.

5.5.4 Discussion

The results appear to provide support for the hypothesis relating social desirability, internality and Goal Coherence. While the absolute size of the observed correlations is not high, there is a positive and significant relationship between Goal Coherence and social desirability, and between internality and Goal Coherence. Furthermore, it seems that this latter relationship has remained stable over time. Eight months had elapsed between Study 6 and the present study.

The decision to test for a relationship between Goal Coherence and internality was made as part of the investigation of an earlier hypothesis. This hypothesis predicted a positive relationship between Goal Coherence and a measure of social desirability. It was argued that added support for the same hypothesis might be gathered

if it could be shown that Goal Coherence correlated positively with internality. This study has demonstrated such a relationship. It would therefore seem reasonable to accept the initial hypothesis.

This study represented the final element in the set of studies designed to test levels of validity and reliability of the HTQ. On the basis of the results from these studies, it was decided that an acceptable foundation existed to support the final set of empirical work in the research programme, work designed to test Goal Coherence against external behavioural criteria.

5.5.5 Conclusions

The present study was designed to test further an earlier hypothesis linking Goal Coherence positively with social desirability. It was argued that a similar relationship should be observed between Goal Coherence and some measure of internality. The Rotter scale was used to test this prediction, and the prediction was upheld.

The present study was the last of the construct validation and reliability tests of the HTQ.

5.6 General Conclusions

This chapter has described studies undertaken to

test the construct validity of the HTQ, and other tests for internal consistency and test-retest reliability. For the most part, conventional psychometric arguments were used to provide the basis for generating hypotheses.

Item to total score correlations were found to be positive, though of moderate magnitude, reflected in the observed value of the alpha coefficient. Cattell's (1978) arguments were considered in relation to the optimum size of the alpha coefficient.

A positive relationship between Goal Coherence and social desirability was predicted, and supported by theoretical argument, evidence from related literature, and a further piece of validating empirical work which included a test of construct stability over time.

Six measures were used to investigate the construct validity of the HTQ, generating 13 test hypotheses. In all cases, the hypotheses were supported. Eight months were allowed to elapse before retesting, considerably longer than usually recommended, and test-retest reliability was judged to be acceptable, with a note of caution placed against the absolute size of the coefficient.

It was pointed out that, in strict factor-analytic terms, one item in the questionnaire did not perform with consistent robustness, as loadings on item 8

fluctuated across administrations. However, it is argued here that the stability of the Goal Coherence construct generated by the HTQ is consistent. It is consequently re-emphasised that some statistical arguments can be tempered by psychologically valid arguments in favour of maintaining the questionnaire in its present form.

As Cattell (1966, 1978, 1985) has frequently argued, factor analysis is a valuable tool available to a researcher wishing to study psychological constructs. But, as Cattell also argues, in many research situations there occurs a point at which psychology must compete, on at least equal terms, with mathematics. An apparently viable psychological construct revealed by mathematical techniques should not be rejected on the basis of mathematical imperfections. The consistency of the Goal Coherence construct has, it is argued, been generally demonstrated at an acceptable level by the tests of validity and reliability, although a guarded acceptability is recommended, particularly with regard to internal consistency.

It may be argued, then, that a platform exists to support further empirical studies to test the HTQ against external behavioural criteria. The theoretical background to those studies forms the subject matter of the following chapter.

CHAPTER 6

TESTING THE HTQ AGAINST BEHAVIOURAL CRITERIA - THEORETICAL AND EMPIRICAL BACKGROUND

6.1 Introduction

Chapter 5 contained reports of empirical studies carried out to test the Goal Coherence dimension for construct validity, test-retest reliability and internality. Generally, these studies produced results in the predicted directions, although certain notes of caution were sounded. It was judged that construct validity, internal reliability and test-retest reliability were of an acceptable level to allow progression to the final phase of the research programme, testing Goal Coherence against external behavioural criteria. This chapter contains a description and discussion of previous research in, and theoretical background to the area which provided the context for the external validation studies.

6.2 Future-Orientation and Motivation

As was indicated in Chapter 3 of this thesis, there has been considerable research into the relationship between future orientation and motivation. Much of the early work in the area was based on elaborations of the expectancy x value theory of achievement motivation

(Atkinson & Feather 1966). In this theory, strength of tendency to act is seen as a multiplicative function of the strength of expectancy that the behaviour will have consequences, and the value of those consequences to the individual concerned. More recently, with regard to future orientation, Raynor (1978) has argued that individuals may differ in the tendency to regard particular behaviours as the immediate next step in a path. This path consists of a series of steps, and each step represents an activity or task, and can include the expected outcome of that activity.

Raynor and Entin (1982) give a detailed account of research which has been undertaken to explore the relationships between path-mapped behaviours, motivation, future orientation and performance. Of particular relevance to the present programme of research, is the distinction made by Raynor and Entin between two types of path believed to subtend to behaviour, the contingent path and the noncontingent path.

A contingent path is defined as a series of steps leading to a goal, where success in each intermediate step is necessary to allow progress to the next step, and ultimately to the goal. Failure in an intermediate step results in the loss of any further opportunity to progress along the path towards the goal. A noncontingent path is defined as a series of steps in which immediate success or failure at any step has no

effect on the individual's right or ability to progress to the next step in the path.

The two studies which comprise the final stages of the present programme of research were both set in the context of contingent versus noncontingent path behaviour. Before reporting these studies, it will be useful to consider some of the main elements of theory and research in the area.

6.3 Contingent and Noncontingent Paths - Theoretical Background

Anticipated differences in task performance as a function of tasks occurring in contingent versus noncontingent paths has generated a considerable body of theory and research. Most of that work has been concerned with the predicted effects of individual differences in achievement motivation.

Raynor and Entin (1982) describe the relationship between motivation and a contingent path in the following way.

When individuals believe themselves faced with the immediate next step of a contingent path, each anticipated step of the path contributes a component of motivation for activity in the immediate next step. (p.20)

They go on to propose that the total motivation for activity in the first step of a contingent path can be calculated by summing the component motivation values aroused across all steps in the path. In a noncontingent path, however, motivation to achieve success in any step is seen to be confined to that amount inherent in the step, and not affected by anticipated future steps in a path.

Therefore, the resultant tendency to achieve in task performance at the first step of a contingent path is the total of the component resultant tendencies to achieve, where one component is the product of one step in the contingent path. In the case of a noncontingent path, only the component resultant tendency to achieve aroused by the first step of the path is proposed to represent the total motivation to achieve.

According to these arguments, the number of motivation components for a contingent path will always exceed the number of motivation components for a noncontingent path. This has to be true for any path of more than one step, since the total motivation components for a noncontingent path will always equal one - that represented by the first step only. Conversely, the total number of motivation components for a contingent path will always exceed one, and will increase proportionately with the number of steps in the path.

The proposals outlined above form the cornerstone of much of the research undertaken to study behaviour in contingent versus noncontingent path experiments. It will be of value to give some brief consideration to some aspects of the research carried out by Raynor and colleagues, addressing two studies in particular, as a precursor to describing the proposed relationships between Goal Coherence and path-mapped behaviour.

6.4 Contingent and Noncontingent Paths - Empirical Investigation

Raynor's research programme was primarily designed to study differences in the aroused levels of inherent achievement motivation that were caused as a function of contingent versus noncontingent path-mapped behaviour. A measure of success orientation/fear of failure was often included as a second independent variable presumed to affect levels of aroused achievement motivation. This is consistent with the original proposals contained in Atkinson's (1957) theory of achievement motivation.

Figure 6.1, on the following page, summarises the fundamental predictions of Raynor's research programme.

(a) person step+1 C step+2 C step+3 C step+4 [goal

(b) person step+1 NC step+2 NC step+3 NC step+4 [goal

(c)

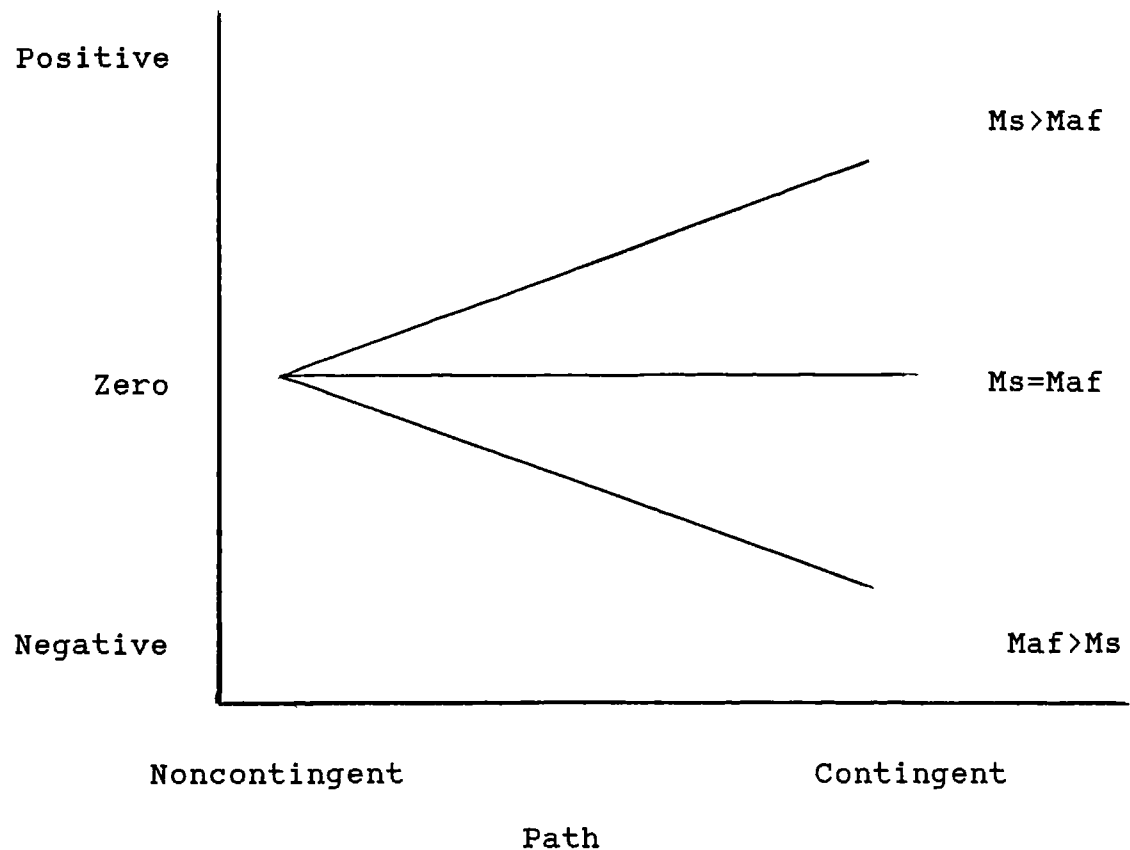


Figure 6.1 Representation of (a) a contingent (C) path and (b) a noncontingent path (NC) of four steps, and (c) the predicted strength of resultant achievement motivation for immediate activity (step 1) in each path. (Adapted from Raynor and Entin, 1982)

The difference in paths is indicated by C for the contingent link between steps, and NC for the noncontingent links. $Ms > Maf$ represents individuals whose

motivation to achieve success is greater than motivation to avoid failure. $Maf > Ms$ represents individuals whose motivation to avoid failure exceeds motivation to achieve success. $Ms = Maf$ represents achievement indifferent individuals.

This research design contains a prediction of an increase in resultant achievement motivation for success oriented individuals in the contingent path versus noncontingent path situation. Similarly, the design contains a prediction of a decrease in resultant achievement motivation for failure threatened individuals, and no change for achievement indifferent individuals. There is consequent prediction that levels of performance for the success oriented individuals will be greater than those of the failure threatened individuals in immediate activity in the contingent path than in the noncontingent path situation.

Therefore the contingent path is expected to arouse higher levels of achievement motivation for success oriented individuals, with consequently higher levels of performance in prescribed tasks.

These predictions were investigated in a number of studies carried out by Raynor and his colleagues. In a typical study, Raynor (1970) measured academic performance in first-year undergraduate psychology students as a function of achievement oriented motives, nAchievement (nAch), and test anxiety.

Students were asked to rate as high or low the perceived importance of good marks for their academic assignments for future career success. Individual differences in strength of motive to achieve success was inferred from their nAch score. Individual differences in strength of motive to avoid failure was inferred from test anxiety scores. Subjects high in nAch and low in test anxiety were classed as Ms>Maf, success oriented. Subjects who scored low in nAch and high in test anxiety were classed as Maf>Ms, failure threatened. Subjects who scored high/high or low/low on both measures were classed as Ms=Maf, intermediate or neutrally motivated.

A further inference was made, that subjects who placed relatively high levels of importance on the attainment of good marks in their academic work for future career success (Raynor (1970) also described this as high perceived instrumentality) faced a contingent path to their future goal. The assumption made by Raynor was that such students would tend to regard good marks for academic work as steps in a contingent path leading to the goal of career success via successful graduation from college.

Subjects who gave low ratings to good coursework performance were assumed to face a noncontingent path to their future goal.

It was found that subjects classed as high in nAch and low in test anxiety attained better coursework marks

than subjects classed as low in nAch and high in test anxiety. Subjects classed as either high/high or low/low gained marks between the two extremes. Despite the number of inferences and suppositions that accompanied this particular study, Raynor argued that the results fully supported his predictions.

Several subsequent studies were undertaken during the 1970s, all of which were based on the same theoretical framework, and most of which produced results in the predicted directions. The range of independent and dependent variables was considerably broadened to include persistence, risk taking, learning and recall, and achievement arousal. A methodology was also developed to include more elegant, verbally-cued procedures for defining contingent and noncontingent paths.

These developments led to Raynor and Entin undertaking a further programme of research to study the effects of high versus low achievement arousal on level of performance in the context of more closely controlled manipulation of contingent and noncontingent paths.

Early work on achievement motivation had involved studies into the effects of aroused versus non-aroused conditions on imaginative thought samples (Atkinson, 1950). This work led to the development of the nAchievement measure of achievement motivation. A substantial body of later research addressed various

issues concerning achievement motivation arousal (Smith, 1963; Raynor and Smith, 1966), leading to Raynor's research into the effects of contingent versus noncontingent paths.

Raynor and Entin (1982) report an experiment combining the effects of achievement motivation arousal and contingent versus noncontingent path behaviour. They had noted in previous studies that results generally failed to show a higher performance of individuals with Ms>Maf over those with Maf>Ms in noncontingent situations as predicted by their derivations from the initial statements of expectancy x value theory of achievement motivation. They argue that perhaps instructions given to subjects to induce the noncontingent condition act as a cue to prevent achievement arousal (this argument is relevant to the link between Raynor's work and the proposals concerning Goal Coherence addressed later in this chapter).

Raynor and Entin (1982) conducted an experiment in which contingent and noncontingent paths were created under two conditions of motivation arousal, high and low. In the high arousal condition, a set of verbal cues was used in the instructions to subjects, to create strong achievement arousal. In the low arousal condition the task was described as a test with a known probability of attaining a certain criterion of immediate performance. All the achievement-related verbal cues were omitted or de-emphasised. The

experimental task was a complex three step arithmetic test.

There were 160 subjects, all male, drawn from ninth and tenth grade classes in an American high school. Each subject was assigned to a motivation group, high (Ms>Maf) or low (Maf>Ms) according to their scores on the Mehrabian (1968, 1969) measure of achievement motivation. They were also rated high or low on the Mandler and Sarason (1952) test anxiety questionnaire (TAQ). The test anxiety ratings were combined with the nAch scores to create a third experimental group of high-high, high-low, low-high and low-low scorers on nAch and TAQ respectively. Low TAQ scores were presumed to represent low Maf, thereby offering an additional means of studying aspects of the Ms>Maf / Maf>Ms dichotomy.

A set of verbal instructions was given to subjects to create the contingent and noncontingent path conditions. In the noncontingent condition, subjects were told that completing 20 out of 25 items correctly on any test was considered successful, but that they would be able to take each test irrespective of their performance. In the contingent condition they were told that completion of 20 out of 25 problems correctly was required to go on to the next test in the series. The same explicit performance criterion, 20 out of 25 items correctly completed, was stated to both groups to create comparable path conditions. The two dependent measures

were total number of problems attempted and total number of problems solved.

Rather unexpectedly, perhaps, no predictions were made concerning the possible interaction between low and high achievement arousal and the contingent and noncontingent path conditions. Raynor and Entin were primarily interested in the arousal of motivation in the contingent and noncontingent conditions. If performance *in the noncontingent condition* was as predicted, where subjects who were rated Ms>Maf recorded higher problem-solving scores than those rated Maf>Ms under both low and high achievement arousal conditions, Raynor and Entin were prepared to reject the proposal that noncontingent cueing inhibited the engagement of achievement-related motives. In the absence of those results, Raynor and Entin were prepared to accept that noncontingent cueing was inhibiting the engagement of achievement-related motives.

The results of the experiment suggested that subjects rated Ms>Maf tended to perform better than those rated Maf>Ms in the contingent condition, with subjects rated Ms=Maf performing at an intermediate level. There was no such predicted ordering within the noncontingent conditions.

However, it is important to note that differences in performance levels between groups in the contingent conditions which achieved statistical significance, did

so only in interactions between the TAQ and Mehrabian scores, not in the Mehrabian scores alone.

Raynor and Entin assumed that noncontingent path cues act as a means of preventing motive engagement by failing to arouse either the motive to succeed or the motive to avoid failure. Furthermore they proposed that in the contingent condition, subjects interpret progression from one test to the next as the goal representative of immediate success. Thus the primary goal in the contingent condition is to reach a level of performance that will permit progression along the path, rather than simply to perform well in the immediate activity.

Raynor and Entin also interpreted results from the study to mean that the critical matter of importance to subjects performing in the contingent condition was not the subjective probability of immediate success in terms of task performance, but the subjective probability of moving on to the next step in the path.

Although Raynor and Entin concluded that the interactions observed in the 1982 experiment and other similar studies were generally consistent with theoretical expectations for achievement motivation within contingent path conditions, they also made two further important conclusions. Firstly, they concluded that the results demonstrated unreliability in the Mehrabian measure alone as a means of assessing

individual differences in achievement motivation. Secondly, and of particular relevance to the present programme of research, Raynor and Entin (1982) come to the following conclusion.

If this (interpretation) is correct, future orientation in the form of a contingent path may often involve more than the accentuation of characteristic differences in achievement-related motives, as originally supposed in the elaborated theory. (p.163)

This conclusion prompts a question. If factors other than achievement motivation may be affecting contingent path behaviour, what might those factors be? It is proposed in the following section of this chapter that a compelling case can be made for the motivating effects of Goal Coherence in a contingent path context. It is consequently argued that a contingent versus noncontingent path setting is wholly appropriate to test Goal Coherence against behavioural criteria.

6.5 Contingent and Noncontingent Paths and Goal Coherence

A central element of Raynor and Entin's work is the concept of individual differences in perceived importance of task performance related to the future. It is argued here that the framework supplied by Raynor

and Entin is well suited to test Goal Coherence against behavioural criteria.

The results of empirical work cast a certain amount of doubt on the suitability of Achievement Motivation to serve as a sensitive measure of individual differences in behaviour in the contingent versus noncontingent context. In a number of contingent path experiments reviewed by Raynor and Entin (1982), predictions about behaviour, based on subjects' achievement motivation scores, were not upheld. Contingent path behaviour appears to be highly dependent upon two elements, future orientation, and the ability to perceive a need for success in one step of a path as vital to the opportunity to progress along the path. It appears improbable that achievement motivation is a sensitive measure of either of these elements.

However, it is argued here that Goal Coherence should serve as sensitive measure of individual differences in task performance in the contingent versus noncontingent context. Individuals high in Goal Coherence may be expected to respond more effectively to performance tasks in a contingent condition than individuals low in Goal Coherence. This is because high Goal Coherent individuals will be strongly motivated to succeed in tasks that are contingent upon each other, and upon the likelihood of attaining an ultimate goal.

According to Raynor and Entin (1982), a

noncontingent path condition may result in some suppression of nAch and a consequent reduction in motivation and performance. It is argued in this chapter, however, that differences in motivation and performance can be more adequately explained by individual differences in the arousal of Goal Coherence in contingent path conditions.

Support for this argument can be drawn from the theoretical underpinning to Goal Coherence described in detail in Chapter 3 of this thesis, and from the relationship between Goal Coherence and other measures of future oriented behaviour recorded in the construct validity studies described in Chapter 5. A predominant feature of Goal Coherence is future orientation. It is a feature consisting of two components, as follows.

Firstly, Goal Coherent individuals should be more highly motivated than others to perform tasks or achieve intermediate goals that effect the ability to attain a superordinate goal. Secondly, taking a broader theoretical perspective, Goal Coherent individuals may be expected to recognise more readily than others a context within which goal attainment may be achieved via a series of steps.

It is therefore argued that task performance in a contingent versus noncontingent path context will provide an appropriate set of external behavioural criteria against which to measure the effects of

individual differences in Goal Coherence.

These arguments were ordered into a set of formally stated hypotheses concerning the predicted relationship between Goal Coherence and behaviour in contingent versus noncontingent path settings. These hypotheses were as follows.

- 1 Goal Coherence will be positively related to, and demonstrate capability to serve as a predictor of, successful performance at tasks presented in a contingent path condition.
- 2 There will be no relationship between Goal Coherence and task performance at tasks presented in a noncontingent path condition.
- 3 Goal Coherence will be positively related to individuals' ability to recognise a contingent path.

The studies undertaken to test the hypotheses listed above form the final phase of the present research programme. The following chapter describes these studies and their outcomes.

CHAPTER 7

TESTING THE HTQ AGAINST BEHAVIOURAL CRITERIA - STUDIES 9 AND 10

7.1 Introduction

This chapter describes two studies which were undertaken to test the validity of the HTQ measure of Goal Coherence against external behavioural criteria. The theoretical and empirical background to the chosen context for the studies was described in Chapter 6. Briefly, Raynor et al (1978), and Raynor and Entin (1982) reviewed several studies using designs containing contingent versus noncontingent path performance tasks as a means of investigating the effects on performance of motivation and future orientation. In a typical contingent path condition, subjects are faced with four separate tasks. In order to proceed from task one to task four, each subject must fulfil certain performance criteria at the intermediate tasks. Failure at the first task bars progress to all subsequent tasks. The same holds true for tasks two and three. In the noncontingent condition, subjects are faced with the same four tasks but are given the opportunity to attempt all four regardless of performance. Contingency versus noncontingency is described to subjects by verbal instruction.

Results from a number of studies reviewed by Raynor and Entin cast doubts on the effectiveness of achievement motivation as a future-oriented measure of individual differences in contingent versus noncontingent path performance. It was subsequently argued in the previous chapter that Goal Coherence may possess many of the characteristics of such a future-oriented measure, and that the contingent versus noncontingent path context would be appropriate to test the HTQ against behavioural criteria.

7.2 Study 9

7.2.1 Introduction

Goal Coherence is proposed to be a measure of individual differences in the ability to perceive the value of success in sub-goal performance to success at a higher level goal. Therefore, given the nature of contingent path behaviour described by Raynor and Entin (1982), Goal Coherence should be a sensitive measure of individual differences in performance in a contingent versus noncontingent path context.

For Study 9, it was predicted that individual differences in Goal Coherence would affect task performance in a contingent path condition. Specifically, subjects scoring more highly on Goal Coherence should perform better in the contingent path

condition, as the strongly future-oriented nature of Goal Coherence should be sensitive to the contextual cues of a contingent path condition. Conversely, it was further predicted that there should be no significant difference in performance as a function of Goal Coherence in a noncontingent path condition. An experimental design similar to that employed in some earlier contingent path studies was used. The dependent performance measures were derived from subjects' scores on sets of arithmetical and anagrammatic problems solved and attempted, and the contingent versus noncontingent conditions were induced verbally.

As an additional means of testing the sensitivity of Goal Coherence to contingent versus noncontingent path conditions at the beginning of each path, data from the first test alone in both conditions will be presented separately. The rationale for this strategy can be found in Raynor's (1982) description of the nature of contingency versus noncontingency. Raynor makes it clear that the tendency to achieve in task performance at the first step of a contingent path is the total of the component tendencies to achieve. In the case of a noncontingent path, only the component tendency to achieve aroused by the first step of the path is proposed to represent the total motivation to achieve. In other words, individual differences in Goal Coherence should affect contingent versus noncontingent task performance in test one separately in the present study, as well as across all four tests.

The following predictions were made before carrying out the study.

- 1 There would be a positive significant relationship between Goal Coherence and numbers of test problems attempted and correctly solved in the contingent path condition.
- 2 Goal Coherence would demonstrate the capability to serve as a predictor of performance in the contingent path condition
- 3 There would be no significant relationship between Goal Coherence and performance in the noncontingent path condition, neither would Goal Coherence demonstrate the capability to serve as a predictor of performance in the noncontingent path condition.
- 4 Results from test 1 alone would support the predictions made in 1-3 above.

7.2.2 Method

Subjects

There were 72 subjects, staff and students from a number of Departments within the Polytechnic. Subjects' ages ranged from 18 to 47. There were 43 females and 29 males.

Procedure

Subjects were randomly allocated either to the contingent path or noncontingent path condition, and were tested in groups of varying numbers from 5 to 8 over two days, each group consisting of subjects all belonging to either the contingent or noncontingent condition. The study was conducted in a quiet room, with each subject sitting at a separate desk. Pilot studies using volunteers not taking part in the experiment had been carried out to establish optimum completion times for each of the four tests. Subjects in the contingent path condition were given the following instructions.

You are asked to undertake a performance task consisting of 4 tests, each containing 16 arithmetical and anagrammatic problems. One point will be awarded for each problem correctly answered, and your aim is to score as many points as you can across the four tests. However, although everyone will be given Test 1, only those who perform to a certain standard, represented by a minimum number of correct answers out of 16 within the permitted time, will be allowed to proceed to Test 2. The same principle applies to Tests 2 and 3. In other words, your performance at one test determines whether or not you get the opportunity to attempt the next test. Before

you begin the first test, you will be asked to complete a short questionnaire.

Subjects in the noncontingent path condition were given the following instructions.

You are asked to undertake a performance task consisting of 4 tests, each containing 16 arithmetical and anagrammatic problems. One point will be awarded for each problem correctly answered, and your aim is to score as many points as you can across the four tests. Each test is timed, and you will attempt all four tests. Before you begin the first test, you will be asked to complete a short questionnaire.

Subjects were asked if they understood what was required of them, then each subject completed the HTQ before the first test was administered. An example of each of the four tests is given in Appendix B.

The time allowed for all subjects for tests 1 and 2 was 4.5 minutes. 5 minutes was allowed for test 3, and 6 minutes for test 4. Subjects were notified of the time allowed before they commenced each test. At the end of each test, the scores for every subject were calculated, and subjects were allowed to proceed to the next test on the following basis.

- 1 A score of 13 from 16 items correct for test 1
 permitted progression to test 2
- 2 A score of 14 from 16 items correct for test 2
 permitted progression to test 3
- 3 A score of 15 from 16 items correct for test 3
 permitted progression to test 4

When scores for each test had been calculated, subjects who did not meet the criterion for any test were thanked, and asked to leave the room while the next test was distributed to successful subjects. At the end of each complete session, remaining subjects were thanked. At the end of the two days of the experimental run, the Goal Coherence scores for each subject were calculated, and the following analyses conducted.

7.2.3 Results

Correlation coefficients and statistics from regression analyses were computed for the contingent path and noncontingent path conditions problems attempted and problems solved, all tests, and for test 1 separately. In addition, the proportion of subjects passing each phase in the contingent path condition is shown. Results from all tests, contingent and noncontingent path conditions are shown in Table 7.1, on the following page.

ALL TESTS

Contingent Path			Noncontingent Path	
N=36			N=36	
Descriptive Statistics				
	mean	sd	mean	sd
Goal Coherence	62.36	10.17	63.97	7.92
problems				
attempted	32.39	19.10	53.77	6.98
solved	28.94	19.01	47.47	8.56
Correlations				
	Goal Coherence		G.Coherence	
attempted	.530, p<0.001		.030, p>0.05	
solved	.526, p<0.001		.032, p>0.05	
Regression Statistics				
Goal Coherence on problems attempted				
adjusted R2	.259		-.028	
Beta	.529		.031	
t	3.642, p<0.001		.18, p>0.05	
Goal Coherence on problems solved				
adjusted R2	.255		.027	
Beta	.526		.032	
t	3.604, p<0.001		.19, p>0.05	

Table 7.1 Descriptive statistics, regression and correlation statistics from all tests

Results from test 1 alone, contingent and noncontingent path conditions are shown in Table 7.2, on the following page.

TEST ONE

Contingent Path			Descriptive Statistics		Noncontingent Path	
	mean	sd			mean	sd
problems						
attempted	14.81	1.74			14.28	1.43
solved	13.17	2.35			12.83	1.84
Correlations						
	Goal Coherence				G.Coherence	
attempted	.399, p<0.01				.113, p>0.05	
solved	.535, p<0.001				.203, p>0.05	
Regression Statistics						
Goal Coherence on problems attempted						
adjusted R2	.134				.016	
Beta	.399				.113	
t	2.535, p<0.05				.66, p>0.05	
Goal Coherence on problems solved						
adjusted R2	.265				.013	
Beta	.535				.203	
t	3.688, p<0.001				1.21, p>0.05	

Table 7.2 Descriptive statistics, regression and correlation statistics from test 1

Computations for differences between correlations (Bruning and Kintz, 1968) were undertaken. For all tests, the difference between correlations for problems attempted and problems solved was significant, $P < 0.05$. For test one alone, the difference between correlations for problems attempted was not significant, and the

difference between correlations for problems solved was significant, $P < 0.05$.

The proportion of subjects passing each phase in the contingent path condition is shown in Table 7.3, below.

	number	% of total	Goal C. scores in top 25%
Test 1	21	58.3	11
Test 2	13	36.1	8
Test 3	7	19.4	5

Table 7.3 Number and percentage of total subjects successfully passing each test phase, contingent path condition, together with number of successful subjects whose Goal Coherence scores fall within the top 25% of the group total.

7.2.4 Discussion

The results appear to be reasonably encouraging. The predictions concerning the relationship between Goal Coherence and problems attempted and solved are generally upheld.

In the contingent path condition, all tests, the correlations between Goal Coherence and problems attempted and solved are positive and significant. The regression statistics suggest that Goal Coherence may be a moderate predictor of problems attempted and problems solved.

In the noncontingent path condition, there are no significant relationships between Goal Coherence and either of the dependent variables, and the regression statistics suggest that Goal Coherence, in the noncontingent path situation, does not serve as a predictor of problems attempted or solved.

The data presented separately for test 1 alone would appear to generally reflect the results recorded for all tests. Similar positive and significant relationships between Goal Coherence and the dependent variables were found in the contingent path condition, while no such relationships occurred in the noncontingent path condition. Additionally, as the number of subjects successfully passing each test phase in the contingent path condition diminishes, the remaining number whose Goal Coherence scores exceed the group mean increases proportionately. 5 out of the total 7 who successfully reached test 4 have Goal Coherence scores that fall within the upper 25% of the group total.

The differences between correlations were statistically significant, with the exception of problems attempted for test one data. Raynor (1970) has noted that problems attempted in a future-oriented contingent versus noncontingent situation sometimes seems to be a less than consistent indicator of differences in task performance. This is perhaps due to lower levels of cued arousability than problems solved, given that the latter contributes more directly to

contingent path progress. This was possibly the case in the present study.

It would be an attractive option to accept these results as an indication that Goal Coherence, as hypothesised, does serve as a useful predictor of performance in a future-oriented situation such as that created by a contingent path condition. However, any conclusions drawn on the strength of the present study must be qualified by the following major concerns.

- 1 The significance of the test statistics
- 2 Alternative explanations for the results

The remainder of this discussion will address these two concerns.

The significance of the test statistics

There is a primary criticism often levelled at research which relies heavily on correlational analysis, as follows. Provided the subject pool is sufficiently large, a statistically significant coefficient is often likely to be recorded, and the experimental hypotheses judged to be upheld. This criticism is frequently valid, and must be addressed with regard to the present research.

Although statistically significant at a conservative level, the absolute significance of the

correlation coefficients and regression statistics reported above must be judged within a proper context. Correlations between Goal Coherence and problems attempted and solved average around the 0.50 level in the contingent path condition. This is not excessively high. Additionally, while the t statistic for each of the four regression models reported in the contingent path condition is statistically significant, the value of adjusted R squared in each case is not high. The HTQ is a new scale. Thus, even if the coefficients reported had been much higher, any consequent enthusiasm must be tempered by an acknowledgement of the need for further research to investigate the hypothesised relationships between Goal Coherence and behaviour.

This being said, taken with the results from the noncontingent path condition, the relationships observed between Goal Coherence and performance in the present study are moderately encouraging, and of a nature which requires closer scrutiny of possible alternative explanations.

Alternative explanations for the results

There are number of alternative explanations for the results reported from the present study, including the following.

- 1 Subjects' progress from one contingent path test to the next was determined not by Goal Coherence, but by boredom
- 2 Subjects progressed from one contingent path test to the next as a function of perseverance or task persistence, not Goal Coherence
- 3 Subjects' progress from one contingent path test to the next was due to individual differences in numerical and verbal ability
- 4 The contingent path condition cued need for achievement, not Goal Coherence
- 5 The subjects in the contingent path condition were more goal coherent
- 6 The HTQ measures something else other than, or as well as future-oriented motivation

The remainder of this discussion will address each of these alternative explanations, and will consider their strength in relation to each other.

Subjects' progress from one contingent path test to the next was determined by boredom

It is a plausible argument, that a group of subjects - usually undergraduate students - in a

psychological study, faced with a set of cognitive processing tasks, will simply get bored at some stage of the proceedings, and stop trying. Indeed the wider issue of using the default subject group - undergraduate psychology students participating as a course requirement, and arguably more prone to the effects of 'experiment fatigue' - is one which understandably gets the goat of many authorities. In the case of the present study, more than a third of the subjects were not students, and those that were, volunteered independently of any course requirements. Nevertheless, boredom with the tasks in the contingent path condition cannot be excluded from any range of potential effects on the eventual outcome of the present study, any more than it can from other similar studies.

Subjects progressed from one contingent path test to the next as a function of perseverance or task persistence

As Allport (1937) argued, perseverence or persistence may be strongly task-specific. The nature of the tests in a contingent path condition has been considered previously by Raynor (1982), and the effects of perseverance on performance in a contingent path are not regarded as potentially strong. In addition, as illustrated in Chapter 4, perseverance has been empirically linked to the completion of single tasks, rather than linked tasks contributing to the attainment of a superordinate goal. Therefore, although it can be argued that in situations such as contingent path task

performance, an element of perseverance cannot be totally excluded, it is not felt that the nature of the tasks, or the nature of perseverance itself recommend this explanation as a strong alternative.

Subjects' progress from one contingent path test to the next was affected by numerical and verbal ability

The tests were subjected to a pilot study to establish optimum completion times. There were no reported effects from individual differences in ability between pilot study subjects drawn from the same population as that sampled in the study itself. In addition, the descriptive statistics from the noncontingent path condition, all tests, suggest that the level of variance in problems attempted or solved was not excessively high.

Clearly there will always be differences in numerical and verbal ability between subjects. But it is felt that the test items were sufficiently well matched to the abilities of the sample population, to suggest that this alternative explanation may not be especially strong.

The contingent path condition cued need for achievement,
not Goal Coherence

Most of the previous studies in the area, including those reported by Raynor and Entin (1982), attempted to use some measure of achievement motivation as a predictor of individual differences in task performance. As Raynor and Entin (1982) have observed, nAch proved to be an inconsistent predictor in contingent versus noncontingent path contexts. This may be explained, given the generally accepted nature of nAch. McClelland (1985a) gives a pertinent definition of nAch, as follows.

...an achievement incentive is one in which a person gets satisfaction from doing something better for its own sake, or to show that he or she is more capable of doing something.

(p.229)

It is consequently arguable that the strongly future-oriented context of contingent path performance is not closely related either to the concept of an individual doing something for its own sake, or merely to demonstrate capability in task performance. Therefore it seems possible to argue that nAch may not be an accurate and consistent determinant of individual differences in future-oriented contexts.

There is an additional issue to be considered with regard to the possible influence of nAch in the context of the present study. The issue concerns the type of task which subjects are asked to perform in contingent versus noncontingent contexts. McClelland (1985a) puts forward the following arguments.

...the achievement incentive is defined by the intrinsic difficulty or challenge of the task. If the incentive is to "do better", neither a very easy task nor a very difficult one provides an opportunity to do better. If the task is easy, there is no question of doing it better, since anyone can do it; if it is very difficult there is also no question of doing it better, because everyone is likely to fail in attempting it. (p.231)

An essential component of achievement motivation rests on the contention that nAch will determine differences in individual performance in tasks of varying difficulty. However, an essential element of contingent versus noncontingent path experiments is that subjects in both conditions are given identical tasks. The context of task performance differs across conditions, the tasks themselves do not. It may not be surprising, then, that Raynor and Entin (1982) conclude that motivational determinants other than nAch may be responsible for the inconsistent results observed in many reported studies.

Despite these arguments, the relationship between nAch and future-orientation must remain contentious. Although much of the previous research in the area suggests that nAch is an inconsistent predictor of future-oriented motivation, effects as a perceived consequence of nAch have been reported (Raynor, 1982). An explanation for the results of the present study in terms of the contingent path cueing effects on need for achievement rather than, or as well as, Goal Coherence, cannot be excluded. Indeed the issue is recognised as a critical one, and is addressed again in the following chapter.

The subjects in the contingent path condition were more goal coherent

This is a simple but important alternative to be considered. In the case of the present study, it may be observed that the difference between mean Goal Coherence scores for each condition, shown in Table 7.1, is trivial, suggesting that performance was not materially affected by differences in HTQ scores.

The HTQ measures something else other than, or as well as future-oriented motivation

This issue really pervades the entire discussion. To most of the arguments raised above, one might add the comment that, according to the information in Table 7.3,

the proportion of subjects who successfully passed from one phase of the contingent path to the next contained an increasingly greater number of individuals high in Goal Coherence. Those eventually attempting test 4 were predominantly high in Goal Coherence.

It is certainly true to say that they scored highly on the HTQ, but that rather begs the question of what the HTQ may actually be measuring. The concern that the scale is either measuring what it is supposed to, or is concurrently measuring some other construct, is a major one. Evidence from validity and reliability testing undertaken earlier in the programme was moderately encouraging, but had it been spectacular, there would still be no supportable reason to exclude this present issue from the list of alternative explanations. It is an explanation which may be affected by additional research within the present programme, and by future studies of external validation. But it is a critical issue that relates to the validity of any self-report measure of personality or motivation, especially, perhaps, during the early stages of development.

Of the alternative explanations considered above, it may be argued that the potential for subject boredom, the possible effects of nAch, and the issue of HTQ validity are the most important.

The potential for subject boredom is always likely to be a problem. It is difficult to see how it can be effectively legislated for, or indeed reliably measured. Arguments for the possible influence of nAch on task performance in future-oriented contexts are equivocal, and cannot be discounted. The issue is raised again in the following chapter. The final explanation considered - that the HTQ might not measure what it is claimed to measure - is probably the most crucial issue of all. It cannot be excluded from any discussion on the present or future results, nor indeed should it.

The remaining three explanations are by no means trivial, but may to some extent be marginalised both by arguments raised against them, and by comparison with the other possible explanations.

It may be reasonable to view the results of the present study as quite encouraging. The results were in the predicted direction, and the hypothesised relationships appear to have been observed. But any encouragement must be tempered by the strength of the alternative explanations considered above. The issues raised by those explanations are unlikely to be resolved within the parameters of the present programme of research. Indeed, they possess a scope far wider than that occupied by the development of a single scale. Their importance should not be underestimated.

7.3 Study 10

7.3.1 Introduction

The second study designed to test the validity of the HTQ measure of Goal Coherence against an external behavioural criterion, was also concerned with individual differences in Goal Coherence in the context of contingent path problem-solving. However, taking a broader theoretical perspective, the study was directed towards a different behavioural criterion from performance alone.

In all previous studies which used a contingent versus noncontingent path context to investigate the proposed effects of various motivating determinants, subjects were cued verbally to the contingent condition. The present study was designed to investigate whether individuals who differed in levels of Goal Coherence, would demonstrate differing abilities to recognise the presence of a contingent path in the absence of verbal cueing.

The results from Study 9 give some indication that strongly goal coherent individuals may perform better in a contingent path context than will individuals who score less highly on Goal Coherence. It was argued that the observed differences in performance occur because the strongly future-oriented nature of Goal Coherence

may be aroused by the contextual cues of a contingent path condition. In the present study, it is further argued that an additional significant reason for such differences in performance is that individuals high in Goal Coherence may more readily recognise the presence of a contingent path, regardless of verbal cueing.

Study 10 was explicitly designed to test the latter argument. This resulted in the framing of two further hypotheses, as listed below.

- 1 Individuals rated high in Goal Coherence will more readily recognise a contingent path than individuals rated intermediate or low in Goal Coherence.
- 2 Individuals rated intermediate in Goal Coherence will more readily recognise a contingent path than individuals rated low in Goal Coherence.

7.3.2 Method

Subjects

There were 72 subjects, staff and students from the polytechnic. Subjects' ages ranged from 19 to 38. There were 39 females and 33 males.

Materials

A fifteen item test sheet was constructed, consisting of 14 simple arithmetical questions numbered

1 to 14, and one cryptic, or coded problem, numbered 15. An example of the test sheet is given in Appendix B.

The key to solving the cryptic problem is illustrated in figure 7.1, below.

(A)	6	1	11	13	2	q5	3	14	4	7	12	9	q10	8
(B)	3	15	13	13	21	14	9	3	1	20	9	15	14	19
(C)	C	O	M	M	U	N	I	C	A	T	I	O	N	S

Figure 7.1 Key to the cryptic problem used in Study 10

Line (A) in the above figure shows the cryptic problem as it appears on the test sheet. Each of the 14 items that comprise the problem refers exactly to the number of one of the 14 preceding arithmetical questions. For example, the first item in the problem, 6, refers to arithmetical question number 6. The items q5 (question 5) and q10 (question 10) are clues to the solution.

Line (B), above, shows the answer to the arithmetical questions as they appear in the sequence adopted for the cryptic problem, shown in line (A). For example, the answer to arithmetical question 6, is 3; the answer to arithmetical question 1, is 15.

Line (C) above shows the solution to the cryptic

problem, obtained by transposing the answer to each of the arithmetical questions to its corresponding letter of the alphabet. For example, the answer to question 6 is 3, which is transposed to the letter C; the answer to question 1 is 15, which is transposed to the letter O.

The cryptic problem is therefore solved by making the procedural and logical connections between the number of each arithmetical question, the answer to that question, and the fact that that answer can be transposed into a letter of the alphabet to form the word COMMUNICATIONS.

Procedure

Subjects were tested in groups of varying numbers from 5 to 8 in one day, beginning on the day following the end of Study 9. They were all asked to complete the HTQ under standard conditions. They were then given the Study 10 test sheet and asked to read the instructions on the front page. Subjects were then asked if they understood what was required of them, and if they had any questions. When questions had been satisfactorily dealt with, subjects were asked to begin the test.

A pilot study had been carried out with 12 students, not participating in the experiment, solving the 14 arithmetical problems only. The average solution time for all problems was 7 minutes 40 seconds, with an

accuracy rate slightly in excess of 95%. Subjects participating in the experiment were given 12 minutes to attempt the test, allowing extra time to attempt the cryptic problem.

Immediately after completing their attempt on the test sheet, subjects were given the data sheet, an example of which appears in Appendix B, and asked to respond to the questions contained on it. Subjects were thanked for their participation and asked not to discuss the experiment with anyone until the end of the final test session that evening.

Further information concerning the experiment, including the solution to the cryptic problem (which many subjects were keen to learn!), was posted on a departmental noticeboard the following day.

7.3.3 Results

In reporting the results from the present study, it was decided to follow the pattern set in most previous studies in the area, and to divide the subject population into three motivation sub-groups, high, medium and low. The criteria used to separate subjects into the three groups of high, medium and low Goal Coherence were as follows.

The mean for all subjects was calculated and rounded off at 63, and the standard deviation was

calculated to be 10.2. Subjects whose scores fell within one standard deviation above or below the mean were classified medium goal coherent. Subjects whose scores were in excess of one standard deviation above the mean were classified as high goal coherent. Subjects whose scores were lower than one standard deviation below the mean were classified as low goal coherent.

The cut-off scores for low and high groups were rounded off, and the resultant classifications were made according to the following scores.

Low goal coherent - a score of 53 and below

Medium goal coherent - a score of 54 to 73

High goal coherent - a score of 74 and above

The following scoring schema was used to rate subjects' performance on the test, the information being extracted from the test paper and the data sheet completed by subjects immediately after their attempt at the test. In each instance, a point was awarded for a piece of behaviour that was judged to be consistent with the recognition of the contingent path context of the task.

Data Sheet

- 1 One point each awarded for a 'yes' response to questions 1 and 2. Looking ahead at a set of tasks

in an attempt to identify a superordinate goal, and attempting to gather as much information as possible about a problem, are, it is argued, both indicators of behaviour consistent with the identification of a contingent path context.

- 2 One point awarded for any indication in the response to question 3 that the subject understood the nature of the cryptic problem.

Test Sheet

- 1 One point awarded for writing down the alphabet and accompanying it with the corresponding numerical values of 1 to 26 for each letter. Again, this is judged to be strongly indicative of goal coherent behaviour consistent with the ability to identify a contingent path context.
- 2 One point for partially or wholly solving the cryptic problem

Thus a total of 5 points was possible for each subject.

Table 7.4, on the following page, shows the descriptive statistics for each Goal Coherence group.

Goal Coherence Group	N	Mean
High	15	2.07
Medium	44	0.91
Low	13	0.62

Table 7.4 Descriptive statistics for each Goal Coherence group, Study 10

A between groups analysis of variance was carried out, the result of which was as follows. $F = 8.52$, ($df = 2, 69$) $p < 0.001$.

In addition, T Tests were carried out to compare the differences between High and Medium, and Medium and Low Goal Coherence groups, with the following results.

Comparing the scores for High and Medium Goal Coherence, it was found that $t = 3.64$, $df = 57$, $p < 0.001$.

Comparing the scores for Medium and Low Goal Coherence, it was found that $t = 0.97$, $df = 55$, $p > 0.05$.

7.3.4 Discussion

Interpretation of the results from Study 10 reveals the following.

- 1 Hypothesis 1 was supported, in that individuals rated high in Goal Coherence exhibited behaviour more consistent with the recognition of a contingent path than did individuals rated intermediate or low in Goal Coherence.
- 2 Hypothesis 2 was partially supported, in that individuals rated intermediate in Goal Coherence exhibited behaviour more consistent with the recognition of a contingent path than did individuals rated low in Goal Coherence, however the difference between mean scores was not significant.

As in Study 9, the results from Study 10 were quite encouraging. There was support for both hypotheses, although, with regard to the medium and low goal coherence groups, the scores were in the expected direction, but the differences between them were not statistically significant. There was, however, a significant level of variance in scores between the three groups.

There is an element of subjectivity in the schema, used to calculate each subject's score, but it is

maintained that the criteria adopted were appropriate. Each activity or piece of behaviour selected to count as a point scored, does, it is argued, indicate that recognition of a contingent path context has occurred.

The overall task itself was clearly set in a contingent path context. The ultimate aim was to score as highly as possible. The superordinate goal was to solve the cryptic problem, and the subordinate goals were to solve the arithmetical questions and to make the logical links between the answers to those questions and the number sequence in the cryptic problem. The activities and behaviours for which the points were awarded are, it is argued, all consequent to individual differences in the ability to recognise a contingent path context.

Study 10 has raised certain interesting questions. For example, the results appear to suggest that individuals high in Goal Coherence may more readily recognise a contingent path context than individuals who are medium or low in Goal Coherence. If this is so, does it occur purely through the interaction between the contingent path situation and individual differences in Goal Coherence, or does it occur because highly goal coherent people spend more time actively looking for contingent path contexts, perhaps because they feel most confident and competent working within such contexts?

Although beyond the scope of the present programme of research, there is clearly much benefit that might be gained from further research in the area of contingent path recognition.

Also of interest are the observed differences in behaviour between high/medium and medium/low goal coherents. In the present study, the HTQ appeared to be slightly more sensitive towards the upper end of the scale, in that the statistical significance of performance observed between high and medium goal coherents was not observed between medium and low goal coherents. It seems possible that the HTQ may be a particularly sensitive identifier of highly future-oriented individuals. If this is so, there are several potentially useful applied contexts for HTQ implementation. This issue is addressed further in Chapter 9 of the present thesis.

7.4 Conclusions

Two studies have been undertaken to test the external validity of the HTQ against behavioural criteria. In the first study, Study 9 in the present programme of research, a conventional contingent versus noncontingent context was used to investigate the effects of individual differences in Goal Coherence on task performance. The predictions concerning the behaviour of different goal coherent groups were largely

upheld. A number of alternative explanations for the results were considered, and compared with each other in terms of relative strength.

In the second study, Study 10, the theoretical perspective was broadened to investigate the effects of Goal Coherence on contingent path recognition. As in Study 9, the predictions concerning the behaviour of different goal coherent groups appeared to be upheld.

Study 10 appears to provide some evidence that the HTQ may be a particularly sensitive measure of Goal Coherence in the intermediate and upper ranges of scores.

Study 10 raised questions concerning the nature of the interaction between Goal Coherence and the contingent path context, and there was an indication that further research in the area might prove useful.

Clearly, there is a need for substantial further investigation of the scale, both in contingent versus noncontingent path contexts and in a wider range of behavioural settings. Such investigation is beyond the scope of the present programme of research, but the issue is taken up again in the final chapter of the present thesis.

The results from both studies appear to provide some encouraging evidence that the HTQ dimension of Goal

Coherence may possess some of the potential necessary to serve as a useful measure of future-oriented motivation. As already discussed, however, any encouragement must be moderated by the caveats raised in the consideration of alternative explanations of observed results.

Some further points of interest arising from Studies 9 and 10 are now discussed in the following chapter.

CHAPTER 8

SUMMARY AND GENERAL DISCUSSION

8.1 Introduction

This chapter contains a summary of the research programme, and addresses specific issues raised during the programme. The chapter is in three sections, as follows.

- 1 A brief summary of each preceding chapter, with the specific discussion points indicated
- 2 A discussion of those specific points
- 3 General discussion and conclusions

8.2 Summary of Preceding Chapters

Chapters 1 and 2 contain an account of the development of the study of motivation, from the work of McDougall and Freud, to that of Weiner and Cattell. In the first two chapters, emphasis was placed on the theoretical content of each area of study, and each area was considered in the context of its relationship with the present programme of research. A number of interesting issues were illustrated in the previous research, and a

number of unanswered questions raised, specifically in relation to the identification and measurement of individual differences in motivation. It was concluded that there was a need for further investigation into the determinants of motivation, using a formal methodological approach such as that offered by factor analysis.

Chapter 3 address two issues, the initial hypothesis for the research programme, and the rationale for the chosen methodology. A five factor hypothesis of trait-based motivation was proposed, involving the following factors.

- I Goal Coherence
- II Planning
- III Strength of Will
- IV Self Evaluation
- V Perseverance

Theoretical support for each factor was established, and the aims of the research programme were defined, as listed below.

- 1 To test the five factor hypothesis of human motivation
- 2 To use one or more of those five factors as the foundation for the development and evaluation of a new scale to measure motivation

The remainder of Chapter 3 gave the rationale for the chosen methodology, namely factor analysis, and a brief definition of the psychometric framework upon which the research programme rests.

An important issue arises from Chapter 3, and will be discussed in the second section of the present chapter. This issue is as follows.

- 1 How appropriate was the initial hypothesis as a starting point from which to begin a study of motivation?

Chapter 4 contains reports of five empirical studies which trace the development of a questionnaire designed around the five hypothesised factors, and intended to measure cross-situational motivation. The chapter describes how the 46 item questionnaire was generated and administered, and, as a function of factor analysis and questionnaire refinement, the five factor model was rejected in favour of a two factor hypothesis. The two factors were named Goal Coherence and Strength of Will. Following further analysis and scale refinement, the two factor model was eventually rejected in favour of a unidimensional measure, retaining the title Goal Coherence.

Further confirmatory analysis provided support for the single factor model, and a finalised version of the questionnaire with an item set of 15 was constructed.

The questionnaire was judged to be of acceptable mathematical and construct strength, and the chapter concludes with the decision to progress with further empirical studies to establish levels of test-retest reliability and construct validity. A number of points were raised with regard to the value of modern confirmatory techniques in the processes of establishing dimensionality of model.

Two further issues for discussion emerge from Chapter 4, and are listed below.

- 1 Does the evidence fully support the decisions to reduce the number of factors from 5 to 1?
- 2 Was a proper balance achieved between the mathematical demands of factor analysis and psychological demands of trait description?

Chapter 5 describes three further empirical studies, together with the necessary statistical procedures carried out to test the questionnaire (now named the Hyland-Thacker Questionnaire, or HTQ) for construct validity, test-retest reliability and internal consistency. The results of these studies were generally in the predicted direction. Construct validity, test-retest reliability and internal consistency were found to be at a generally acceptable level, and it was decided to proceed with the final phase of the research programme, namely to test the HTQ against external

behavioural criteria. The following issues for discussion emerged from Chapter 5.

- 1 The debate surrounding the use and interpretation of item to criterion correlation and Cronbach's alpha to measure internal consistency
- 2 The relationship between Goal Coherence and social desirability

Chapter 6 describes the theoretical and empirical work which forms the background to the choice of external behavioural criteria chosen to further test the validity of the HTQ. Some of the work of Raynor, Entin, and colleagues, in the area of contingent and noncontingent path behaviour is summarised, and the future-oriented context of this work is argued to be appropriate to the needs of the present research programme.

Chapter 7 describes two empirical studies carried out to test the HTQ against two behavioural criteria, namely, task performance in contingent versus noncontingent path conditions, and the ability of individuals to recognise a contingent path. It is concluded that the results from both studies appear to provide some encouragement that the HTQ dimension of Goal Coherence may possess some of the potential to be a useful measure of future-oriented motivation. These conclusions are set in the context of a number of

caveats raised by a discussion of alternative explanations of the results from both studies.

Two issues for discussion arise from Chapters 6 and 7, as follows.

- 1 The appropriateness of the chosen behavioural context
- 2 The appropriateness of the chosen behavioural criteria

8.3 Discussion of Specific Issues

8.3.1 Introduction

In the first section of this chapter seven specific points requiring further discussion were identified. These were as follows.

- 1 The appropriateness of the initial hypothesis as a starting point from which to begin a study of motivation
- 2 Does the evidence fully support the decisions to reduce the number of factors from 5 to 1?

- 3 Was a proper balance achieved between the mathematical demands of factor analysis and psychological demands of trait description?
- 4 The debate surrounding the use and interpretation of item to criterion correlation and Cronbach's alpha to measure internal consistency
- 5 The relationship between Goal Coherence and social desirability
- 6 The adequacy of the behavioural context in which it was chosen to further test the validity of the HTQ
- 7 The adequacy of the behavioural criteria used to further test the validity of the HTQ

The remainder of this section addresses these seven issues.

8.3.2 Issue 1

How appropriate was the initial hypothesis as a starting point from which to begin a study of motivation

It is proper that this issue is addressed first, not only because it deals with the fundamental subject

matter of the research programme, but also because the hypothesis underwent substantial change during the first stages of the programme.

The issue can be addressed from two directions. Firstly, was the initial five factor hypothesis defensible, and secondly, was the scope of the hypothesis suitable for the scope of the research programme?

Cattell (1966) describes a hypothesis in the following way.

The hypothesis...(is)...a working conjecture...derived deductively from a larger theoretical system, or inductively from whatever scanty previous empirical signs existed. (p.41)

It is argued here that the initial hypothesis for the present programme of research was founded both on a suitable theoretical basis, as well as on the product of previous empirical work. The possible effects on motivation of all five factors are supported by sound theoretical argument from a number of sources. In addition, there is a varying degree of empirically derived evidence to support the inclusion of at least some of the factors in the initial hypothesis.

It is further argued that, as was indicated in Chapter 3, there was a recognised need for further research into the nature of all five factors. This need was expressed by several authorities cited in Chapter 3, and provides additional strength to the defence of the initial hypothesis.

With regard to the scope of the initial hypothesis, judgements are more difficult to make. The scope of the hypothesis concerns both its adequacy as a theoretical explanation of cross-situational motivation, and its adequacy as a practical starting point for a three year research programme.

As Gorsuch (1983) has pointed out, one of the thorniest problems of factor-analytic based research is to decide upon the number of factors with which to start and finish. Cattell (personal communication, 1989) and Saville (1990) are embarking upon further factor-analytic research into human motivation. Cattell is returning to the five first-order factors of the MAT (Cattell et al, 1970). Saville is apparently attempting to address a complex 21 factor model. As events were to show during the first stages of the present research programme, the five factor hypothesis was not easily sustained in the light of evidence produced by the factor-analytic studies. It does seem probable that, in the area of motivation and personality, studies which attempt to be over-ambitious in the number of initially proposed factors investigated, run a serious risk of

failing to achieve meaningful results. Further research may offer help in forming more conclusive judgements. The issue of further research in the area is addressed again in the final chapter of the present thesis.

Two arguments can be put forward in defence of the adequacy of the hypothesis as a practical starting point for a three year research programme. Firstly, a more constrained approach may not have offered the same opportunities for initial investigation, in that there might conceivably have been a risk of omitting important theoretical input. In addition, a more constrained hypothesis may not have produced results which, as is the case in the present research, indicate a number of possible directions for further research.

The second argument simply proposes that a more expansive hypothesis may have been very difficult to adequately explore within the some of the temporal and other constraints of the present programme of research. Cattell (1966) has clear views on this particular issue.

...the most inspired research cannot be done...where the schedule is as imperative as a railroad timetable. Instead a researcher must have time - and inclination - to wander through the wilderness of phenomena, watching and listening...The hypothesis spirals out of

the dust of many observations, and is checked

and tried many times. (p.14)

While it is hoped that the present researcher has not spent too much time wandering through the wilderness of phenomena, it is argued, on the basis of the results from the present programme, that the initial five factor hypothesis represents a tenable compromise between Cattell's ideals and the practical constraints of research.

8.3.3 Issue 2

Does the evidence fully support the decisions to reduce the number of factors from 5 to 1?

The problems of establishing dimensionality of model were consistently emphasised throughout Chapters 3 and 4. On the basis of evidence from traditional psychometric techniques, a set of decisions were taken which led to the adoption of a unidimensional model. It is argued here that these decisions to reduce the model to that extent are supportable in the light of evidence from the factor-analytic studies.

Considerable effort was directed towards refining a scale which still retained items designated to two or more factors. The resultant factor structures in every case showed that the only dimension which appeared to support a consistent number of 'clean' items was Goal Coherence. Ambiguity in the form of factors loading

across items assigned to the other four factors persisted throughout the studies. It may be recalled that early emphasis was placed on the future-oriented nature of motivation. However, no attempt was made to bias the outcomes of the factor structures by concentrating solely on future-orientation, or by according less effort in the research leading up to questionnaire construction, to those proposed factors not directly associated with future-orientation.

As well as the evidence from the factor structures, the scree plots from all five studies provide some evidence in favour of reducing the model from five factors to one. As Irvine (1988) has pointed out, the first extracted factor must be treated as an artifact of the factor-analytic procedure until evidence to the contrary has been produced. The evidence provided by the present research seems acceptable in this respect. The difference in eigenvalues between the first factor and others, in all five factor analyses, is sufficient to suggest the presence of a reliable single factor representing a single dimension.

Much emphasis was clearly placed on the factor loadings, and the presence or lack of ambiguity in those loadings. Consideration must therefore be given to the nature of the items themselves. Was ambiguity observed in all but the Goal Coherence dimension because of the strength of that dimension in comparison to the other four proposed factors? Or could a case be made for the

inappropriateness of certain items to represent the dimension to which they were assigned?

Two arguments can be put forward to support the contention that the procedures employed in the present programme of research to generate items were appropriate. Firstly, rigorous methods of domain and literature search advocated by Cattell (1946) and Guilford (1965) were adopted. Furthermore, scientific rather than lay sources were used as the basis of the search.

Secondly, psychometric convention was adhered to with regard to the generation of new items on the basis of factor analysis. Gorsuch (1983) describes this convention in the following way.

...it is not good to identify the constructs in an area by the factoring of items and then build scales from the same factor analysis. One study should factor the items simply to define the constructs in the area, and another study, with new items written to test the interpretations of these constructs, should be used to develop the scales. (p.356)

It may be noted that all the factor-analytic studies leading up the finalised version of the questionnaire in the present programme of research used new and reworded items to support scale construction.

On the strength of the considerations discussed above, and on the other evidence cited in the present section of the thesis, it can be argued that the decisions taken to reduce the 5 factor model to a unidimensional model are justifiable. However, the problems of establishing dimensionality are substantial, and the decisions taken in the present programme are undeniably contentious, as they are in many similar programmes. Consequently it is important to reiterate the potential value to the processes of choosing the best model, that may be accrued through the use of modern confirmatory techniques such as the LISREL program described in previous chapters. The problems of establishing what dimensionality of model best fits the given data were quite self-evident from the first five studies. The techniques employed in those studies were of necessity from the domain of traditional factor analysis. The potential for additional contribution to studies undertaken in contexts similar to that of the present, by recently developed confirmatory techniques, should not be underestimated.

8.3.4 Issue 3

Was a proper balance achieved between the mathematical demands of factor analysis and the psychological demands of trait description?

This issue relates to the arguments put forward by Cattell (1978, 1980) warning against an over-rigid

mathematical approach to scale construction.

As far as the mathematical evidence is concerned, there is no doubt that the factor loadings observed in Study 5 are lower than might be ideally wished. In addition, the loading on item 8 gave some reason for concern in that study, although as table A.2 in Appendix A shows, the loadings did improve in the factoring from the Study 6 administration. Despite these imperfections, it was decided to proceed with tests for validity and reliability. In the event, this decision appears to be justifiable in the light of the results from the validity and reliability tests, and by the evidence from the two final studies in the present programme.

It could be reasonably argued that further work in scale refinement might have been undertaken. Such effort may have been rewarded by a more mathematically ideal factor solution. It may not. Briggs and Cheek (1986) have argued that replicability of factors is perhaps more important than precise mathematical consistency. There appears to be evidence from Studies 4, 5 and 6 (see Table A.2 in Appendix A) that the single Goal Coherence factor replicates acceptably. The resolution of this issue, if indeed there is to be one, may rest on Cattell's insistence that there comes a point in any research programme of a similar nature to the present, when the approach of the psychologist should be allowed to supersede that of the mathematician. The psychologist's approach may be, in fact frequently

appears to be, intuitive. In the case of the present programme of research it is clear that the balance between mathematical and psychological requirements was tipped slightly in favour of the latter, for the reasons given at the end of Chapter 4. The evidence provided by results from subsequent studies perhaps suggest that it was not an improper balance.

8.3.5 Issue 4

The debate surrounding the use and interpretation of item to criterion correlation and Cronbach's alpha to measure internal consistency

This issue was dealt with in some detail in Chapter 5, however, it may be advisable to reiterate the salient arguments proposed at the time.

The conventional psychometric view is that any developing scale should have high internal consistency reliability, for the obvious reason that if part of a test is measuring a variable, then the other parts, if not consistent with it, cannot be measuring the same variable. Cronbach's alpha (Cronbach, 1951) is the usual measure of internal consistency, indicating the average intercorrelation between test items and any set of items drawn from the same domain.

However Cattell has argued (Cattell and Kline,

1977) that in the case of tests which measure aspects of personality, high internal consistency is antithetical to validity, because any item must be narrower than the target criterion being measured. In addition, Kline (1983) has proposed two related arguments. Firstly, Cronbach's alpha increases with item intercorrelations, which according to Cattell (Cattell and Kline, 1978) is an indicator of diminishing validity. Secondly, in any multivariate predictive study involving tests, the maximum multiple correlation between items and the criterion total score is obtained when the variables are uncorrelated.

This must be so, because if two variables are perfectly correlated, one is providing no new information. Therefore maximum validity is obtained, according to both Cattell and Kline, when items correlate not at all with each other, but positively with the criterion. However, it was pointed out that no such ideal test has yet been constructed, and in reality there is a close relationship between item to total correlations and coefficient alpha.

The results from the calculations of internal consistency are not inconsistent with Cattell's requirements for a measure of personality such as the HTQ. While not high in absolute terms, the item to criterion correlations are positive, while the alpha coefficient is of moderate magnitude. Nevertheless a note of caution was sounded against the internal

consistency of the HTQ, and this caution is reiterated here.

8.3.6 Issue 5

The relationship between Goal Coherence and social desirability

This issue was addressed in detail in Chapter 5 of the present thesis, but again, a brief recapitulation of the salient points may be useful.

It is usually argued that a positive relationship between a test and a measure of social desirability implies a response bias towards social acquiescence. In other words, the test is measuring social desirability instead of or as well as its intended target construct.

However, it was argued in Chapter 5 that Goal Coherence may be expected to correlate positively with a measure of social desirability, on the grounds that Goal Coherence may be perceived as a socially desirable trait. The successful achievement of a goal as the product of an ability to identify and attain hierarchically structured subgoals can be regarded as a socially positive attribute. The ability to successfully plan and execute those plans, together with the perseverative element that is present in some HTQ items can also be regarded as a desirable ability,

particularly, perhaps, by those who possess it.

Other arguments supporting this hypothesis were cited from the literature concerning the concept of locus of control, which relates to individuals' acquired generalised expectation about the source of reinforcement for their actions. In particular, the work of Rotter (1966) was described. In addition, the arguments of Hochreich (1975), Stern and Manifold (1977), and Evans (1980), namely that internality is of itself a positive societal value, and internality should be expected to correlate positively with social desirability, were put forward. It was argued earlier in this thesis that aspects of Goal Coherence should depend on internality, in that individuals high in Goal Coherence will be more likely to attribute their success or failure in goal attainment to the internalised processes inherent to hierarchical goal structuring, rather than to external influences. It was subsequently argued that individuals who score highly on Goal Coherence should also score highly on social desirability and internality.

The results from the construct validity study did indeed reveal a positive correlation between Goal Coherence scores and scores on the social desirability scale. As a consequence, a further study, Study 8, was carried out to test the prediction of a positive correlation between Goal Coherence and internality. This prediction appeared to be upheld by the results. It was

argued in Chapter 5, as it is argued now, that the validity of the HTQ is not damaged by the positive relationship with social desirability, given the evidence from Study 8.

It has been argued in the present thesis that a suitable strategy of construct validation of the HTQ was undertaken. It is interesting to note that Kline (1983) is in no doubt as to the meaningfulness of social desirability in cases where such validation has taken place.

...it is necessary to have sound evidence that a personality test is valid, because if it is, the question of social desirability becomes otiose. (p.20)

8.3.7 Issue 6

The adequacy of the behavioural context in which it was chosen to further test the validity of the HTQ

Chapter 6 contains a description of some of the work of Raynor, Entin and colleagues in the area of motivation research, particularly future-oriented motivation, in a contingent versus noncontingent path context. Much of that work was concerned with attempts to study proposed relationships between Achievement Motivation and performance in contingent and noncontingent path conditions. The evidence gathered by

much of the work described, supported Raynor and Entin's theories concerning the future-oriented nature of the contingent path condition. However, the evidence to support the theory that individual differences in achievement motivation (specifically nAch) were responsible for the observed results was equivocal. Raynor was therefore obliged to conclude that nAch was a less than satisfactory measure by which to account for differences in performance in the study context.

Goal Coherence is proposed to contain a very strong element of future-orientation. Consequently, the present writer put forward arguments that the contingent versus noncontingent path domain might provide a suitable context for testing the validity of Goal Coherence against behavioural criteria. There is some evidence to suggest that the present writer's arguments were justifiable.

In almost all of Raynor and Entin's studies (Raynor and Entin, 1982), there were significant differences in performance across a range of measures, between contingent and noncontingent path conditions. The lack of any reliable independent variable which might be used to account for these differences, suggested that further investigation in the domain was called for.

There is an established relationship between the context of contingent and noncontingent path behaviour and future-orientation, and no reliable independent

variable to explain differences in behaviour within that context. Taken together with the proposed relationship between Goal Coherence and future orientation, an argument can be sustained that the context was appropriate in which to further test HTQ validity.

8.3.8 Issue 7

The adequacy of the behavioural criteria used to further test the validity of the HTQ

This final issue is closely related to that discussed immediately above, and can be addressed quite briefly. Two discrete pieces of behaviour were measured in Studies 9 and 10, as follows.

- 1 Differences in performance between subjects in contingent and noncontingent path conditions as a proposed function of Goal Coherence
- 2 Differences in subjects' ability to recognise a contingent path

The work of Raynor, Entin and colleagues provides substantial evidence to support the inclusion in Study 9 of a measure of the first piece of behaviour listed above. It is argued by the present writer that the second piece of behaviour, measured in Study 10, represents an appropriate broadening of the theoretical

perspective presented by the contingent versus noncontingent path context. Anderson's (1980) review of the literature concerning goal-directed problem solving, stresses the importance to the activity of problem solving of the cognitive processes involved in recognising paths and algorithms. It can therefore be argued that, just as individual differences in Goal Coherence may be predicted to affect levels of performance in a contingent path condition, so those same individual differences may be predicted to affect levels of ability to recognise a contingent path condition. In the event, the results from Study 10 were encouraging, and the argument appears to have received some support.

Clearly, further research in the area is vital, particularly with regard to identifying the determinants that may be affecting contingent path recognition. Nevertheless, there are sound theoretical arguments and empirical evidence to merit the contention that the behavioural criteria used in Studies 9 and 10 were appropriate.

8.4 General Discussion

8.4.1 Introduction

There are two issues which require some general

discussion, before final conclusions are drawn on the research programme. These issues are as follows.

- 1 What is the relationship between Goal Coherence and the need for achievement?
- 2 Does Goal Coherence measure motivation?

8.4.2 Goal Coherence and Achievement Motivation

The fact that the context chosen for Studies 9 and 10 is one previously dominated by achievement motivation research, merits some discussion on the relationship, if any, between Goal Coherence and the need for achievement (nAch).

It can be reasonably argued that some element of need to achieve is present in many day to day human activities. In that respect, any performance task used as a dependent variable in a Goal Coherence study may be influenced by a subject's desire to achieve, or to perform well at the task. What is important, however, is to distinguish between the peripheral effects of the desire to achieve, and the specific contamination of data by a specific person variable such as nAch.

The distinction can be made. As early as the 1950s, Atkinson (1953), French (1955), and Atkinson and

Raphelson (1956) were finding that performance was quite unrelated to nAch in the absence of expectancy cues related to pride in accomplishment. Almost thirty years later, Raynor (Raynor and Entin, 1982) was reporting similar results in contingent versus noncontingent path studies where expectancy x value cues were not given to subjects. It is this construct of expectancy, central to the nAch variable, which sets it apart from Goal Coherence. Neither of the final Goal Coherence studies contained any element of expectancy-cue manipulation, yet results varied significantly for subjects between conditions, as predicted. This variation in results, it is argued, was due primarily to the effects of Goal Coherence, the determinant of future-oriented of motivation proposed to be measured by the HTQ. Hence, there appears to be evidence to support the contention that Goal Coherence does indeed have no close relationship to nAch.

Perhaps it is fitting to reiterate the words of Raynor himself on the issue (Raynor and Entin, 1982).

If this...is correct, future orientation in the form of a contingent path may often involve more than the accentuation of characteristic differences in achievement-related motives, as originally supposed in the elaborated theory. (p.163)

It is proposed in the present thesis that a substantial element of the "more" to which Raynor refers, may, in fact, be the measure of Goal Coherence proposed to be provided by the HTQ.

8.4.3 Goal Coherence as a Measure of Motivation

A series of arguments, from historical, anthropological and psychological perspectives, was put forward to support a central contention of the present thesis, namely that future-orientation is a powerful determinant of human motivation. These arguments are supported by a substantial body of domain-specific research.

As has already been discussed in detail, the evidence from numerous studies undertaken in the seventies and eighties by Raynor and others, indicates the important part played by future-orientation in motivating behaviour across a range of activities. The influence of future-orientation on motivation is further supported by a substantial body of empirical evidence and theoretical support from other sources, from the level of aspiration studies undertaken by Mace (1935), through the empirical work of Atkinson and colleagues in the sixties and seventies, to the recent theoretical contributions of Cattell. In summary, a compelling case can be made for the importance of future-orientation as a determinant of human motivation.

Additionally, there is evidence from the construct validation studies reported in Chapter 5 of the present thesis, and from the two final empirical studies reported in Chapter 7, that the HTQ measure of Goal Coherence may possess some of the characteristics expected of a measure of future-oriented motivation. It can therefore be argued that a relationship between Goal Coherence and motivation may indeed exist, and that the final discussion issue has been addressed. It would be improper, however, not to return once more to the final issue raised during the discussion of Study 9. A link may be established between Goal Coherence, future-orientation and motivation. This, however, has no bearing at all on whether the HTQ actually measures Goal Coherence. Within the parameters of the present research programme, it is probably safest to conclude that the results from the empirical studies, while encouraging, must be viewed within a context of all the caveats raised and discussed in previous chapters.

8.5 Summary and Conclusions

The present thesis has described particular elements in the history of the scientific study of motivation, illustrating particular areas of uncertainty or inconsistency which have indicated the need for further investigation in the area. The present programme of research was embarked upon with the aim of attempting to address part of that need.

An initial hypothesis of five related factors of motivation was tested by factor analysing a questionnaire constructed around those factors. The hypothesis was reframed and eventually rejected, on the basis of factor-analytic and psychologically-based evidence, in favour of a unidimensional model. The single construct was labelled Goal Coherence, proposed to be measured by a 15 item questionnaire named the Hyland-Thacker Questionnaire (HTQ).

Tests for construct validity, test-retest reliability and internal consistency were carried out, and, given certain caveats, produced evidence to suggest that Goal Coherence may possess some of the characteristics appropriate to a viable construct.

Two final studies were undertaken, in which Goal Coherence was tested against external behavioural criteria. Again, evidence was forthcoming which provided encouraging support for the contention that the HTQ may have the potential to serve as useful measure of future-oriented motivation.

A number of questions and issues arose from the present programme of research. Some of these were addressed in the present chapter, others are addressed in the following, final chapter.

It is seen as appropriate that a research programme should raise as many (if not more) questions as it sets

out to answer. Cattell (1966) has argued as follows.

...let us never forget that the scientific process is a spiral. The penny-in-the-slot concept of scientific method as testing the deduced consequences of a single, miraculously-produced-from-nowhere hypothesis by a single, final, experimental verdict must give way to the more realistic concept of the...spiral. (p.16)

It is hoped that the present programme of research, as well as attempting to address its original aims, may have gone some way towards providing the basis for a spiral of continuing research. Issues salient to this hope are considered in the final chapter.

CHAPTER 9

APPLIED USES OF THE HTQ AND SUGGESTED DIRECTIONS FOR FURTHER RESEARCH

9.1 Introduction

This final chapter contains a brief description of current and potential applied uses of the HTQ, together with some suggestions for further research.

9.2 Applied Uses of the HTQ

9.2.1 Current Applied Uses

The HTQ is currently being used in two applied contexts. Both should provide valuable opportunities to compare Goal Coherence scores with scores from other measures being used in parallel.

Firstly, the HTQ is being used as part of a test battery administered to second year undergraduate students before they embark upon a twelve month period of work experience in industry or commerce. Scores from the HTQ have been taken, and will be compared with relevant scores from other tests in the battery, as well as with employers' ratings of student motivation and performance.

The results from this study may provide useful information on the relationships between Goal Coherence and performance across a range of tasks and work situations. A comparison of HTQ scores with ratings made by experienced managers should be of particular value and interest.

Secondly, the HTQ is being used in a longitudinal evaluation of assessment-centre effectiveness. Candidates will complete the HTQ as part of a range of objective measures and structured interviews. HTQ scores will be compared with other relevant measures, and with candidates' performance at the centre. As in the case of the first study, it is hoped that the results from the assessment centre project will provide valuable data which may shed further light on the structural properties of the questionnaire.

9.2.2 Potential Applied Uses

In addition to the studies described above, negotiations are beginning with two commercial organisations who have expressed an interest in using the HTQ as a stand-alone measure of future-oriented motivation, to form part of a test battery used in personnel selection. Part of those negotiations includes the right to access data, which may again facilitate the continuing scrutiny of the properties of the questionnaire.

It was suggested in Chapter 7 that the HTQ may be particularly sensitive in identifying high goal coherents. If this is so, there may be potential for using the HTQ in a range of applied contexts where the identification of strongly motivated people is critical.

Finally, interest has been expressed by the Ministry of Defence in using a measure of future oriented motivation in the area of Simulation in Training (SiT).

A substantial amount of personnel training presently takes place during military exercises. In the light of recent political and economic changes, the opportunities to mount large-scale exercises are rapidly diminishing, with a consequent loss of valuable training time. It is the intent of MoD to significantly increase programmes of simulated training to compensate for this loss. There is a perceived use for the HTQ in two specific areas related to SiT.

Firstly, it is envisaged that a measure of future-oriented motivation may be of great value as an indicator of suitability for certain types of simulated training. Current selection for many military staff is very rigorous; however, it is recognised that the planned investment in high cost simulators may demand the introduction of even more precisely targeted selection procedures. Secondly, scores on future-oriented motivation may provide a valuable

measure of effectiveness in assessing SiT programmes. It is becoming generally recognised that overall measures of effectiveness in the area of training must include the effects of individual differences between personnel who have undergone the training. It is perceived that a measure of future-oriented motivation may serve a valuable purpose in assessing some part of these individual differences, and the HTQ is currently being considered in such a role.

9.3 Suggested Directions for Further Research

9.3.1 Introduction

As discussed in the previous chapter, results from the present programme of research have raised several issues which suggest the potential value for further investigation. There are four specific areas in which further research might usefully be undertaken, as follows.

- 1 Further exploration of the HTQ as a predictor of the ability to recognize contingent path situations
- 2 Investigation of the HTQ in experimental contexts other than contingent versus noncontingent path behaviour

- 3 Continuing research in an attempt to identify additional factors of motivation
- 4 Use of the HTQ measure of Goal Goherence as a variable in a systems model of behaviour

9.3.2 The HTQ and Contingent Path Recognition

As indicated in Chapter 8, there is potential for continuing research in the area of contingent path recognition. The results from the final study in the present programme gave encouragement that Goal Coherence might have the potential to serve as a predictor not only of performance in contingent path situations, but also of individual differences in the ability to recognise such situations. As was discussed at the end of Chapter 7, further clarification would be valuable in establishing the nature of goal coherent behaviour in the domain of recognising versus searching for contingent path contexts.

9.3.3 Investigation of the HTQ in Different Experimental Contexts

The results from Studies 9 and 10 provided some support for the predictions concerning Goal Coherence and behaviour. However, it is clearly essential to broaden the theoretical perspective further, to

investigate the HTQ in new experimental contexts.

There is a substantial range of experimental contexts, described by Raynor and Entin (1982), which has previously been the domain solely of nAch as a measure of motivation. Many of these experimental contexts may prove appropriate as vehicles for further investigation of the HTQ and the relationship between Goal Coherence and future-oriented behaviour.

For example, useful research may be undertaken to study individual differences in the perceived importance of future goals. Pearlson and Raynor (1982) undertook a study in this area, using the McClelland et al (1953) measure of nAch, and the Mandler and Sarason (1952) measure of test anxiety as measures of individual differences in achievement-related motivation. The results from this study were equivocal. It may be argued that this experimental context would be quite suitable for further investigation of the HTQ in relation to behaviour in other future-oriented contexts.

9.3.4 Additional Factors of Motivation

The initial hypothesis proposed at the beginning of the present programme of research was substantially modified in the light of evidence from the factor analytic studies. However, there may well be scope for further factor analytic research aimed towards

identifying other determinants of motivation.

It is perceived that valuable information may be gained from undertaking research in two specific areas. Firstly, it may be useful to carry out further investigation into the presence and effects of other possible determinants of future-oriented motivation. For example, it may be feasible, by generating new item sets and factoring the resultant data, to establish whether or not there may be some benefit gained from attempting to identify separate strength of will or planning factors.

Secondly, there are entirely different aspects of motivation that require investigation. The results of the studies reported in Chapter 4 of this thesis indicated the possible advantages to be gained from pursuing a unidimensional model of Goal Coherence. It may be useful to consider one or more of the other originally hypothesised factors not directly related to future-orientation as worthy of investigation in their own right. Perseverance, for example, could be regarded as orthogonal to future-orientation for the purposes of further study, and investigated in the same context as Muller's factor 'p', described in Chapter 3 of the present thesis.

9.3.5 Goal Coherence and Systems Modelling

It may be recalled that some consideration was given in Chapter 3 of this thesis to the way in which the products of factor-analytic research might be used. It was established that such products should be seen to act as stand-alone measures of certain behavioural trends. However, it was also recognised that a comprehensive model of behaviour must take into account the interactive effects of situation and person. One would then expect the products of factor-analytic research to fit within such a model alongside the more transient determinants of behaviour.

The problem, until quite recently, has been to identify a suitable medium for constructing and operating a complex behavioural model. With the advent of accessible, powerful computing facilities, that medium now exists in the form of computer-based systems modelling.

Some work has already been carried out by the present writer (Thacker, 1988) into the feasibility of a computer-simulated systems model of behaviour, using Cattell's (1985) VIDAS, Vector Id Analysis System, as a framework.

Cattell (1985) describes the VIDAS model in the following way.

In the VIDAS system we begin with the structures (checkable traits, states and processes) discovered and used in the Vector Id Analysis equations and no longer consider the outer stimulus triggering a response in a black box organism that operates as a mere transmitter as in reflexology. Instead the stimulus sets in motion several interactions within the box which deny any simple total action stimulus-response law. (pp.91-92)

The basic VIDAS model is illustrated in Figure 9.1, below.

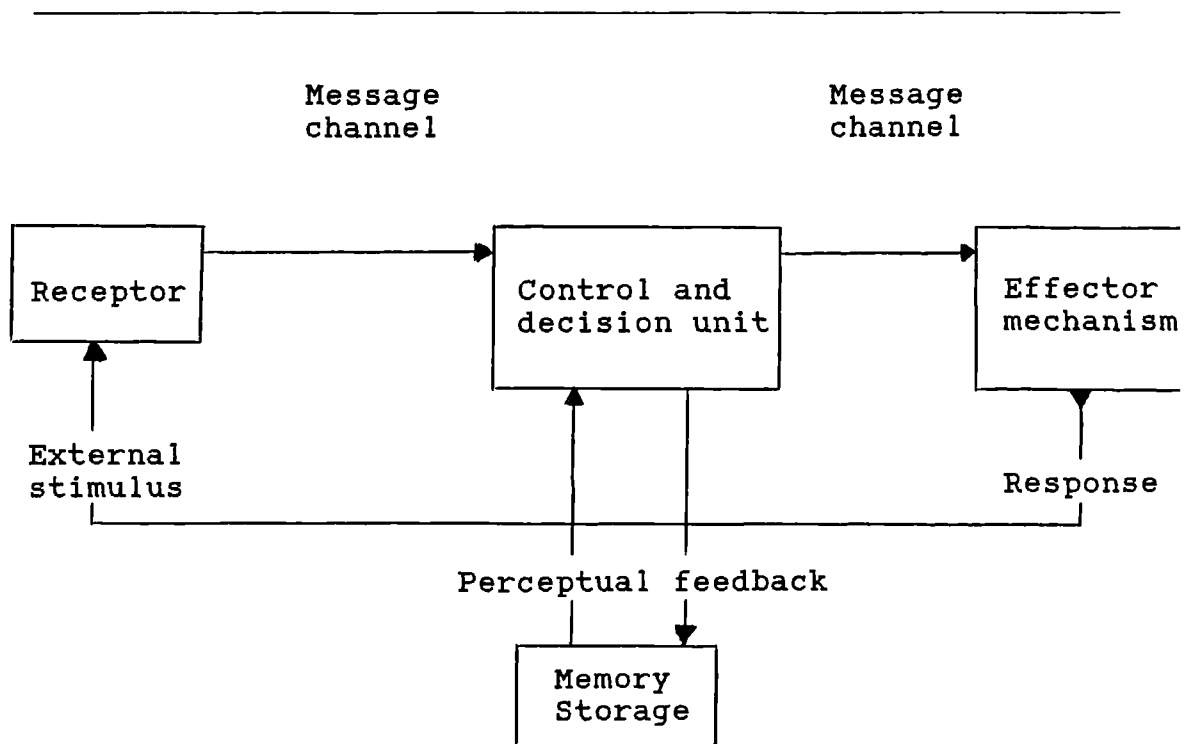


Figure 9.1 A basic behavioural systems model (adapted from Cattell, 1985, p.92)

Cattell (1985) lists the basic elements of the VIDAS model as follows.

- 1 Reservoirs of information bits or energy which are exhaustible and place limits to individual actions
- 2 Channels serving interactions of sources and limited by varying capacities to carry information
- 3 The action of reversible and irreversible processes
- 4 A hierarchical structure in which higher level holons (self-sufficient wholes) exercise control over the behaviour of lower levels by cybernetic, guiding action
- 5 The existence of encoding and decoding units mainly between the outer and inner world

Certain elements, or holons, within the VIDAS model are represented by traits of personality and motivation. Up to the present, no suitable measure of motivation has been identified to serve as a functional element within a systems model such as that proposed by Cattell. It is suggested here that the HTQ measure of Goal Coherence might serve a dual purpose with regard to further research in a systems model context.

Firstly, Goal Coherence might be expected to provide appropriate data to represent some individual differences in motivation within a full VIDAS model. Secondly, it seems likely that the complexity of the VIDAS model will be unraveled by investigating constrained versions of the full system. Thus, although Goal Coherence may provide only a fraction of the input to represent motivation, it may serve as a useful element within a constrained systems model.

9.4 Summary and Conclusions

This chapter has described some current and potential applied uses for the HTQ measure of Goal Coherence, and has considered areas of possible further research. It is to be hoped that useful further information will be gathered to aid the continuing development of the scale, and that useful further empirical investigation will be undertaken on the basis of results observed during the present programme.

The aim of the present programme of research was to address the conceptual and practical problems of developing a new scale to measure motivation. This thesis contains evidence from 10 studies. The evidence illustrates the complex nature of the problems encountered, and a number of caveats have been attached

to the outcomes from the more contentious issues addressed during this programme of research.

Some of these issues have by no means achieved complete resolution in the present programme. Indeed, it is reasonable to conjecture whether some of the difficulties surrounding certain methodological areas will ever be fully resolved. Notwithstanding, it is hoped, on the evidence presented in this thesis, that the HTQ may have some of the potential required to eventually serve as a useful instrument, both in the objective measurement of future-oriented motivation, and as a platform for further research.

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APPENDIX A

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Table A.1 Correlation matrix for all construct validating measures used in Study 6

	PR	PL	SA	S	T	W	M	C	SD	E	N	GO
PR												
PL	<u>40</u>											
SA	13	<u>32</u>										
S	<u>31</u>	<u>22</u>	<u>32</u>									
T	<u>30</u>	<u>28</u>	<u>51</u>	<u>67</u>								
W	01	04	-16	<u>-24</u>	<u>-23</u>							
M	01	<u>-24</u>	<u>-37</u>	<u>-20</u>	<u>-28</u>	<u>44</u>						
C	02	10	-14	03	07	<u>24</u>	<u>26</u>					
SD	03	05	02	11	15	<u>22</u>	<u>17</u>	-11				
E	-11	02	<u>-42</u>	<u>-21</u>	<u>-39</u>	06	12	<u>19</u>	12			
N	<u>40</u>	<u>34</u>	<u>39</u>	<u>48</u>	<u>62</u>	07	<u>-27</u>	02	<u>-19</u>	10		
GO	-13	<u>-21</u>	<u>-22</u>	<u>-18</u>	<u>-23</u>	<u>40</u>	<u>49</u>	<u>17</u>	<u>32</u>	05	<u>-27</u>	
P	09	01	00	01	05	<u>24</u>	<u>22</u>	06	<u>27</u>	<u>-27</u>	05	<u>41</u>

Key to table A.1

PR = Fenigstein, private self-consciousness; PL = Fenigstein, public self-consciousness; SA = Fenigstein, social anxiety; S = Spielberger, state anxiety; T = Spielberger, trait anxiety; W = Spence Helmreich, work; M = Spence Helmreich, mastery; C = Spence Helmreich, competitiveness; SD = Marlowe Crown, social desirability; E = EPI, extraversion/introversion; N = EPI neuroticism; GO = Frese, goal orientation; P = Frese, planning

Each underscored coefficient denotes $p < 0.05$ ($N = 209$)

Table A.2 HTQ factor loadings from Study 6

Item	Loading
1	.52
2	.48
3	.63
4	.41
5	.35
6	.55
7	.42
8	.25
9	.63
10	.54
11	.33
12	.55
13	.53
14	.53
15	.62

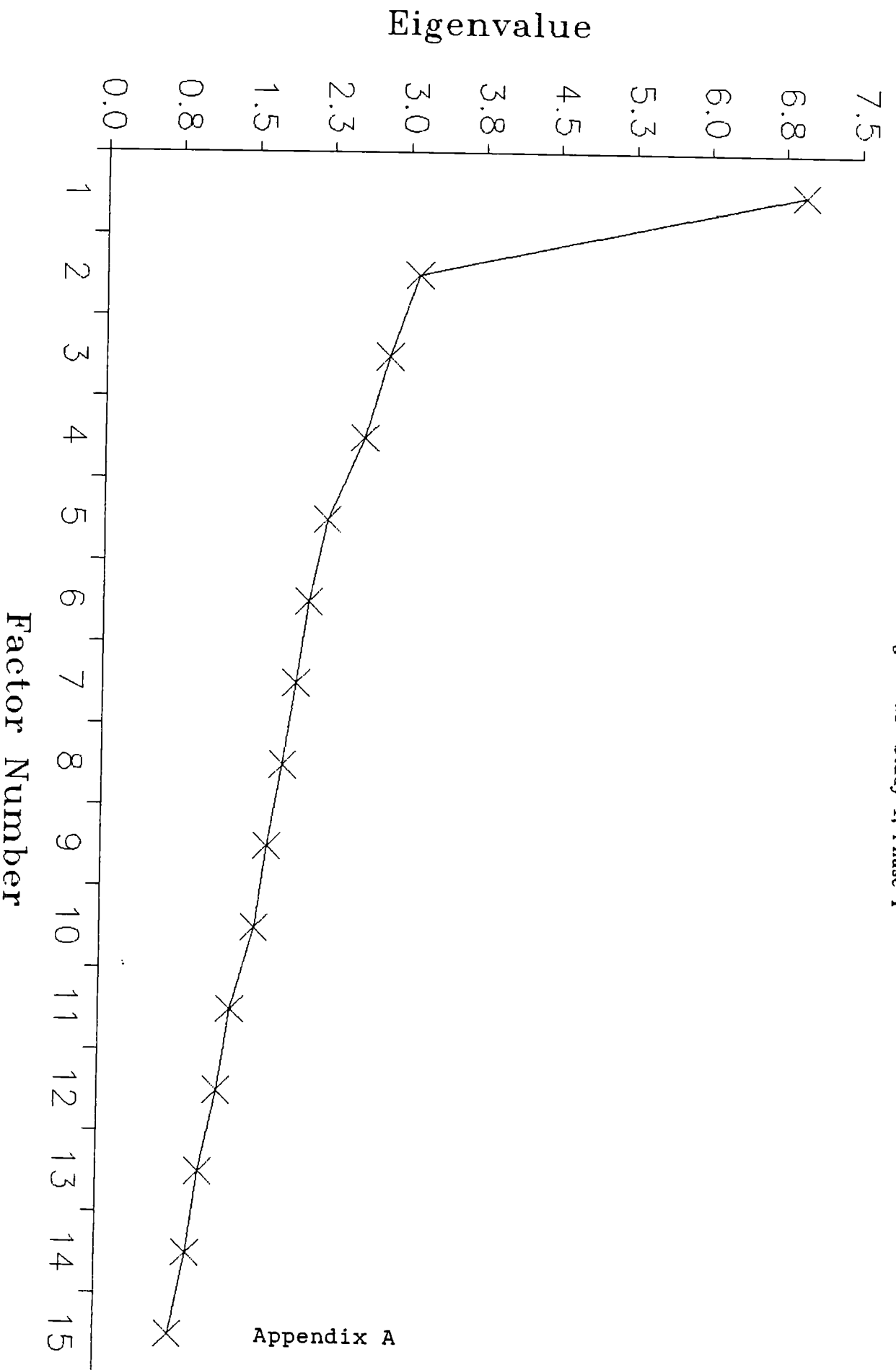
It is interesting to note that the loadings are generally much higher than for Study 5. Although it is the only item that does not load above the 0.30 criterion, the loading for item 8 is more satisfactory.

Percentage of Explained Variance

The percentage of variance accounted for by the single factor in the above solution was 25%. The average

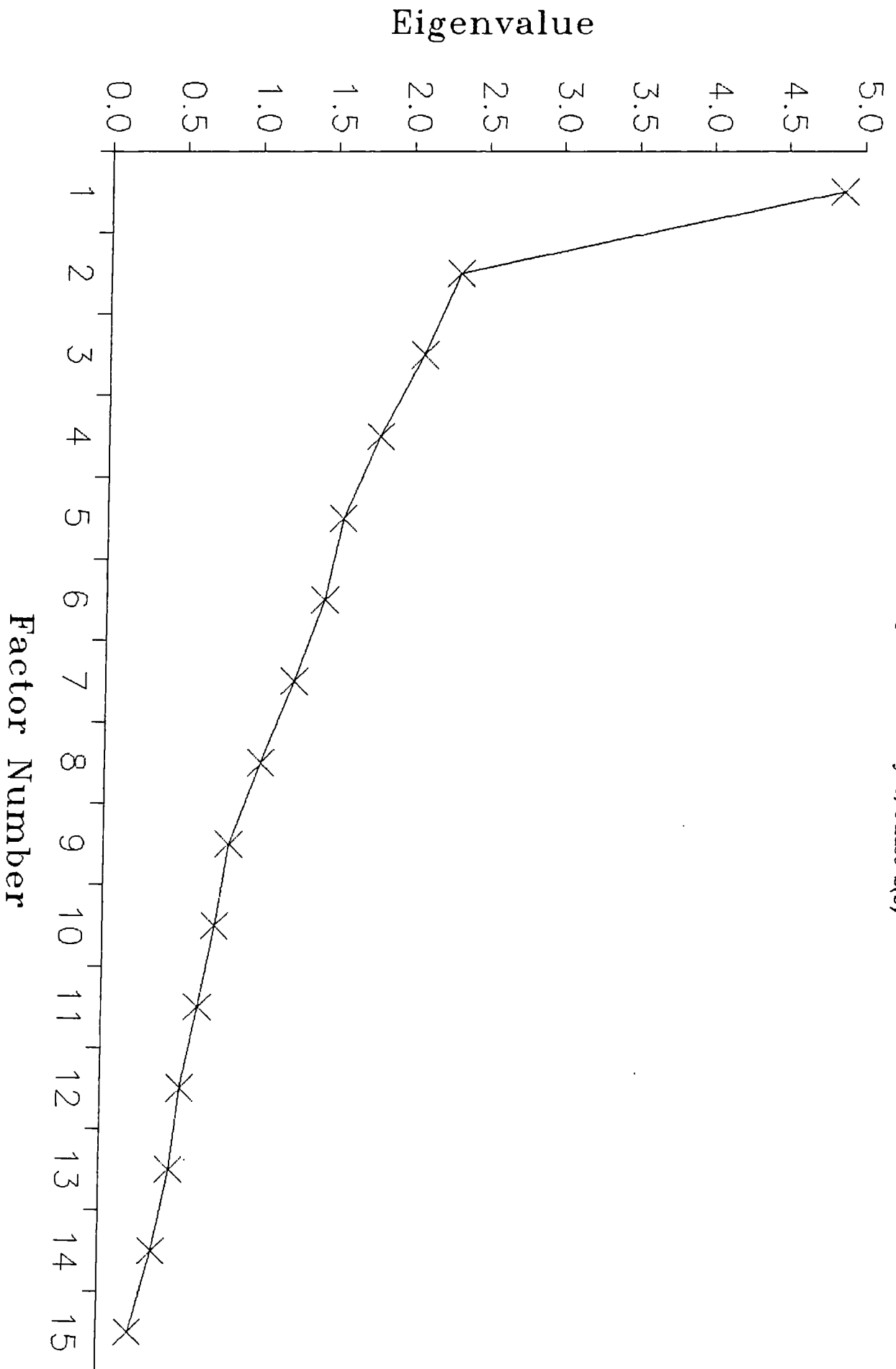
percentage variance accounted for in the single factor solution across the three factorings from Studies 4, 5 and 6 was 31%. The issue of explained variance is discussed in Chapter 4, Section 4.3.

Figure A.1 Study 1, Phase 1

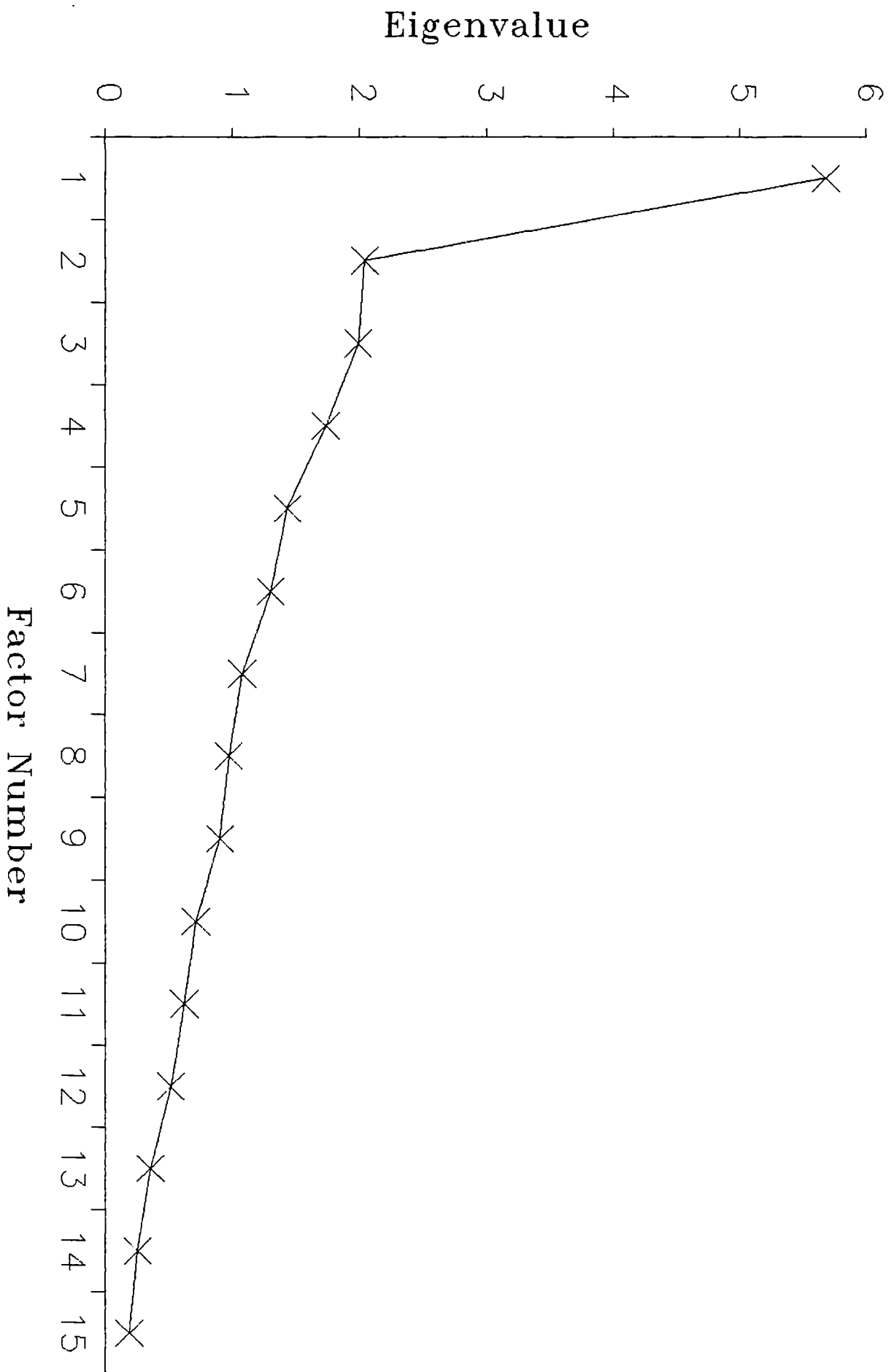


SCREE PLOT

Figure A.2 Study 1, Phase 2(b)

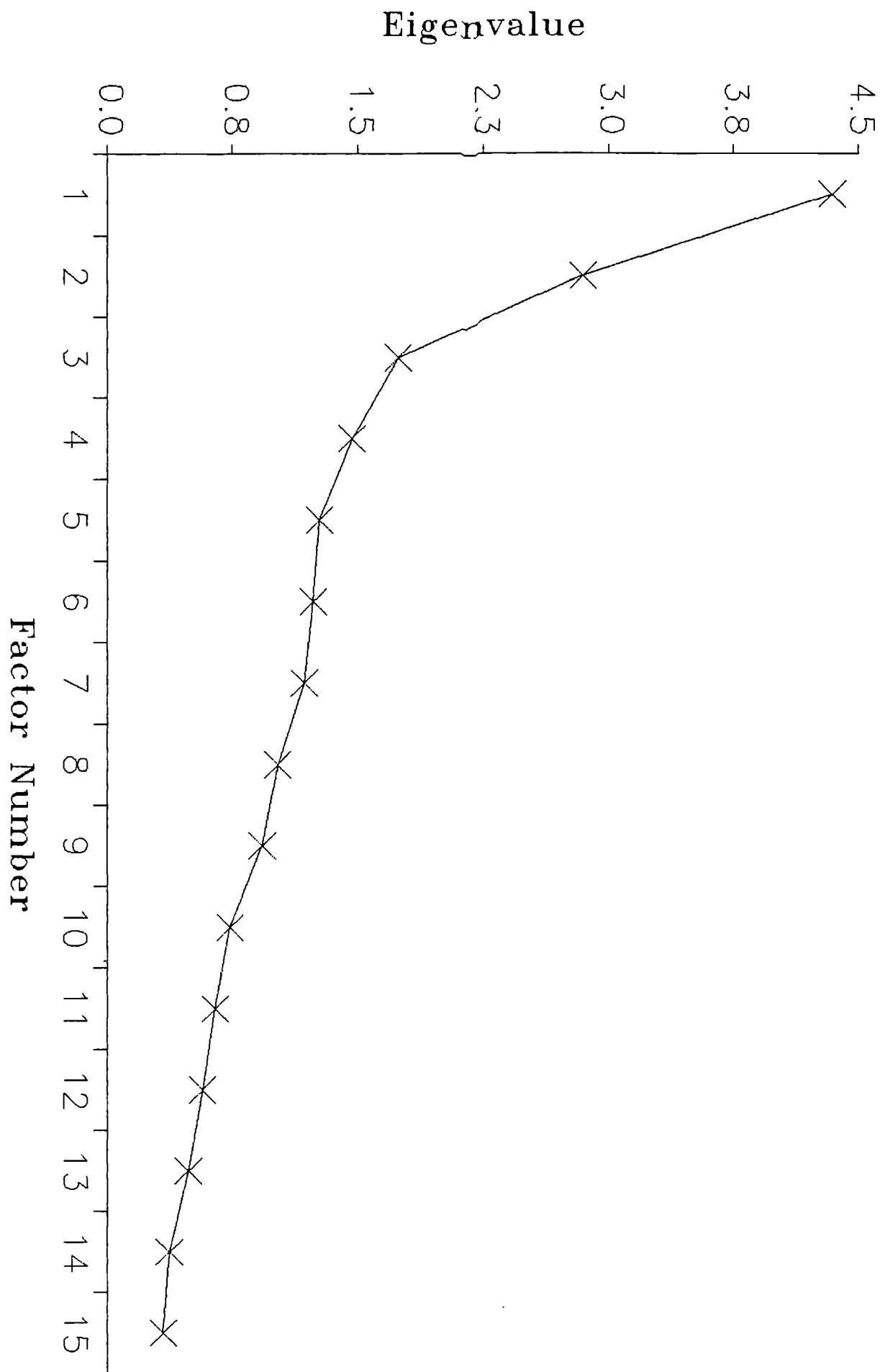


SCREE PLOT
Figure A.3 Study 2

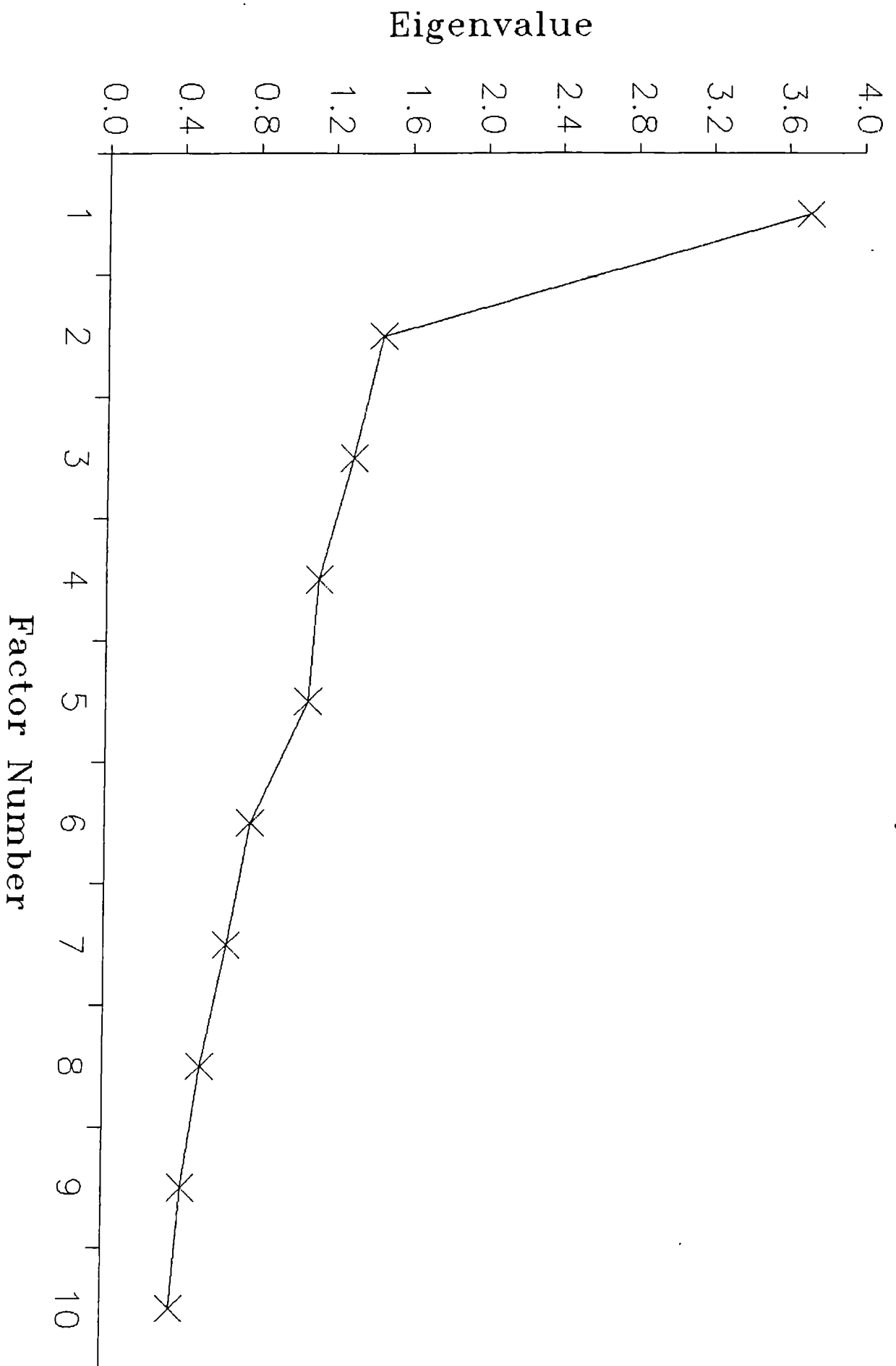


SURTEL FLU1

Figure A.4 Study 3



SCREE PLOT
Figure A.5 Study 4



SCREE PLOT

Figure A.6 Study 5

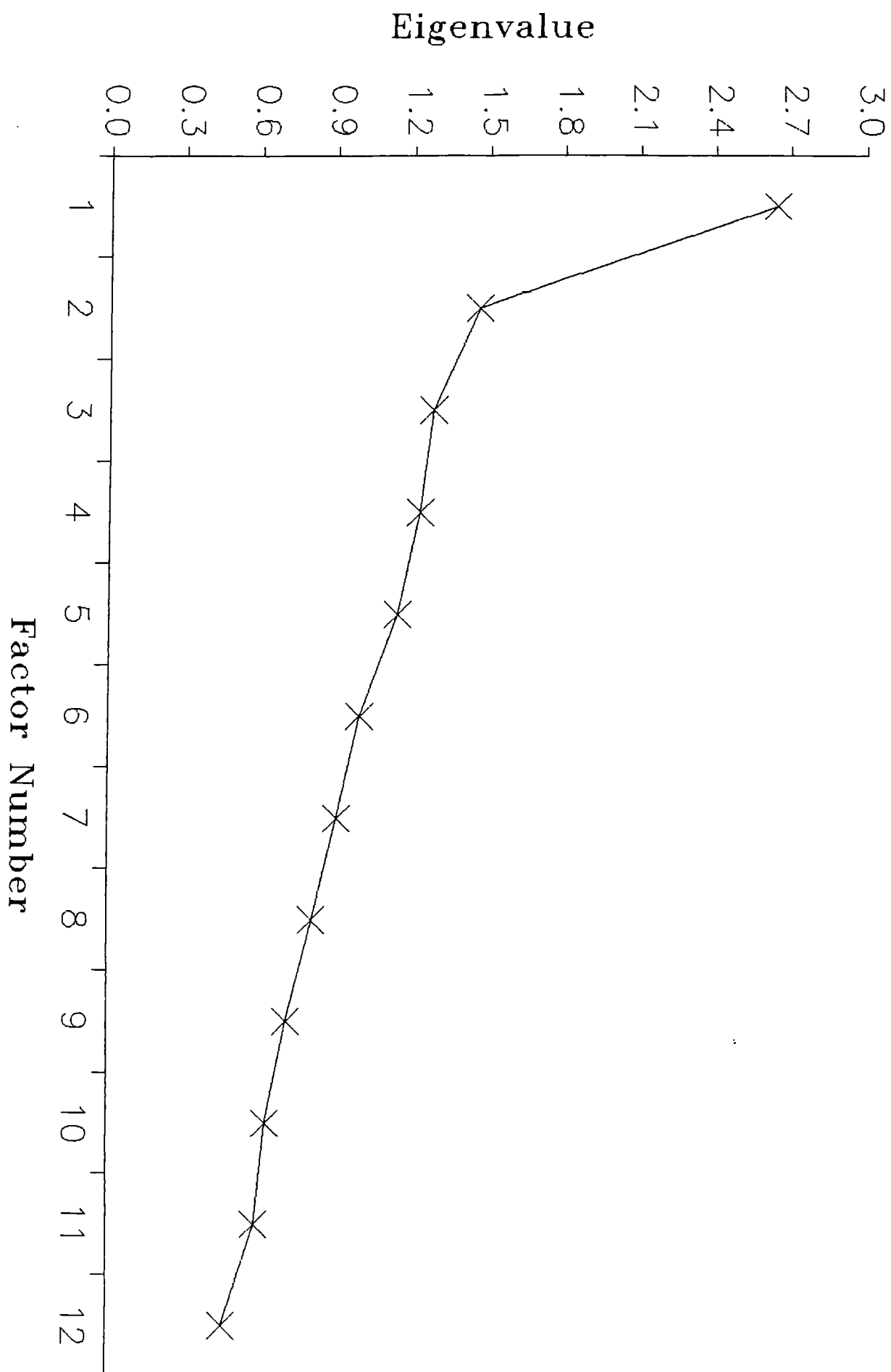


Table A.3 Eigenvalues of factors illustrated in scree plots,
Figures A.1 to A.6

Factor No.	Figure A.1	A.2	A.3	A.4	A.5	A.6
1	6.941	4.864	5.681	4.346	3.713	2.642
2	3.098	2.318	2.041	2.847	1.454	1.461
3	2.813	2.083	1.993	1.743	1.302	1.281
4	2.576	1.797	1.735	1.467	1.125	1.231
5	2.214	1.561	1.432	1.269	1.072	1.145
6	2.039	1.447	1.300	1.232	0.772	0.998
7	1.924	1.251	1.075	1.177	0.651	0.910
8	1.800	1.035	0.971	1.018	0.517	0.813
9	1.653	0.832	0.898	0.926	0.421	0.713
10	1.540	0.745	0.712	0.736	0.366	0.631
11	1.311	0.642	0.624	0.645		0.587
12	1.189	0.531	0.520	0.571		0.459
13	1.019	0.466	0.356	0.486		
14	0.907	0.357	0.257	0.372		
15	0.745	0.210	0.190	0.336		

APPENDIX B

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QUESTIONNAIRE USED IN STUDY 1

Please read the following instructions carefully.

Each item in the questionnaire is followed by this rating scale :

disagree / / / / / / / agree
 1 2 3 4 5 6

After reading each item, mark your response with an 'x' in one of the sections of the scale. For every item, use the scale to rate your agreement or disagreement in the following way :

- 1 = disagree very strongly
- 2 = disagree quite strongly
- 3 = disagree
- 4 = agree
- 5 = agree quite strongly
- 6 = agree very strongly

For example, if your response to an item is "I agree very strongly" then your rating should look like this :

disagree / / / / / / x / agree
 1 2 3 4 5 6

This questionnaire is not a test of ability or intelligence, so there are no 'right' or 'wrong' answers. Please just respond to each item as truthfully as possible. Also, try not to spend a lot of time on any item, as it is very important to get your immediate response.

If you have any questions, please ask the experimenter. If you are sure that you understand the instructions, please turn the page and begin.

Thank you for your co-operation.

1 When I'm doing something I've planned myself I
always keep checking on my progress

disagree / / / / / / / agree
 1 2 3 4 5 6

2 The most useful feedback on something I've done is
feedback that tells me how well I've done it

disagree / / / / / / / agree
 1 2 3 4 5 6

3 I daydream a lot about what will happen

disagree / / / / / / / agree
 1 2 3 4 5 6

4 If you're doing a particular piece of work, I think
it's a good sign to be often thinking about the
likely outcome

disagree / / / / / / / agree
 1 2 3 4 5 6

5 I usually see a piece of work as consisting of a
number of stages

disagree / / / / / / / agree
 1 2 3 4 5 6

6 I often find it hard to make decisions

disagree / / / / / / / agree
 1 2 3 4 5 6

7 Whatever I'm doing I'm always aware of the eventual
outcomes

disagree / / / / / / / agree
 1 2 3 4 5 6

8 I tend to think a lot about the cause of my
successes and failures

disagree / / / / / / / agree
1 2 3 4 5 6

9 Acquiring knowledge for its own sake does have
long-term benefits

disagree / / / / / / / agree
1 2 3 4 5 6

10 I prefer to set myself specific targets and stick
to them

disagree / / / / / / / agree
1 2 3 4 5 6

11 I prefer to work to deadlines that others set for
me

disagree / / / / / / / agree
1 2 3 4 5 6

12 I agree with the ethic "it's more important to play
than to win"

disagree / / / / / / / agree
1 2 3 4 5 6

13 Leaving aside any political or economic
considerations, I think people do have a genuine
need to work

disagree / / / / / / / agree
1 2 3 4 5 6

14 I feel as bad when I fail a mock exam as I would if
I'd failed the real one

disagree / / / / / / / agree
1 2 3 4 5 6

15 I'm always planning for the future

disagree / / / / / / / agree
1 2 3 4 5 6

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16 Whenever I finish a piece of work I start thinking about what I'm going to do next

disagree / / / / / / / agree
 1 2 3 4 5 6

17 I usually think carefully about the things I'm about to say

disagree / / / / / / / agree
 1 2 3 4 5 6

18 I don't usually find it difficult to state a preference for things

disagree / / / / / / / agree
 1 2 3 4 5 6

19 I find it easy to concentrate on research for an essay or project work

disagree / / / / / / / agree
 1 2 3 4 5 6

20 I enjoy planning my holidays or days out

disagree / / / / / / / agree
 1 2 3 4 5 6

21 I usually imagine myself in situations before they actually occur

disagree / / / / / / / agree
 1 2 3 4 5 6

22 The most useful feedback on my work is that which gives me pointers for the future

disagree / / / / / / / agree
 1 2 3 4 5 6

23 I usually think about a problem or piece of work for some time before actually starting in on it

disagree / / / / / / / agree
 1 2 3 4 5 6

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24 I am often motivated to work by thoughts of
long-term outcomes

disagree / / / / / / / agree
 1 2 3 4 5 6

25 When I'm answering an exam question I always jot
down a few notes first

disagree / / / / / / / agree
 1 2 3 4 5 6

26 I admire the way some people seem able to organise
their time so well

disagree / / / / / / / agree
 1 2 3 4 5 6

27 Whenever I finish a piece of work I think about
what I've just done

disagree / / / / / / / agree
 1 2 3 4 5 6

28 I tend to think about the good consequences when
I'm considering a course of action

disagree / / / / / / / agree
 1 2 3 4 5 6

29 I usually find it easy to justify to myself what
I'm doing

disagree / / / / / / / agree
 1 2 3 4 5 6

30 If I'm not working when I should be I often feel
guilty

disagree / / / / / / / agree
 1 2 3 4 5 6

31 I usually find it easy to explain my ideas to
people

disagree / / / / / / / agree
 1 2 3 4 5 6

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32 I often find things that really hold my interest

disagree / / / / / / / agree
 1 2 3 4 5 6

33 If I'm involved in something that interests me I'm
not easily distracted

disagree / / / / / / / agree
 1 2 3 4 5 6

34 I take a lot of pleasure in just looking forward to
something I think might be enjoyable

disagree / / / / / / / agree
 1 2 3 4 5 6

35 I'm attracted by the idea of spending a lot of time
researching a project or piece of work

disagree / / / / / / / agree
 1 2 3 4 5 6

36 Generally speaking, once I've made a decision I
know it's the right one

disagree / / / / / / / agree
 1 2 3 4 5 6

37 I tend to tackle a problem by separating it into
its smaller component parts

disagree / / / / / / / agree
 1 2 3 4 5 6

38 It's not usually easy to make me change my mind

disagree / / / / / / / agree
 1 2 3 4 5 6

39 I consider myself to be well-organised in most
things I do

disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

40 I find it easy to relate a piece of work to my long-term aims

disagree / / / / / / / agree
 1 2 3 4 5 6

41 I find it hard to do two things at once, like reading while the radio or tv is on in the same room

disagree / / / / / / / agree
 1 2 3 4 5 6

42 I am aware of my abilities in relation to those of other people

disagree / / / / / / / agree
 1 2 3 4 5 6

43 Whatever the situation I need to feel that I've done my best

disagree / / / / / / / agree
 1 2 3 4 5 6

44 Achieving my aims, however long it takes, is very important to me

disagree / / / / / / / agree
 1 2 3 4 5 6

45 I feel that I have an accurate awareness of my own abilities

disagree / / / / / / / agree
 1 2 3 4 5 6

46 I easily become bored with things

disagree / / / / / / / agree
 1 2 3 4 5 6

QUESTIONNAIRE USED IN STUDY 2

Please read the following instructions carefully.

Each item in the questionnaire is followed by this rating scale :

disagree / / / / / / / agree
 1 2 3 4 5 6

After reading each item, mark your response with an 'x' in one of the sections of the scale. For every item, use the scale to rate your agreement or disagreement in the following way :

- 1 = disagree very strongly
- 2 = disagree quite strongly
- 3 = disagree
- 4 = agree
- 5 = agree quite strongly
- 6 = agree very strongly

For example, if your response to an item is "I agree very strongly" then your rating should look like this :

disagree / / / / / / x / agree
 1 2 3 4 5 6

This questionnaire is not a test of ability or intelligence, so there are no 'right' or 'wrong' answers. Please just respond to each item as truthfully as possible. Also, try not to spend a lot of time on any item, as it is very important to get your immediate response.

If you have any questions, please ask the experimenter. If you are sure that you understand the instructions, please turn the page and begin.

Thank you for your co-operation.

1 I easily become bored with things

disagree / / / / / / / agree
 1 2 3 4 5 6

2 I prefer to set myself specific targets

disagree / / / / / / / agree
 1 2 3 4 5 6

3 If I'm involved in something that interests me, I'm
not easily distracted

disagree / / / / / / / agree
 1 2 3 4 5 6

4 I consider myself to be well-organised in most
things I do

disagree / / / / / / / agree
 1 2 3 4 5 6

5 I seldom plan for the future

disagree / / / / / / / agree
 1 2 3 4 5 6

6 If you are doing a particular piece of work, I
think it's a good sign to be thinking about the
likely outcome

disagree / / / / / / / agree
 1 2 3 4 5 6

7 Whatever the situation I need to feel that I've
done my best

disagree / / / / / / / agree
 1 2 3 4 5 6

8 If you don't take an opportunity when it arises,
then you've only got yourself to blame

disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

9 I don't mind taking personal risks just for a laugh

disagree / / / / / / / agree
 1 2 3 4 5 6

10 I daydream a lot about what will happen

disagree / / / / / / / agree
 1 2 3 4 5 6

11 I tend to tackle a problem by separating it into
its component parts

disagree / / / / / / / agree
 1 2 3 4 5 6

12 I am seldom motivated to work by thoughts of long
term outcomes

disagree / / / / / / / agree
 1 2 3 4 5 6

13 I feel as bad when I fail a mock exam as I would if
I'd failed the real one

disagree / / / / / / / agree
 1 2 3 4 5 6

14 Whenever I finish a piece of work, I think it's a
good sign to be thinking about the likely outcome

disagree / / / / / / / agree
 1 2 3 4 5 6

15 It's usually easy to make me change my mind

disagree / / / / / / / agree
 1 2 3 4 5 6

16 I usually get more enjoyment from completing a
straightforward crossword quickly, than spending a
long time on a more difficult one

disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

17 I usually find it easy to explain my ideas to people

disagree / / / / / / / agree
 1 2 3 4 5 6

18 I can work for long periods of time without getting any feedback

disagree / / / / / / / agree
 1 2 3 4 5 6

19 I often do things without really knowing why I'm doing them

disagree / / / / / / / agree
 1 2 3 4 5 6

20 I am aware of my abilities in relation to those of other people

disagree / / / / / / / agree
 1 2 3 4 5 6

21 I don't like playing card or board games

disagree / / / / / / / agree
 1 2 3 4 5 6

22 I seldom compare my performance to that of others

disagree / / / / / / / agree
 1 2 3 4 5 6

23 I find it easy to relate a piece of work to my long term aims

disagree / / / / / / / agree
 1 2 3 4 5 6

24 I don't like working to deadlines

disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

25 I often do things "just for the hell of it"

disagree / / / / / / / agree
 1 2 3 4 5 6

26 Generally speaking, once I've made a decision I
know it's the right one

disagree / / / / / / / agree
 1 2 3 4 5 6

27 I often do things without giving a lot of thought
to the consequences

disagree / / / / / / / agree
 1 2 3 4 5 6

28 I seldom find things that really interest me

disagree / / / / / / / agree
 1 2 3 4 5 6

29 If I'm not working when I should be I often feel
guilty

disagree / / / / / / / agree
 1 2 3 4 5 6

30 I seldom think about the cause of my successes and
failures

disagree / / / / / / / agree
 1 2 3 4 5 6

31 I would never get into more debt than I could
handle

disagree / / / / / / / agree
 1 2 3 4 5 6

QUESTIONNAIRE USED IN STUDY 3

Please read the following instructions carefully.

Each item in the questionnaire is followed by this rating scale :

disagree / / / / / / / agree
 1 2 3 4 5 6

After reading each item, mark your response with an 'x' in one of the sections of the scale. For every item, use the scale to rate your agreement or disagreement in the following way :

- 1 = disagree very strongly
- 2 = disagree quite strongly
- 3 = disagree
- 4 = agree
- 5 = agree quite strongly
- 6 = agree very strongly

For example, if your response to an item is "I agree very strongly" then your rating should look like this :

disagree / / / / / / x / agree
 1 2 3 4 5 6

This questionnaire is not a test of ability or intelligence, so there are no 'right' or 'wrong' answers. Please just respond to each item as truthfully as possible. Also, try not to spend a lot of time on any item, as it is very important to get your immediate response.

If you have any questions, please ask the experimenter. If you are sure that you understand the instructions, please turn the page and begin.

Thank you for your co-operation.

1 I easily become bored with things

disagree / / / / / / / agree
 1 2 3 4 5 6

2 I don't like being set specific targets

disagree / / / / / / / agree
 1 2 3 4 5 6

3 I can still be easily distracted, even if I'm
involved in something that interests me

disagree / / / / / / / agree
 1 2 3 4 5 6

4 I'm not very well organised in my work

disagree / / / / / / / agree
 1 2 3 4 5 6

5 I like making plans for the future

disagree / / / / / / / agree
 1 2 3 4 5 6

6 When tackling a particular piece of work, I think
it's a good sign to be thinking about the likely
outcome

disagree / / / / / / / agree
 1 2 3 4 5 6

7 Whatever the situation I need to feel that I've
done my best

disagree / / / / / / / agree
 1 2 3 4 5 6

8 If you don't take an opportunity when it arises
then you've only got yourself to blame

disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

9 I daydream a lot about what will happen

disagree / / / / / / / agree
 1 2 3 4 5 6

10 Before starting a problem I like to separate it
into its smaller component parts

disagree / / / / / / / agree
 1 2 3 4 5 6

11 I am often motivated to work by thoughts of
long-term outcomes

disagree / / / / / / / agree
 1 2 3 4 5 6

12 I feel as disappointed when I do badly in a mock
exam as I would in the real one

disagree / / / / / / / agree
 1 2 3 4 5 6

13 Whenever I finish a piece of work, I think it's a
good sign to be thinking about what I am going to
do next

disagree / / / / / / / agree
 1 2 3 4 5 6

14 It's usually easy to make me change my mind

disagree / / / / / / / agree
 1 2 3 4 5 6

15 I usually get more enjoyment from completing a
straightforward task quickly than spending a long
time on a more difficult one

disagree / / / / / / / agree
 1 2 3 4 5 6

16 I usually find it easy to explain my ideas to
people

disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

17 I often do things without really knowing why I'm doing them

disagree / / / / / / / agree
 1 2 3 4 5 6

18 If I'm not getting constant feedback I feel unsure of myself

disagree / / / / / / / agree
 1 2 3 4 5 6

19 I am aware of my strengths and weaknesses

disagree / / / / / / / agree
 1 2 3 4 5 6

20 A useful way of finding out about my own performance is to compare it to that of others

disagree / / / / / / / agree
 1 2 3 4 5 6

21 I am conscious of how my work relates to my long-term aims

disagree / / / / / / / agree
 1 2 3 4 5 6

22 I don't like working to deadlines

disagree / / / / / / / agree
 1 2 3 4 5 6

23 Once I've made a decision I don't worry if it's the right one

disagree / / / / / / / agree
 1 2 3 4 5 6

24 I often do things without giving a lot of thought to the consequences

disagree / / / / / / / agree
 1 2 3 4 5 6

25 I seldom find things that really interest me

disagree / / / / / / / agree
 1 2 3 4 5 6

26 If I'm not working when I should be I often feel
guilty

disagree / / / / / / / agree
 1 2 3 4 5 6

27 I seldom think about the cause of my successes and
failures

disagree / / / / / / / agree
 1 2 3 4 5 6

28 I would never get into more debt than I could
handle

disagree / / / / / / / agree
 1 2 3 4 5 6

29 I often hold imaginary conversations with other
people

disagree / / / / / / / agree
 1 2 3 4 5 6

30 I don't tend to plan ahead very often

disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

QUESTIONNAIRE USED IN STUDY 4

Please read the following instructions carefully.

Each item in the questionnaire is followed by this rating scale :

disagree / / / / / / / agree
 1 2 3 4 5 6

After reading each item, mark your response with an 'x' in one of the sections of the scale. For every item, use the scale to rate your agreement or disagreement in the following way :

- 1 = disagree very strongly
- 2 = disagree quite strongly
- 3 = disagree
- 4 = agree
- 5 = agree quite strongly
- 6 = agree very strongly

For example, if your response to an item is "I agree very strongly" then your rating should look like this :

disagree / / / / / / x / agree
 1 2 3 4 5 6

This questionnaire is not a test of ability or intelligence, so there are no 'right' or 'wrong' answers. Please just respond to each item as truthfully as possible. Also, try not to spend a lot of time on any item, as it is very important to get your immediate response.

If you have any questions, please ask the experimenter. If you are sure that you understand the instructions, please turn the page and begin.

Thank you for your co-operation.

1 I don't tend to plan ahead very often

disagree / / / / / / / agree
 1 2 3 4 5 6

2 I easily become bored with things

disagree / / / / / / / agree
 1 2 3 4 5 6

3 I am often motivated to work by thoughts of
long-term outcomes

disagree / / / / / / / agree
 1 2 3 4 5 6

4 I am not easily distracted if I am involved in
something that interests me

disagree / / / / / / / agree
 1 2 3 4 5 6

5 When working on a task I seldom think about how it
will turn out

disagree / / / / / / / agree
 1 2 3 4 5 6

6 I like making plans for the future

disagree / / / / / / / agree
 1 2 3 4 5 6

7 I am often aware that trivial things can have
important consequences

disagree / / / / / / / agree
 1 2 3 4 5 6

8 I daydream a lot about what will happen

disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

9 I am seldom conscious of how my work relates to my long-term aims

disagree / / / / / / / agree
 1 2 3 4 5 6

10 Whatever the situation I like to know that I have done my best

disagree / / / / / / / agree
 1 2 3 4 5 6

11 It's usually easy to make me change my mind

disagree / / / / / / / agree
 1 2 3 4 5 6

12 Before starting a problem I like to separate it into its smaller component parts

disagree / / / / / / / agree
 1 2 3 4 5 6

13 I often find things that really interest me

disagree / / / / / / / agree
 1 2 3 4 5 6

14 I seldom feel unsure of what I'm doing

disagree / / / / / / / agree
 1 2 3 4 5 6

15 I feel as bad when I fail a mock exam as I would if I had failed the real one

disagree / / / / / / / agree
 1 2 3 4 5 6

QUESTIONNAIRE USED IN STUDY 5 - THE FINALISED VERSION OF THE HTQ

Please read the following instructions carefully.

Each item in the questionnaire is followed by this rating scale :

disagree / / / / / / / agree
 1 2 3 4 5 6

After reading each item, mark your response with an 'x' in one of the sections of the scale. For every item, use the scale to rate your agreement or disagreement in the following way :

- 1 = disagree very strongly
- 2 = disagree quite strongly
- 3 = disagree
- 4 = agree
- 5 = agree quite strongly
- 6 = agree very strongly

For example, if your response to an item is "I agree very strongly" then your rating should look like this :

disagree / / / / / / x / agree
 1 2 3 4 5 6

This questionnaire is not a test of ability or intelligence, so there are no 'right' or 'wrong' answers. Please just respond to each item as truthfully as possible. Also, try not to spend a lot of time on any item, as it is very important to get your immediate response.

If you have any questions, please ask the experimenter. If you are sure that you understand the instructions, please turn the page and begin.

Thank you for your co-operation.

- 1 I don't tend to plan ahead very often
disagree / / / / / / / agree
 1 2 3 4 5 6
- 2 I easily become bored with things
disagree / / / / / / / agree
 1 2 3 4 5 6
- 3 I am often motivated to work by thoughts of
long-term outcomes
disagree / / / / / / / agree
 1 2 3 4 5 6
- 4 I am not easily distracted if I am involved in
something that interests me
disagree / / / / / / / agree
 1 2 3 4 5 6
- 5 When working on a task I seldom think about how it
will turn out
disagree / / / / / / / agree
 1 2 3 4 5 6
- 6 I like making plans for the future
disagree / / / / / / / agree
 1 2 3 4 5 6
- 7 I am often aware that trivial things can have
important consequences
disagree / / / / / / / agree
 1 2 3 4 5 6
- 8 I daydream a lot about what will happen
disagree / / / / / / / agree
 1 2 3 4 5 6

APPENDIX B

9 I am seldom conscious of how my work relates to my long-term aims

disagree / / / / / / / agree
 1 2 3 4 5 6

10 Whatever the situation I like to know that I have done my best

disagree / / / / / / / agree
 1 2 3 4 5 6

11 It's usually easy to make me change my mind

disagree / / / / / / / agree
 1 2 3 4 5 6

12 Before starting a problem I like to separate it into its smaller component parts

disagree / / / / / / / agree
 1 2 3 4 5 6

13 I often find things that really interest me

disagree / / / / / / / agree
 1 2 3 4 5 6

14 I usually feel sure about what I'm doing

disagree / / / / / / / agree
 1 2 3 4 5 6

15 I feel as bad when I fail a mock exam as I would if I had failed the real one

disagree / / / / / / / agree
 1 2 3 4 5 6

SPENCE HELMREICH WOFO used in Study 6

Please read the following instructions carefully.

Each of the statements overleaf is followed by this six-point rating scale.

strongly / / / / / / strongly
agree 1 2 3 4 5 6 disagree

After reading each statement, mark your response in one of the sections of the rating scale according to how strongly you agree or disagree with the statement in the following way :

- 1 = agree very strongly
- 2 = agree quite strongly
- 3 = agree
- 4 = disagree
- 5 = disagree quite strongly
- 6 = disagree very strongly

For example, if you strongly agree with statement 1 :

1. It is important for me to do my work as well as I can even if it isn't popular with my co-workers

then your response should be :

strongly / x / / / / / strongly
agree 1 2 3 4 5 6 disagree

This questionnaire is not a test of ability or intelligence. There are no 'right' or 'wrong' answers. Please make each response as truthful as possible, and try not to spend a lot of time on any statement, as it is very important to get your immediate response.

If you are sure you understand the instructions, please turn to the next page and begin.

1. It is important for me to do my work as well as I can even if it isn't popular with my co-workers

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

2. I would rather learn easy fun games than difficult thought games

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

3. I find satisfaction in working as well as I can

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

4. It is important to me to perform better than others on a task

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

5. I feel that winning is important in both work and games

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

6. I try harder when I'm in competition with other people

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

7. Once I undertake a task, I persist

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

8. If I am not good at something, I would rather keep struggling to master it than move on to something I may be good at

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

(turn to the next page)

9. I prefer to work in situations that require a high level of skill

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

10. I like to be busy all the time

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

11. There is satisfaction in a job well done

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

12. I like to work hard

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

13. I would rather do something at which I feel confident and relaxed than something which is challenging and difficult

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

14. Part of my enjoyment in doing things is improving my past performance

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

15. I find satisfaction in exceeding my previous performance even if I don't outperform others

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

16. I enjoy working in situations involving competition with others

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

(turn to the next page)

17. When a group I belong to plans an activity, I would rather direct it myself than just help out and have someone else organise it

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

18. I more often attempt tasks that I am not sure I can do than tasks that I believe I can do

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

19. It annoys me when other people perform better than I do

strongly / / / / / / / strongly
agree 1 2 3 4 5 6 disagree

PLEASE MAKE SURE YOU HAVE ANSWERED ALL THE QUESTIONS

FRESE ACTION STYLE QUESTIONNAIRE used in Study 6

name _____

Please indicate your agreement with the following statements as they apply to you. Put an X in the appropriate space of the rating scale, but try not to use the middle response unless absolutely necessary.

This is not a measure of intelligence or ability, and there are no right or wrong answers. Don't spend too long on any statement, as it is important to get your immediate response.

1

Once I decide on something
I'm going to do, I go
straight ahead and do it

When I decide on
something I'm going
to do, I often take
my time doing it

<-----|----->
() () I am in () ()
very true somewhat the middle somewhat very true
of me true of me true of me of me

2

The purpose of doing
things is to enjoy
them along the way

The purpose of
doing things is not
so much enjoyment,
as getting them done

<-----|----->
() () I am in () ()
very true somewhat the middle somewhat very true
of me true of me true of me of me

3

When I attempt a task
I stop when I reach an
approximation of what I
want to achieve

I find it difficult
to stop until I
achieve everything
I set out to

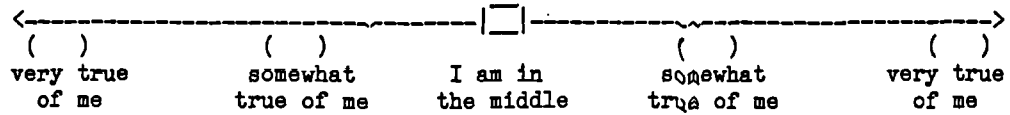
<-----|----->
() () I am in () ()
very true somewhat the middle somewhat very true
of me true of me true of me of me

next page ...

4

In general, I take
all my goals very seriously

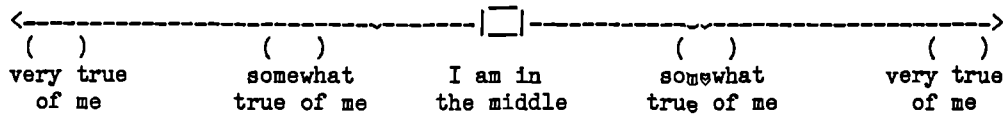
My goals may be
important, but I
sometimes lose sight
of them



5

I often think about the
long term implications of
things

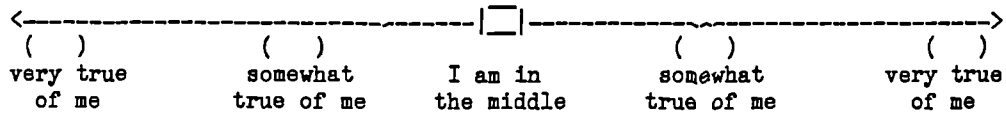
In general I
think about what is
necessary at the
moment



6

I always find it
necessary to think
about past mistakes

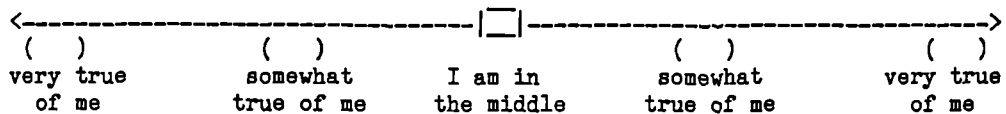
I do not find it
necessary to think
about past mistakes



7

I find it necessary to
think of several different
ways of doing something

I usually do things
in the first
way I think of

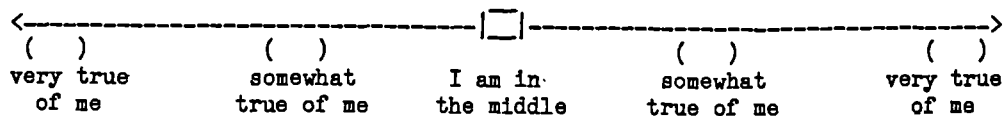


next page ...

8

When I do something, I usually make a second plan in case something goes wrong

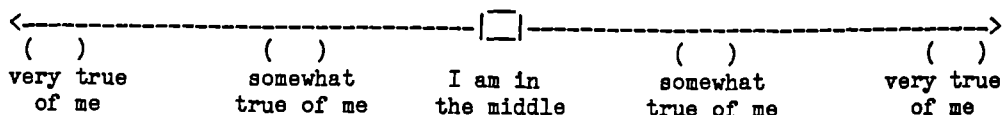
I rarely make a second plan in the event of things going wrong



9

I tend to make fairly detailed plans

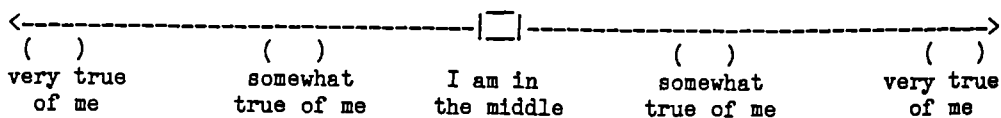
I often have a general notion of what I want to do, but don't make precise plans



10

In attempting a task, everything I do contributes to my accomplishing what I want to do

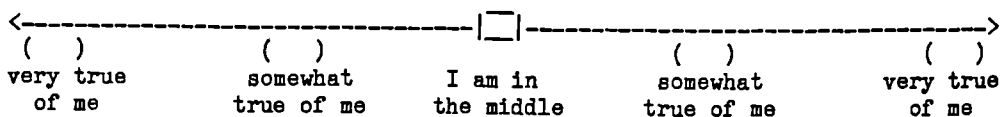
I allow myself to be diverted from what I want to accomplish



11

I plan far in advance before doing things

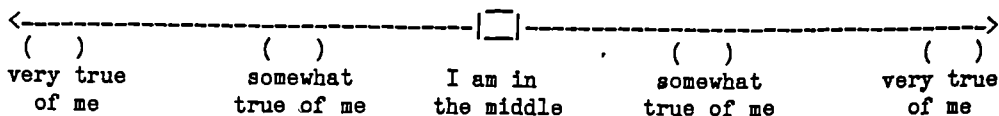
I think about what I'm going to do as I go along



12

I plan for things that other people consider unlikely

I can't be bothered to think about unlikely events



13

I always accomplish
every last thing I
intended to do

Sometimes I do not
get around to doing
everything I
intended to do

<-----|----->
() () I am in () ()
very true somewhat the middle somewhat very true
of me true of me true of me of me

14

I do not think for long
about how I am going to
do things, I just do them

I think for quite
a while about how
I am going to do
things

<-----|----->
() () I am in () ()
very true somewhat the middle somewhat very true
of me true of me true of me of me

15

I am very persistent in
pursuing what I want to do

I tend to stop when
major difficulties
come along

<-----|----->
() () I am in () ()
very true somewhat the middle somewhat very true
of me true of me true of me of me

16

I know the details of what
I want to achieve

I am not always
absolutely clear
about what I want to
achieve

<-----|----->
() () I am in () ()
very true somewhat the middle somewhat very true
of me true of me true of me of me

PLEASE MAKE SURE THAT YOU HAVE ANSWERED ALL THE QUESTIONS

Appendix B

MARLOWE-CROWN SOCIAL DESIRABILITY SCALE used in Study 6

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you personally. Indicate your decision by circling either the T or the F. For example, if you think statement no.1 is true, as it pertains to you personally, you should indicate your response thus:

1. Before voting I thoroughly investigate the qualifications of all candidates (T / F

If you are sure you understand the instructions, please begin.

1. Before voting I thoroughly investigate the qualifications of all candidates T / F
2. I never hesitate to go out of my way to help someone in trouble T / F
3. It is sometimes hard for me to go on with my work if I am not encouraged T / F
4. I have never intensely disliked anyone T / F
5. On occasion I have had doubts about my ability to succeed in life T / F
6. I sometimes feel resentful when I don't get my way T / F
7. I am always careful about my manner of dress T / F
8. My table manners at home are as good as when I eat out in a restaurant T / F
9. If I could get into a cinema without paying and be sure I was not seen, I would probably do it T / F
10. On a few occasions, I have given up doing something because I thought too little of my ability T / F
11. I like to gossip at times T / F
12. There have been times when I felt like rebelling against people in authority even though I knew they were right T / F
13. No matter who I'm talking to, I'm always a good listener T / F
14. I can remember 'playing sick' to get out of something T / F
15. There have been occasions when I took advantage of someone T / F
16. I'm always willing to admit when I've made a mistake T / F

(turn the page)

17. I always try to practice what I preach T / F
18. I don't find it particularly difficult to get along with loud-mouthed obnoxious people T / F
19. I sometimes try to get even, rather than forgive and forget T / F
20. When I don't know something, I don't at all mind admitting it T / F
21. I am always courteous, even to people who are disagreeable T / F
22. At times I have really insisted on having things my own way T / F
23. There have been occasions when I felt like smashing things T / F
24. I would never think of letting someone else be punished for my wrongdoings T / F
25. I never resent being asked to return a favour T / F
26. I have never been annoyed when people expressed ideas very different from my own T / F
27. I would never make a long trip without checking the safety of my car T / F
28. There have been times when I was quite jealous of the good fortune of others. T / F
29. I have almost never felt the urge to tell someone off T / F
30. I am sometimes irritated by people who ask favours of me T / F
31. I have never felt that I was punished without cause T / F
32. I sometimes think when people have a misfortune they only got what they deserved T / F
33. I have never deliberately said something that hurt someone's feelings T / F

PLEASE MAKE SURE THAT YOU HAVE ANSWERED ALL THE QUESTIONS

SELF-EVALUATION QUESTIONNAIRE

Developed by Charles D. Spielberger
in collaboration with
R. L. Gorsuch, R. Lushene, P. R. Vagg, and G. A. Jacobs

STAI Form Y-1

Name _____ Date _____ S _____
Age _____ Sex: M _____ F _____ T _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

NOT AT ALL
MODERATELY SO
VERY MUCH SO

- | | | | | |
|--|---|---|---|---|
| 1. I feel calm | 1 | 2 | 3 | 4 |
| 2. I feel secure | 1 | 2 | 3 | 4 |
| 3. I am tense | 1 | 2 | 3 | 4 |
| 4. I feel strained | 1 | 2 | 3 | 4 |
| 5. I feel at ease | 1 | 2 | 3 | 4 |
| 6. I feel upset | 1 | 2 | 3 | 4 |
| 7. I am presently worrying over possible misfortunes | 1 | 2 | 3 | 4 |
| 8. I feel satisfied | 1 | 2 | 3 | 4 |
| 9. I feel frightened | 1 | 2 | 3 | 4 |
| 10. I feel comfortable | 1 | 2 | 3 | 4 |
| 11. I feel self-confident | 1 | 2 | 3 | 4 |
| 12. I feel nervous | 1 | 2 | 3 | 4 |
| 13. I am jittery | 1 | 2 | 3 | 4 |
| 14. I feel indecisive | 1 | 2 | 3 | 4 |
| 15. I am relaxed | 1 | 2 | 3 | 4 |
| 16. I feel content | 1 | 2 | 3 | 4 |
| 17. I am worried | 1 | 2 | 3 | 4 |
| 18. I feel confused | 1 | 2 | 3 | 4 |
| 19. I feel steady | 1 | 2 | 3 | 4 |
| 20. I feel pleasant | 1 | 2 | 3 | 4 |



Consulting Psychologists Press
577 College Avenue, Palo Alto, California 94306

SELF-EVALUATION QUESTIONNAIRE

STAI Form Y-2

Name _____ Date _____

DIRECTIONS: A number of statements which people have used to describe themselves are given below. Read each statement and then blacken in the appropriate circle to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

- | | ALMOST NEVER | SOMETIMES | OFTEN | ALMOST ALWAYS |
|---|--------------|-----------|-------|---------------|
| 21. I feel pleasant | ① | ② | ③ | ④ |
| 22. I feel nervous and restless | ① | ② | ③ | ④ |
| 23. I feel satisfied with myself | ① | ② | ③ | ④ |
| 24. I wish I could be as happy as others seem to be | ① | ② | ③ | ④ |
| 25. I feel like a failure | ① | ② | ③ | ④ |
| 26. I feel rested | ① | ② | ③ | ④ |
| 27. I am "calm, cool, and collected" | ① | ② | ③ | ④ |
| 28. I feel that difficulties are piling up so that I cannot overcome them | ① | ② | ③ | ④ |
| 29. I worry too much over something that really doesn't matter | ① | ② | ③ | ④ |
| 30. I am happy | ① | ② | ③ | ④ |
| 31. I have disturbing thoughts | ① | ② | ③ | ④ |
| 32. I lack self-confidence | ① | ② | ③ | ④ |
| 33. I feel secure | ① | ② | ③ | ④ |
| 34. I make decisions easily | ① | ② | ③ | ④ |
| 35. I feel inadequate | ① | ② | ③ | ④ |
| 36. I am content | ① | ② | ③ | ④ |
| 37. Some unimportant thought runs through my mind and bothers me | ① | ② | ③ | ④ |
| 38. I take disappointments so keenly that I can't put them out of my mind | ① | ② | ③ | ④ |
| 39. I am a steady person | ① | ② | ③ | ④ |
| 40. I get in a state of tension or turmoil as I think over my recent concerns and interests | ① | ② | ③ | ④ |

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FENIGSTEIN QUESTIONNAIRE used in Study 6

Questionnaire Name _____
Course _____

Below you will find a number of statements about the way you feel. Please answer these questions as truthfully as possible.

1. I'm always trying to figure myself out

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
2. I'm concerned about my style of doing things.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
3. Generally, I'm not very aware of myself.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
4. It take me time to overcome my shyness in new situations.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
5. I reflect about myself a lot.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
6. I'm concerned about the way I present myself.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
7. I'm often the subject of my own fantasies.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
8. I have trouble working when someone is watching me.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
9. I never scrutinize myself.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------
10. I get embarrassed very easily.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------

11. I'm self-conscious about the way I look.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
12. I don't find it hard to talk to strangers.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
13. I'm generally attentive to my inner feelings.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
14. I usually worry about making a good impression.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
15. I'm constantly examining my motives.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
16. I feel anxious when I speak in front of a group.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
17. One of the last things I do before I leave the house is to look in the mirror.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
18. I sometimes have the feeling that I'm off somewhere watching myself.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
19. I'm concerned about what other people think of me.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
20. I'm alert to changes in my mood.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|
21. I'm usually aware of my appearance.
- | | | | | | | |
|-------------------------------|---|---|---|---|---|-----------------------------|
| Extremely
uncharacteristic | 0 | 1 | 2 | 3 | 4 | Extremely
characteristic |
|-------------------------------|---|---|---|---|---|-----------------------------|

Appendix B

22. I'm aware of the way my mind works when I work through a problem

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------

23. Large groups make me nervous.

Extremely uncharacteristic	0	1	2	3	4	Extremely characteristic
-------------------------------	---	---	---	---	---	-----------------------------

EPI used in Study 6

E ☐ N ☐ L ☐

--	--	--	--	--	--	--	--	--	--

FORM A

	YES	NO
1. Do you often long for excitement?	<input type="radio"/>	<input type="radio"/>
2. Do you often need understanding friends to cheer you up?	<input type="radio"/>	<input type="radio"/>
3. Are you usually carefree?	<input type="radio"/>	<input type="radio"/>
4. Do you find it very hard to take no for an answer?	<input type="radio"/>	<input type="radio"/>
5. Do you stop and think things over before doing anything?	<input type="radio"/>	<input type="radio"/>
6. If you say you will do something do you always keep your promise, no matter how inconvenient it might be to do so?	<input type="radio"/>	<input type="radio"/>
7. Does your mood often go up and down?	<input type="radio"/>	<input type="radio"/>
8. Do you generally do and say things quickly without stopping to think?	<input type="radio"/>	<input type="radio"/>
9. Do you ever feel "just miserable" for no good reason?	<input type="radio"/>	<input type="radio"/>
10. Would you do almost anything for a dare?	<input type="radio"/>	<input type="radio"/>
11. Do you suddenly feel shy when you want to talk to an attractive stranger?	<input type="radio"/>	<input type="radio"/>
12. Once in a while do you lose your temper and get angry?	<input type="radio"/>	<input type="radio"/>
13. Do you often do things on the spur of the moment?	<input type="radio"/>	<input type="radio"/>
14. Do you often worry about things you should not have done or said?	<input type="radio"/>	<input type="radio"/>
15. Generally, do you prefer reading to meeting people?	<input type="radio"/>	<input type="radio"/>
16. Are your feelings rather easily hurt?	<input type="radio"/>	<input type="radio"/>
17. Do you like going out a lot?	<input type="radio"/>	<input type="radio"/>
18. Do you occasionally have thoughts and ideas that you would not like other people to know about?	<input type="radio"/>	<input type="radio"/>
19. Are you sometimes bubbling over with energy and sometimes very sluggish?	<input type="radio"/>	<input type="radio"/>
20. Do you prefer to have few but special friends?	<input type="radio"/>	<input type="radio"/>
21. Do you daydream a lot?	<input type="radio"/>	<input type="radio"/>
22. When people shout at you, do you shout back?	<input type="radio"/>	<input type="radio"/>
23. Are you often troubled about feelings of guilt?	<input type="radio"/>	<input type="radio"/>
24. Are all your habits good and desirable ones?	<input type="radio"/>	<input type="radio"/>
25. Can you usually let yourself go and enjoy yourself a lot at a lively party?	<input type="radio"/>	<input type="radio"/>
26. Would you call yourself tense or "highly-strung"?	<input type="radio"/>	<input type="radio"/>
27. Do other people think of you as being very lively?	<input type="radio"/>	<input type="radio"/>

(turn the page)

Appendix B

- YES
28. After you have done something important, do you often come away feeling you could have done better? ☐
 29. Are you mostly quiet when you are with other people? ☐
 30. Do you sometimes gossip? ☐
 31. Do ideas run through your head so that you cannot sleep? ☐
 32. If there is something you want to know about, would you rather look it up in a book than talk to someone about it? ☐
 33. Do you get palpitations or thumping in your heart? ☐
 34. Do you like the kind of work that you need to pay close attention to? ☐
 35. Do you get attacks of shaking or trembling? ☐
 36. Would you always declare everything at the customs, even if you knew that you could never be found out? ☐
 37. Do you hate being with a crowd who play jokes on one another? ☐
 38. Are you an irritable person? ☐
 39. Do you like doing things in which you have to act quickly? ☐
 40. Do you worry about awful things that might happen? ☐
 41. Are you slow and unhurried in the way you move? ☐
 42. Have you ever been late for an appointment or work? ☐
 43. Do you have many nightmares? ☐
 44. Do you like talking to people so much that you never miss a chance of talking to a stranger? ☐
 45. Are you troubled by aches and pains? ☐
 46. Would you be very unhappy if you could not see lots of people most of the time? ☐
 47. Would you call yourself a nervous person? ☐
 48. Of all the people you know, are there some whom you definitely do not like? ☐
 49. Would you say that you were fairly self-confident? ☐
 50. Are you easily hurt when people find fault with you or your work? ☐
 51. Do you find it hard to really enjoy yourself at a lively party? ☐
 52. Are you troubled with feelings of inferiority? ☐
 53. Can you easily get some life into a rather dull party? ☐
 54. Do you sometimes talk about things you know nothing about? ☐
 55. Do you worry about your health? ☐
 56. Do you like playing pranks on others? ☐
 57. Do you suffer from sleeplessness? ☐

PLEASE CHECK TO SEE THAT YOU HAVE ANSWERED ALL THE QUESTIONS

ROTTER SCALE OF INTERNALITY/EXTERNALITY used in Study 8

Name _____

Please read the following notes :

The purpose of this questionnaire is to gain an impression of people's attitudes and opinions concerning a number of things that may affect us from time to time. It is not a test of intelligence or ability, so there are no right or wrong answers.

Each item in the questionnaire consists of two statements marked (a) and (b); you are asked to read both statements, and then to indicate which of the two you agree with most by placing a tick or 'x' in the appropriate box.

Unlike some questionnaires which you will have encountered, you are not asked to give a rating of agreement or disagreement, but rather to choose one response in preference to another. It may well be that for some items your opinion makes it difficult for you to make a simple 'one or the other' choice; nevertheless please try to answer every question - choose the response which most closely represents the way you feel.

If you are sure you understand what is required, please turn the page and begin.

- 1 (a) Many of the unhappy things in people's lives are partly due to be luck ☐
- (b) People's misfortunes result from the mistakes they make ☐
- 2 (a) One of the major reasons we have wars is because people don't take enough interest in politics ☐
- (b) There will always be wars, no matter how hard people try to prevent them ☐
- 3 (a) In the long run people get the respect they deserve in this world ☐
- (b) Unfortunately, an individual's worth often passes unrecognised no matter how hard she or he tries ☐
- 4 (a) The idea that lecturers are unfair to students is nonsense ☐
- (b) Most students don't realise the extent to which their grades are influenced by accidental happenings ☐
- 5 (a) Without the right circumstances one cannot be an effective leader ☐
- (b) Capable people who fail to become leaders have not taken advantage of their opportunities ☐
- 6 (a) No matter how hard you try some people just don't like you ☐
- (b) People who can't get others to like them don't understand how to get along with others ☐
- 7 (a) I have often found that what is going to happen will happen ☐
- (b) Trusting to fate has never turned out as well for me as making a decision to take a definite course of action ☐
- 8 (a) In the case of the well-prepared student, there is rarely if ever such a thing as an unfair exam ☐
- (b) Many times exam questions tend to be so unrelated to course work that studying is really useless ☐

Appendix B

- 9(a) Becoming a success is a matter of hard work; luck has little or nothing to do with it ☐
- (b) Getting a job depends mainly on being in the right place at the right time ☐
- 10(a) The average citizen can have an influence in government decisions ☐
- (b) This world is run by the few people in power, and there is not much the average person can do about it ☐
- 11(a) When I make plans, I am almost certain that I can make them work ☐
- (b) It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyway ☐
- 12(a) In my case, getting what I want has little or nothing to do with luck ☐
- (b) Many times we might just as well decide what to do by spinning a coin ☐
- 13(a) Who gets to be boss often depends on who was lucky enough to be in the right place first ☐
- (b) Getting people to do the right thing depends upon ability; luck has little or nothing to do with it ☐
- 14(a) As far as world affairs are concerned, most of us are the victims of forces we can neither understand nor control ☐
- (b) By taking an active part in political and social affairs, the people can control world events ☐
- 15(a) Most people don't realise the extent to which their lives are controlled by accidental happenings ☐
- (b) There is really no such thing as 'luck' ☐
- 16(a) It is hard to know whether or not a person really likes you ☐
- (b) How many friends you have depends upon how nice a person you are ☐

Appendix B

- 17(a) In the long run the bad things that happen to us are balanced by the good ones ☐
- (b) Most misfortunes are the result of lack of ability, ignorance, laziness or all three ☐
- 18(a) With enough effort we can wipe out political corruption ☐
- (b) It is difficult for people to have much control over the things politicians do in office ☐
- 19(a) Sometimes I can't understand how lecturers arrive at the marks they give ☐
- (b) There is a direct connection between how hard I study and the marks I get ☐
- 20(a) Many times I feel that I have little influence over the things that happen to me ☐
- (b) It is impossible for me to believe that chance or luck plays an important role in my life ☐
- 21(a) People are lonely because they don't try to be friendly ☐
- (b) There's not much use in trying to please people; if they like you - they like you ☐
- 22(a) What happens to me is my own doing ☐
- (b) Sometimes I feel that I don't have enough control over the direction my life is taking ☐
- 23(a) Most of the time I can't understand why politicians behave the way they do ☐
- (b) In the long run the people are responsible for bad government or a national as well as local level ☐

TESTS ONE to FOUR used in Study 9

TEST NUMBER ONE

q1. $14 + 11 + 6 + 21 - 16 =$

q2. $7 \times 4 \times 3 =$

q3. $60 - 27 + 8 - 4 =$

q4. $1 + 2 + 16 - 5 + 4 =$

q5. $8.5 + 7.5 - 4 =$

q6. $14 + 11 + 6 + 21 - 16 =$

q7. $13 + 10 + 5 + 20 - 15 =$

q8. solve : RDEMA =

q9. solve : YEPNN =

q10. solve : WHONS =

q11. solve : PEDAS =

q12. $58 - 29 + 7 - 3 =$

TURN THE PAGE

q13. $6 \times 5 \times 2$ =

q14. $8.1 + 12.2 + 17.6$ =

q15. $5 \times 4 + 6 - 17$ =

q16. $17 + 18 + 19 - 23.5$ =

END OF TEST NUMBER ONE

TEST NUMBER TWO

q1. $9.4 - 8.7 + 13.6$ =

q2. solve : BLEAM =

q3. solve : MACRE =

q4. solve : ECHIM =

q5. solve : SELID =

q6. solve : GRAEN =

q7. solve : VABRE =

q8. $(16 \div 4) + (12 \div 4)$ =

q9. if $z = 2$ and $y = 3$, solve :
 $(2z + y) - y$ =

q10. if $z = 3$ and $y = 4$, solve :
 $(3z + 5y) - y^2$ =

q11. $6.3 + 4.1 + 3.2$ =

TURN THE PAGE

$$q12. (17 + 4) \div (49 - 42) =$$

$$q13. (96 \div 16) - 4 =$$

$$q14. (41 \times 2) - \sqrt{16} =$$

$$q15. 4 + 5 + 6 + 2 + 3 + 7 + 9 - 8 =$$

$$q16. 21 - 9 + 17 - 4 =$$

END OF TEST TWO

TEST NUMBER THREE

q1. $(22 + 17) - (14 + 3) + 2 =$

q2. $(6 \div 2) \times (4 \div 2) =$

q3. if $z = 5$ and $y = 2$, solve :
 $2z - 4y =$

q4. if $z = 5$ and $y = 2$, solve :
 $(3z + 2y) - z =$

q5. solve : LSBAT =

q6. solve : EENFC =

q7. solve : VHAYE =

q8. solve : SGORS =

q9. solve : ALUGH =

q10. solve : ROMTO =

q11. solve : TNIHG =

TURN THE PAGE

q12. $\sqrt{9} + \sqrt{4}$ =

q13. $3^2 + 4^2 - (12 \div 4)$ =

q14. if $z = 4$ and $y = 5$, solve :
 $z^2 + 2y$ =

q15. $2.7 + 8.8 + 6.9 + 3.7$ =

q16. $9.9 + 8.7 + 1.6$ =

END OF TEST NUMBER THREE

TEST NUMBER FOUR

q1. if $a = \frac{17 + 19}{2}$ and $b = 18 - 9 + 17$

solve : $a + 2b$ =

q2. if $z = 1.5 + 3.7 + 2.9$ and $y = \frac{5 \times 3}{2}$

solve : $2z + y$ =

q3. if $a = 4$ and $b = 3$ and $c = 5$

solve : $a + 2b + 3c$ =

q4. $\frac{100}{5} + 16 + 24.3$ =

q5. $23 + 89 + 54 + 512$ =

q6. $8 - 3 + 171.6 + 4$ =

q7. solve : TYALS =

q8. solve : DHRSE =

q9. solve : ELODV =

TURN THE PAGE

q10. solve : ALENC =

q11. solve : LJTEF =

q12. solve YRELA =

q13. if a = 3 and y = 4 and z = 5
 solve : (2z - y) + 4a + z =

q14. 1264 - 372 + 19 =

q15. 4 x 3 x 7 x 2 =

q16. 17.4 x 2 + 18.9 =

END OF TEST FOUR

TEST SHEET used in Study 10

Please read the following instructions carefully.

You are asked to complete a fifteen question problem-solving test. There are twelve minutes allowed for the test, and it will be strictly timed.

You will be awarded one point for each of the first fourteen questions correctly answered. A correct answer to the final question, no. 15, is worth 3 points. In addition, whatever you have scored on the previous 14 questions will be doubled if you correctly answer question 15. For example, if you get 9 out of the first 14 questions right, and also get question 15 right, your score will be $18 \text{ plus } 3 = 21$.

Your aim is to get the highest score you can.

If there is anything you do not understand, ask the test administrator now, otherwise please wait until told to begin.

Thank you for agreeing to participate in this test.

EXPERIMENT TWO

PAGE ONE

q1. $18 + 7 + 16 + 2 - 28$ =

q2. $8.4 + 7.6 + 9 - 4$ =

q3. $\sqrt{81}$ =

q4. $\frac{6}{2} + 4 - 6$ =

q5. $3^2 + 2^2 + 3 - 2$ =

q6. $99 - 87 - 3^2$ =

q7. $2.6 + 2.6 + 2.6 + 12.2$ =

TURN THE PAGE

PAGE TWO

$$q8. 2 \times 3 \times 4 - (15 \div 3) =$$

$$q9. 18 + 7 + 16 + 3 - 29 =$$

$$q10. 3^2 + 2^2 + 4 - 3 =$$

$$q11. 12 + 1 + 9 - 3^2 =$$

$$q12. \sqrt{81} =$$

$$q13. 1 + 12 - 4 + \sqrt{16} =$$

$$q14. 98 - 86 - 3^2 =$$

TURN THE PAGE

PAGE THREE

Each of the following code numbers represents a letter of the alphabet; solve the code to reveal a fourteen-letter English word.

Clue : it is not in the form of an anagram : the code represents the letters as they actually occur in the solution.

6 1 11 13 2 q5 3 14 4 7 12 9 q10 8

END OF EXPERIMENT TWO

DATA SHEET

these questions refer to the way in which you approached the problems contained in experiment 2

q1. before attempting to solve any of the problems, did you first look through any of the booklet (for example, to see how many problems there were, or to get a brief picture of the type of problems)?

please answer yes or no _____

q2. irrespective of your answer to q1. above, before attempting to solve any of the problems did you look at the last page of the booklet?

please answer yes or no _____

q3. do you have any idea of the nature of the code used in the final problem?

please use the space below for your answer

thank you for participating in these experiments; before leaving, please make sure you have the information necessary for you to claim your two points.