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Flow : the concept and implication for mental well-being and health.

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FLOW : THE CONCEPT AND IMPLICATIONS FOR MENTAL WELL-BEING AND HEALTH

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SUMMARY

The humanistic concept of flow (Csikszentmihalyi, 1975), which describes intrinsically enjoyable experiences, is based on the ratio of challenges to skills. Csikszentmihalyi's (1975) flow theory emphasises the positive affective state ('flow') experienced where challenges and skills are matched, so that the theory has clear implications for the study of personality. However, of more immediate consequence are the possible implications of the experience of flow and intrinsic motivation for the study of of health and well-being.

In this study, three experiments were conducted. The first determined the intrinsically motivating qualities of performing on a computer video game in comparison with other stimulating and unstimulating activities. Subsequently, this task was used in Experiment Two to formally examine the flow theory by assessing skill, and varying the challenge dimension of the activity. Affective states were assessed via the Experience Sampling Method (Larson and Csikszentmihalyi, 1983) and Experience Questionnaire (Privette, 1984) thereby identifying the factors underlying the flow experience. Three factors, labelled intensity of flow, coping and motivation, were shown to vary in line with predictions from the flow model; that is to say, the flow and experience factors were at their most positive where skill and challenge were matched, and at their most negative where the skill/challenge ratio imbalance was greatest.

Experiment Three originated the construction of 'flow profiles' to examine the hypothesis that the flow experience is a desirable quantity, and that differences in individual experiences of flow are accompanied by crucial differences in personality factors. The findings suggested that differences in flow experiences should not be considered in personality terms alone, but also that the flow experience is associated with more desirable personality characteristics from a health point of view, as described by Eysenck (1987). More specifically, healthy personality characteristics were associated with positive aspects of the flow factors (intense flow experience, ability to cope, motivation), whilst vulnerability to stress related disease was associated with the negative aspects of the flow factors (less intense flow experience, coping at a cost to health, less motivation). Evidence as to the causality of the relationship between flow, personality and health is discussed, and it is concluded that this indicates a cyclical relationship.

It was concluded that the flow experience may therefore play an important role in the prevention of stress related health disorders via it's interaction with personality factors. Further implications and directions for future research are discussed.

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CHAPTER 1

INTRODUCTION TO THE AREA OF STUDY

The study of intrinsic motivation in the psychological research literature has resulted in numerous theoretical notions about the concept, its basis and its nature. The writings of Deci (1972, 1975) appear to contribute the fullest accounts and definitions of the nature of intrinsically motivating situations and intrinsically motivated behaviour. It was suggested that a person could experience intrinsic motivation by performing an activity solely for the pleasure of the activity. Alternatively, a person could engage in an activity if the behaviour itself is rewarding (Deci, 1972). In addition, Deci (1975) suggested that the psychological process of feeling competent and self-determining underlies intrinsically motivated behaviour, and that such feelings will occur whenever people are able to deal with situations which provide them with some type of challenge. Combined with the incongruity theories of intrinsic motivation, ie, the need to seek optimal challenge with moderate discrepancy from some internal standard (for example, Hunt, 1965), one might conceptualise that intrinsic motivation is a result of the need to seek optimal incongruity, and feel competent and self-determining in dealing with it.

It is therefore not too difficult to follow the line of thought which resulted in Csikszentmihalyi's (1975) concept of 'flow' as a new model of intrinsic rewards. Formally defined as an intrinsically rewarding experience, flow is similar to the humanistic concepts of peak performance (above average behaviour or superior performance - Privette, 1981, 1982; Ravizza, 1977) and peak experience (moments of highest happiness - Maslow, 1962). Flow shares the enjoyment value of peak experience and the superior behaviour of peak performance, yet it should be noted that flow does not neccessarily imply optimal joy or optimal performance, but may include either or both.

Csikszentmihalyi (1975) described flow as a common experiential state found in play and other activities which are intrinsically rewarding, or autotelic experiences. Based on the ratio of perceived challenges and perceived skills, flow is hypothesised to occur wherever challenge and skill are matched, with imbalances resulting in boredom (when skill exceeds challenge) or anxiety (when challenge exceeds skill). Flow may occur in almost any behaviour ranging from automatic, repetitive behaviour to very complex behaviour. For example, microflow (where challenge is matched by skill at a low level) may be as inconsequential as chewing a piece of gum, whereas deep flow or macroflow (where challenge is matched by skill at a high level) has a full range of potential which may be accompanied at its most extreme by peak performance and ecstacy.

The research work of Csikszentmihalyi and his colleagues (for example, Csizkszentmihalyi, 1975; Larson and Csikszentmihalyi, 1978; Csikszentmihalyi and Graef, 1980; Massimini, Carli and Csikszentmihalyi, 1987) has centered on the collection of data via various random sampling methods. These resulted in the development of the Experience Sampling Method (Larson and Csikszentmihalyi, 1983), which consists of random reports of daily affective experiences, including how people spend their time and how they feel about it. Some of the more obvious questions arising from this research have been: Do different people derive the same rewards from the same activities ? Across how wide a variety of situations do people experience intrinsic rewards ? Do some people experience more intrinsic rewards (flow) than others ? And could it be possible to teach people how to experience flow more intensely and/or more often ? It would seem that these questions essentially address differences in individual reactions and responses to the environment. To consider any hypothesised differences in the experience of flow would therefore be deficient without seriously considering the role of individual differences in personality. Csikszentmihalyi (1975) has already suggested that 'flow profiles' may be a useful way of categorising people according to their potential for meeting environmental demands, although this line of research has not yet been taken any further. In constructing such flow profiles, it should be possible to determine the variety of situations across which a person experiences flow.

On the assumption that the flow experience is a desirable one, it follows that a person who is able to experience flow more often, or across a wider range of situations/activities, must demonstrate different personality characteristics than someone who experiences flow to a lesser extent. Taking this line of enquiry a little further, it may be possible to extract some type of explanation to the question of why the flow experience might be desirable and encouraged.

In discussing desirable (and undesirable) personality traits and their possible association with flow, one should also consider the body of literature which considers the relationship between personality and health. For example, the Type A behaviour pattern (hard driving, competitive behaviour - Glass, 1977) has traditionally been equated with Coronary Heart Disease, yet there have been more recent studies which have emphasised the potentially healthy aspects of Type A behaviour (Ivancevich and Matteson, 1988). Another example can be found in the recent work of Eysenck and colleagues (for example, Eysenck, 1986, 1987; Grossarth-Maticek, Eysenck and Vetter, 1987) who have identified the interacting role of psychosocial and personality variables in the onset of stress related health disorders. It might therefore be considered that the flow experience of intrinsic rewards with its basis in individual differences has far ranging implications in terms of reactions to stress, and health and well-being.

Initially one might consider the relationship between flow, personality and health, with particular reference to if and where the causality lies. However, it would seem that the major implication of this combination of research from humanistic and mainstream psychology is that it establishes a research basis for organising and channelling efforts towards optimal, healthy and superior functioning and experience. The concept of flow is applicable to virtually any situation where effective functioning is desirable. In a more general scheme of things, links can be achieved between the more conventional types of research in mainstream psychology (for example, through the concept of intrinsic motivation on which the flow theory is based), and the more abstract concepts from humanistic psychology. This interaction should be of interest to sport psychologists, rehabilitators, motor performance theorists, and health and exercise psychologists alike. Consequently, in any activity or situation, the humanistic constructs of peak performance, peak experience, and in particular, flow are potentially very important states. As a result, they may have immediate implications for the quality of life in general, as well as playing an important role in mental health and well-being.

CHAPTER 2

INTRINSIC MOTIVATION

Intrinsic Motivation Introduced And Defined

Over the past two decades, psychologists seem to have had an increasing interest in centering upon man as someone who is actively interested in pursuing work orientated goals. For example, Argyris (1964) suggests that individual employees need to experience `psychological success', or feel that their important abilities are being utilised. McGregor (1967) develops a case for enhancing the self control exercised by employees over their own activities, as well as reorganising jobs so that tasks become more meaningful. Overall, the emphasis centres on (i) a new reliance on self control as opposed to external coercion of the individual, and (ii) redesign of tasks so as to enhance the interest, involvement and growth of the individual.

Although not explicitly stated as such, these concepts are closely allied with the construct of intrinsic motivation. A number of conceptualisations have been advanced concerning the nature of intrinsic motivation. Both Deci (1975) and Eysenck (1982) have postulated that when someone is intrinsically motivated, the perceived locus of causality is within the person. However, if people perceive that they are engaging in an activity for an extrinsic reward, then the perceived locus of causality changes to the external reward or incentive, hence probably reducing intrinsic motivation. The work of Deci and his associates (1971, 1972, 1975) represents a similar position. In defining intrinsic motivation, Deci offers several different alternatives at various points in his writings. For example, Deci (1972) states that a person is intrinsically motivated if he/she performs an activity solely for the pleasure of the activity.

From a different perspective, Deci (1975) states that a person is intrinsically motivated to engage in a behaviour if he/she does it because the behaviour itself is rewarding. A third definition, also offered by Deci (1972), states that a person is intrinsically motivated if he/she is motivated by the job or activity itself, and satisfaction is derived from doing the activity well.

In a broader sense, such definitions of intrinsic motivation are not very satisfactory as they provide no understanding of the psychological basis of intrinsic motivation. A more meaningful definition offered by Deci (1975), makes reference to the processes which underlie a person's actions. According to Deci (1975) :

> "intrinsically motivated behaviour is behaviour which is motivated by a persons' innate need to feel competent and self-determining in dealing with his/her environment"

Such a viewpoint considers earlier assertions by the likes of Maslow (1954), Hartman (1958) and White (1963) who have suggested the presence of an energy source inherent in the ego of an individual, and the possibility of a motivational construct which is independent of the primary drives (such as hunger and sex).

In reviewing and contrasting several conceptualisations of intrinsic motivation it will be seen that precise definitions depend upon which conceptualisation one favours. However, a common element seems to be that intrinsically motivated behaviours are related to internally rewarding consequences located in the central nervous system, and have no appreciable biological effect on non-nervous system tissues. Activities which are motivated by extrinsic needs such as hunger, do have primary effects on non-central nervous system tissues.

From the definitions which emphasise self-mediated rewards and committment to the task (individual variables) interacting with the characteristics of the task itself (situational variables), Deci (1972) has proposed several means by which intrinsic motivation may be enhanced. First of all, jobs might be redesigned such that they necessitate creativity and resourcefulness from the individual. Secondly, employees might be allowed to participate in decisions which will eventually effect them, so as to increase feelings of being the causal agent (ie, the prime motivational source) of events which occur around them (de Charms, 1968). Thirdly, supervisors might direct positive verbal reinforcement towards their subordinates. According to Deci (1972), such reinforcements enhance intrinsic motivation because they provide additional positive affect which becomes associated with the task, and feedback concerning the adequacy of one's behaviour. These are ideas to which we will return at the end of the study as they provide important concepts on which to base future research.

Having provided a definition of intrinsic motivation from the research literature, it would seem logical next to examine explanations of intrinsic motivation. Numerous studies have attempted to explain and account for intrinsically motivated behaviour. To consider the merits and inadequacies of each, and draw conclusions about the nature and underlying processes of intrinsically motivated behaviour would be both time consuming and beyond the scope of this study. However, as intrinsic motivation is an underlying and important concept in the study of flow, a basic discussion of the investigation of intrinsic motivation will be considered.

Drive Accounts Of Intrinsic Motivation
(i) Exploratory Drive

Historically speaking, attention to the concept of intrinsic motivation began with animal studies by Dashiell (1925) and Nissen (1930). Both these studies reported that rats would cross an electrified grid and endure shock in order to explore novel stimuli in a maze, thereby demonstrating that exploration was in itself a reinforcing activity. By the late 1940's and early 1950's, a great deal of research reported similar findings, that manipulation and exploration are important examples of intrinsically motivated behaviour. For example, Berlyne (1950, 1955) demonstrated that rats are quick to explore novel spaces and objects, and will persist as long as novel stimulation is available. Similarly, Walker (1956) found that chimpanzees' interest in a novel object only waned when they had thoroughly explored and manipulated it. Such experiments clearly show that animals are motivated to explore and manipulate novel stimuli.

(ii) Visual Exploration

Butler (1953, 1954, 1957, 1958) reported that visual exploration of novel stimuli was rewarding for monkeys, and also that the probability of such a response increased as the interval to explore increased. Exploration was seen as an intrinsically rewarding activity which could be used to strengthen other responses. When an animal had been deprived of the opportunity to explore, the act of exploration became even more rewarding. Results supporting those of Butler were reported by Myers and

Miller (1954), and by Zimbardo and Miller (1958). However, these investigators suggested that animals explore novel stimuli in order to relieve a `boredom drive', which results from unchanging stimuli, as opposed to Butler's suggestion of a motive toward visual exploration of the environment. The boredom drive explanation focussed on the boredom which results from insufficient stimulation (ie, the absence of a stimulus), whereas Butler's drive explanation focussed on the elicitation of an exploratory drive towards novel stimuli (ie, the presence of a stimulus).

(iii) Boredom Drive

Isaac (1962) also suggested a boredom drive explanation of curiosity and exploratory behaviours. In this, the absence of stimulation or the presence of unchanging stimuli increases boredom so that any novel stimuli become more reinforcing. Isaac (1962) reported an experiment which suggested that the absence of stimulation produces greater boredom than the presence of an unchanging stimulus to one of the senses. The experiment demonstrated that monkeys deprived of light and sound engaged in more behaviour to turn on a light than those deprived of light but given an unchanging sound stimulus. However, the interpretation of this evidence in terms of intrinsic motivation could be disputed as it might be argued that this `sensory deprived behaviour' may be motivated by primary needs.

Studies by Bexton, Heron and Scott (1954), and Heron, Doane and Scott (1956) showed that humans are also unwilling to tolerate more than three or four days of unchanging stimuli (despite receiving substantial financial reward for doing so). Both Jones (1961) and Jones, Wilkinson and Braden (1961) demonstrated similar findings, concluding that information deprivation appears to have strong motivational properties.

(iv) Manipulation Drive

Harlow (1950, 1953) suggested a `manipulation drive' which is very similar to the Montgomery (1952, 1953, 1954) notion of an `exploratory drive'. Montgomery's research essentially demonstrated that rats will spontaneously explore novel places, and suggested that novel stimuli not only elicit an exploratory drive, but also a fear drive which may block exploratory behaviour if it is of a sufficient magnitude. In addition, Premack (1959, 1962, 1963) also demonstrated the reinforcing potential of manipulatory responses with both children and monkeys.

Much work related to intrinsic motivation has begun with optimal levels of stimulation as it's basis, be it at a psychological or a physiological level. Those who have focussed on the psychological level have generally been guided by one of two approaches: the incongruity theories, and the competence/self-determination theories.

Optimal Stimulation Theories Of Intrinsic Motivation
(i) Optimal Incongruity

The incongruity approach suggests that organisms are intrinsically motivated by a need to encounter stimuli which are moderately discrepant from some internal standard. In other words, they seek stimulation which is moderately different from their accustomed level of stimulation (Berlyne, 1978; Hunt, 1965; McClelland et al, 1953; Walker, 1973). For example, Hunt has argued that for effective functioning, organisms need an optimal amount of psychological incongruity between some internal standard and a stimulus event. The internal standard is simply some element of one's cognitive structure, for example, a person who has swum a maximum distance of one mile will have that as an internal standard. The stimulus event, such as the goal of swimming a mile and an eighth would provide a moderate discrepancy, so that the person might well be sufficiently intrinsically motivated to swim that distance. On the other hand, the goal of swimming two miles might provide too much of a discrepancy and would therefore become aversive. When the situation becomes either boring or aversive, people do not function as effectively as when there is moderate incongruity to stimulate their intrinsic interest. This notion, or others which are similar in nature, has also appeared in the work of McClelland et al (1953), Hebb (1955), Dember and Earl (1957) and Berlyne (1967, 1969).

McClelland et al (1953) considered that at any given time, a person has developed a level of adaptation. Consequently, that amount of stimulation will cause a neutral response. Small deviations either above or below are considered desirable, whereas large discrepancies will result in a negative affect. Hence people approach slightly discrepant situations but avoid highly discrepant ones. Some evidence supporting this position was presented by Haber (1958) from a study in which subjects immersed their hands in water of varying temperatures above and below their adaptation level. Slightly discrepant temperatures were chosen and highly discrepant ones avoided.

Dember and Earl (1957) have suggested that the important incongruity or discrepancy in intrinsically motivated behaviour is between a person's expectations and the properties of the stimulus. A person approaches a stimulus with certain expectations about (some dimensions of) the stimulus (for example, the temperature of the water, the loudness of a noise). The stimulus has some value on that dimension, and it is the discrepancy between the expected level of the stimulus (or a particular dimension of the stimulus) and the actual level, which is of central importance. Their theory also asserts that a person will attend to a stimulus which has optimal `complexity' (that is, the discrepancy between a person's expectation about complexity and it's actual level or levels). Finally, it was proposed by Dember and Earl that individuals will direct their attention towards `pacer' stimuli, ie, they will be intrinsically motivated to approach stimuli which have a complexity value at an optimal level above their ability with regard to the various dimensions of the stimulus.

(ii) Competence And Self-Determination

The focus of the competence and self-determination approach to understanding intrinsic motivation is on the need and capacity of organisms to deal effectively with their environment. White (1959) proposed the concept of competence to refer to a person's capacity to deal effectively with his/her surroundings. This concept considers such activities as exploration, manipulation, attention, perception, thought, and communication, as all these activities are necessary to deal effectively with the human environment. White uses the term `effectance motivation' to describe this need.

Like Berlyne, White suggested that the energy for intrinsically motivated behaviour comes from the central nervous system. Effectance motivation leads to behaviours which result in a person having feelings of efficacy. Therefore he/she is intrinsically motivated to engage in behaviours which allow him/her to experience competence or efficacy.

Angyal (1941) preceded White in attaching considerable importance to the notion of competence in dealing with one's environment. He argued that organisms increase their autonomy through acquiring competence in dealing with their environment. Angyal also suggested that humans tend toward self-determination (a notion very similar to that of effectance motivation). For Angyal, the tendency toward self-determination would appear to be the essence of intrinsic motivation. The notions of competence and self-determination first appear together in the work of de Charms (1968). He suggested that people have a basic desire to experience themselves as the originators of their own behaviours rather than experiencing their behaviours as being the result of external forces. Indeed, according to de Charms, the desire to be in control of one's fate is a contributing factor in all motives. In further discussing the notion of intrinsic motivation, de Charms considered Heider's (1958) concept of perceived locus of causality. As a result of this, he suggested that whenever people experience themselves as being the locus of causality for their own behaviour, they will consider themselves to be intrinsically motivated. Conversely, when people perceive the locus of causality for behaviour to be external to themselves, they will consider themselves to be extrinsically motivated.

Deci (1972) has also asserted that people engage in many behaviours in order to feel competent and self-determining. These behaviours can be considered in two classes. The first includes behaviours which involve seeking out situations providing a reasonable level of challenge. If someone is bored, they will seek out an opportunity to use their creativity. If someone is overchallenged and frightened, they will seek a different situation which provides a challenge that they can handle. In short, this motivational mechanism leads people to situations which provide challenges that allow them to make optimum use of their abilities. The second class of behaviours motivated by the need for competence and self-determination includes behaviours which are intended to overcome challenging situations. In other words, people are motivated to reduce `uncertainty', `dissonance' or `incongruity' to acceptable levels whenever they encounter it or create it.

In sum, this approach suggests that intrinsically motivated behaviours are aimed at bringing about certain internally rewarding consequences that are independent of non-nervous system tissue needs. More specifically, they are intended to bring about the feeling of competence and self-determination.

Concluding Comments

It is clear from this review that theories of intrinsic motivation should account for the fact that behaviour is motivated by desires both to reduce and induce stimulation. These facts can be handled by three of the approaches to understanding intrinsic motivation: optimal arousal theories (eg, Hebb, 1955; Leuba, 1955), optimal incongruity theories (eg, Hunt, 1965; Dember and Earl, 1957), and competence and self-determination theories (eg, White, 1959; de Charms, 1968; Deci, 1972). Optimal arousal theories focus on the physiology of the central nervous system, whereas the two other approaches are primarily psychological. A complete understanding of intrinsic motivation should ideally include both psychological and physiological considerations.

The optimal incongruity and competence approaches are both psychological theories, which talk about similar phenomena and are clearly somewhat related. However, there is an important difference; the end state for an optimal incongruity theory is that the organism achieves the optimum, whereas for the competence theories the end state is positive affect (ie, feelings of competence and self-determination). Having a positive affective state as the end point is appealing because it is obviously an internally rewarding condition. An optimal level of incongruity is less obviously rewarding, and therefore seems to have less heuristic value. Adopting the competence and self-determination approach, Deci (1975) suggests that people will feel competent and self-determining whenever they are able to deal effectively with challenging situations. Consequently, organisms will seek challenge if there is no challenge or stimulation present in their environment. Furthermore, if they encounter a situation which is too challenging, they may leave it for a situation which offers a more reasonable challenge to them (this is not grossly dissimilar from saying that organisms need to encounter some optimal incongruity).

CHAPTER 3

MEASUREMENT OF INTRINSIC MOTIVATION

Introduction

Motivation is an abstract concept, and as such, cannot be directly observed. Quite often, only the resulting behaviour and feelings can be observed, measured or recorded. In addition, a major limiting factor is the paucity of measurement devices available for assessing motivation. The existing literature has utilised two major measures of the strength of intrinsic motivation:

(i) the amount of time spent working on an activity in a free choice situation in which there are other things to do, and no external rewards are available; and

(ii) task satisfaction and willingness to volunteer for a similar future experiment, revealed by questionnaires and self-report measures. Furthermore, taking the lead of Halliwell's (1978) suggestion that:

> "researchers should supplement behavioural indices with self-report instruments which would provide valuable attributional and attitudinal information."

there are several examples in the intrinsic motivation literature to be discussed which have utilised both measures.

Behavioural Measures Of Intrinsic Motivation

In order to consider solely behavioural measures from which intrinsic motivation has been assessed, it is necessary to retreat to the 1950's and early animal studies for the first examples. Harlow, Harlow and Meyer (1950) observed that monkeys would work on a puzzle apparatus over an extended period for no apparent reward other than the activity itself. Similarly, Gately (1950) also observed such an effect with monkeys. In these studies, behavioural measures consisted of subjective observations by the experimenters. More recent studies have found it necessary to utilise more intricate designs in order to quantify their observations. In what proved to become a standard paradigm for such research, Deci (1972) examined the effects of extrinsic reinforcement and rewards on intrinsic motivation. Following several experimental manipulations, subjects were left alone with a puzzle solving task in a free choice situation in which they were allowed to pass the time as they wished. The amount of free time spent during a rest period on the criterion task in preference to any other available choice was taken as the measure of the intrinsic value of the task.

A similar design was utilised by Kruglanski et al (1975). Subjects' degrees of intrinsic motivation were inferred from the amount of time they spent on a verbal puzzle task beyond the required 10 minutes (up to a maximum of 14 minutes after the starting time).

Using nursery school children as subjects, Ross (1975) also used a behavioural observation index to measure intrinsic motivation. Following a task involving the accompaniment of a record of animal sounds on a toy drum, subjects were placed in a free choice situation for 5 minutes, during which time they were allowed to continue playing with drums or any other toy in the room. Three measures of intrinsic interest in the drums were obtained: (i) whether the first toy that the child contacted during the free time play period was the drum, (ii) the total duration of contact with the drum during the free play period, and (iii) whether the child reported that the drum was the most `fun thing' in the room when subsequently questioned by the experimenter.

This traditional behavioural method was also used in a study with young children by Boggiano, Ruble and Puttman (1982) using a `hidden pictures' task. Following performance on this criterion task, subjects were left alone for a 9 minute free choice period. They were allowed to play with any of a series of games which had been pre-tested for their intrinsic value. These included marbles, a game where lines could be drawn to form a picture (dot-to-dot), two mazes, and an additional set of hidden pictures. The amount of time that subjects spent with the target activity (hidden pictures) was recorded as a behavioural index of intrinsic motivation.

Behavioural indices of intrinsic motivation therefore consist of subjective observation during free choice periods, with the amount of time dedicated to the criterion activity usually taken as the measure of intrinsic interest.

Behavioural/Questionnaire Measures Of Intrinsic Motivation

Several studies in the 1970's and early 1980's have combined behavioural observation measures with additional questionnaire measures. Although the observational measures follow the lead of Deci (1971, 1972), the questionnaires used in the literature vary greatly. Using the cube puzzles which appear in most of his motivational studies, Deci (1971) took the amount of time spent working on the puzzles during an 8 minute free choice situation as his primary measure of intrinsic motivation. Additionally, at the end of each session, subjects were asked to rate on a 9 point scale the degree to which they found the task interesting and enjoyable. This information was collected to empirically verify the assumption that the subjects were intrinsically interested in the task.

Three measures of intrinsic motivation were obtained in a study by Fisher (1978). The first was a behavioural measure of intrinsic interest using a hidden word puzzle task. Subjects were given a 10 minute free time period each day, during which they were allowed to take coffee, talk with each other, or work on a `supplementary puzzle packet'. Rather than use the amount of time spent on the primary activity which had been the traditional behavioural measure (eg, Deci, 1971), intrinsic motivation was defined by the number of words circled on the supplementary packet. The second measure was constructed by summation of six of the intrinsic job satisfaction items from the short form of the Minnesota Satisfaction Questionnaire (Weiss, Dawes, England and Loftquist, 1967). The third measure was the Task Reaction Questionnaire (Mayo, 1977), which is a scale specifically designed to measure intrinsic and extrinsic motivation, and which will be discussed in more detail later.

Intercorrelations between these three measures of intrinsic motivation were computed, revealing a correlation of .73 between the two self-report measures. However, the free time measure failed to correlate significantly with either of the questionnaire measures of intrinsic motivation. It should be observed that there was substantial reason to believe that the free time activity did not reflect intrinsic motivation due to a misunderstanding over a payment system as part of the experimental treatment. Many subjects believed that they were being paid to work in their free time despite being told that they were not. Thus, the free time measure for some subjects reflected extrinsic rather than intrinsic motivation.

In criticising the validity of certain dependent measures of intrinsic motivation used in the existing literature, Arnold (1976) focussed on the importance of other influential factors and their effects upon intrinsic motivation. He suggested that a subject's level of performance on a task together with feedback regarding their performance, would both be important influences upon intrinsic motivation. Arnold went on to state that if measures of satisfaction and enjoyment are valid indicators of the strength of intrinsic motivation, then it should also be possible to predict future behaviours from such data. This prediction is discussed further in the light of his findings in the study reported next. The study required subjects to perform on a strategy type computer game. The primary measure of intrinsic motivation was the voluntary return behaviour of subjects who had initially agreed to participate, ie, whether subjects returned to play the game more than once. The design allowed subjects to play the game a maximum of three times if they so desired. At the conclusion of the game, subjects also completed a brief questionnaire. The questionnaire contained four 7-point scales which asked for ratings of enjoyment of the game, satisfaction with the game, feelings of competence at the end of the game, and degree of interest in returning to play the game again. It was concluded that volunteering for the task in the future is an inflated measure of intrinsic motivation, and that self-report indices should be approached with caution. It was suggested that research is required which examines the relationship between volunteering and actual return behaviour for tasks which are not highly intrinsically motivating. However, it may also be interesting to note from this study that it was tentatively concluded that feedback from the task influenced subjects' perceived competence on the task, and that perceived feelings of competence were an important component of intrinsic motivation.

Again using puzzle solving, although in a competitive setting on this occasion, Deci (1981) used the free choice time that subjects spent working on the puzzles as the dependent measure of intrinsic motivation. The puzzles available during this period were insoluble so as to preclude the possibility that subjects would finish a puzzle and continue because of the success feedback. Subjects also completed a short questionnaire containing two target questions: "how interesting did you find the puzzle solving activity ?", and "how skilful did you perceive yourself to be ?". Both were answerable on a Likert-type scale from 1 to 7. Deci's rationale behind asking these questions was that past research utilising this general paradigm (cf Deci, 1975) had always yielded large within cell variances on the dependent measure (presumably reflecting large individual differences in people's motivation for the activities used). The questions were used as covariates in an attempt to reduce the error variance. Deci argued that although the questions were answered after experimental treatments and therefore could have been influenced by the treatments, one might expect that the largest share of variance in response to the questions was a reflection of their interest and perceived ability on the task, rather than a result of the treatments.

Adopting his procedure from the Deci studies, Earn (1982) used the time spent by each subject working on anagrams as the main measure of intrinsic motivation. In addition, subjects also completed a `post-task evaluation questionnaire'. This questionnaire included four 7 point differential scales designed to assess task liking. The scales were anchored by four adjective pairs: not at all interesting - very interesting, not at all entertaining - very entertaining, not at all exciting - very exciting, not at all enjoyable - very enjoyable. These were summed to form the index of task liking. Analysis of variance on the task liking ratings revealed results very similar to those on the behavioural measure of intrinsic motivation.

In a design similar to that of Earn (1982), Ryan et al (1983) also supplemented behavioural indices with a questionnaire measure. Subjects were again observed in a 6 minute free choice period, with the number of seconds spent on the criterion task serving as the behavioural measure of intrinsic motivation. Following the free choice period, subjects were asked several questions in which they rated their interest and enjoyment of the puzzles on 7 point Likert scales. These questions were incorporated into a questionnaire which also contained items relating to levels of tension and pressure experienced, degrees of effort and so on. Although Ryan et al found both their dependent measures of intrinsic motivation - behavioural and self-report, to be elevated by the experimental treatment, the ANOVA results using the self-report measure failed to reach significance, although the pattern of results paralleled the free choice data (which was significant). The relationship between these two measures will be discussed with reference to other research findings later.

The primary measure of intrinsic interest used in a study by Harackiewicz et al (1984) was the behavioural record of pinball playing activity during a free choice period. This assessment included the number of balls played, as well as the amount of free time spent playing pinball. The former was chosen as it seemed to be a natural measure of interest in playing pinball, and corresponded to the number of games a subject chose to play. As time has been measured in so many other previous studies (eg, Deci, 1972), the time measure was included here for comparative purposes. Self-report measures were also taken in this study. Subject's anticipated performance ("how well do you think you will do in the game today ?") and evaluation of personal meaning ("how important is it to you to do well at the game today ?") were assessed prior to performance on a 10 point scale. Actual performance was indexed by scores on the game during the experimental session. Following the free choice period, perceived performance ("how well do you think you did compared to other students ?") was measured on a 10 point scale. Analysis showed that the three measures of intrinsic motivation - balls played, time spent on the game given a free choice (behavioural measure), and enjoyment (self-report questions relating to fun, interest, boredom, and enjoyment) were all significantly correlated.

The literature which has assessed intrinsic motivation through both behavioural and self-report measures has been of much interest in providing a comparative analysis of the two measures, and as a means of linking the intrinsic motivation studies which have used different methods of assessment. Harackiewicz (1984) found the two measures to be significantly related as did Harackiewicz et al (1979) as previously mentioned. A correlation of .42 ($p<.001$) was found between behavioural and questionnaire measures in the Ryan et al (1983) study, which was to all intents and purposes identical to the one obtained by Harackiewicz et al (1979). A study which did not find the two measures to be related was that of Luyten and Lens (1981). Their work was criticised by Ryan et al, on the grounds that it utilised only a single self-report item, whereas Ryan et al's interest measure comprised 11 items. Furthermore, it seems likely that this difference is the reason for the different correlation results.

Questionnaire Measures Of Intrinsic Motivation

Several recent studies have employed a variety of self-report measures to assess intrinsic motivation. However, in the tradition of the questionnaire measures which have been used to supplement the behavioural measures discussed previously, there appears to be no standard format. Weinberg and Jackson (1979) gave subjects three questions following performance on a stabilometer (pilot testing had indicated that the task was intrinsically motivating). The questions were answered using a 7 point scale which attempted to assess subjects' intrinsic motivations during the task. Subjects were asked to rate the task from extremely uninteresting (1) to extremely interesting (7); from extremely boring (1) to extremely exciting (7); and from extremely unenjoyable (1) to extremely enjoyable (7). In addition, attributional questions were administered on a 5 point scale, concerning luck, ability, effort and task difficulty.

Weinberg and Ragan (1979) also used three attitudinal questions, which were answered on a 7 point scale. These questions concerned subjects' perception of intrinsic interest following performance on a pursuit rotor task. In particular, subjects were asked to rate the task from extremely enjoyable to extremely unenjoyable. A second question asked if the task was more like work or leisure time. Finally, subjects were questioned directly about their degree of intrinsic interest in the task. As the experimental task did not lend itself to a typical free time measure of intrinsic interest, subjects were asked to volunteer some of their time to take part in a future experiment of a similar nature. The amount of time which they volunteered was then used as a measure of intrinsic motivation. Such a procedure had been successfully employed previously by Calder and Staw (1975).

Harackiewicz and Manderlink (1984) presented subjects with an unvalidated questionnaire following performance on hidden word puzzles, previously shown to be of considerable intrinsic interest (Harackiewicz, 1979; Manderlink and Harackiewicz, 1984). The questionnaire contained 24 questions concerning task involvement and enjoyment of the puzzles. The questions were again answered using 7 point Likert scales. Several studies were cited by these authors which reported correlations of approximately .40 between similar self-report scales (which were not reported) and free choice time (Harackiewicz, 1979; Harackiewicz, Manderlink and Sansone, 1984).

A different questionnaire was used by Sansone (1986) to study the effects of competence and task feedback upon intrinsic motivation. The primary dependent measure of intrinsic motivation was an enjoyment scale which comprised seven items in a post-performance questionnaire. The seven items asked subjects to rate their enjoyment of the task, their interest in the task, and whether it was fun, not boring, absorbing, interesting, and enjoyable. Each question was rated on a 7 point scale, so that possible scores ranged from 7 to 49, with higher scores indicating greater enjoyment. Attempts to obtain a behavioural measure in a free choice situation were unsuccessful because subjects indicated that temporary satiation and fatigue were the main causes of their lack of play during this period.

What is probably most apparent from the research examples cited which have utilised questionnaire measures of intrinsic motivation is that the selection of test items appears to be totally arbitrary. Although many scales have similar items, none are identical, resulting in an absence of any objective measuring instrument.

Task Reaction Questionnaire (Mayo, 1977)

The lack of a standard intrinsic motivation instrument led to the development of the Task Reaction Questionnaire - TRQ (Mayo, 1977). It has been suggested that the questionnaire reflects Deci's (1975) understanding of intrinsic motivation as a need to feel competent and self-determining (Vallerand and Reid, 1984). It consists of 23 questions, each of which is scored on a 7 point Likert scale. The maximum score is thus 161, which is indicative of a high level of intrinsic motivation. The TRQ has been found to possess high internal consistency (.93 - Mayo, 1977), and split-half reliability (.96 - Fisher, 1978). It has also been shown to possess construct validity, as it has yielded results in line with predictions from cognitive evaluation theory (see Mayo, 1977; Fisher, 1978). Finally, the questionnaire has been found to be relatively free from social desirability answer sets (Mayo, 1977). Thus, the instrument appears to represent a reliable and valid measure of intrinsic motivation.

In the development of the questionnaire, two item pools were created, one containing items assessing intrinsic motivation, and the other pool extrinsic motivation. An initial 96 items in the intrinsic pool were reduced to 62 items following a content evaluation. In addition to the intrinsic motivation scale, an extrinsic motivation scale was also developed. The item pool generated for this subscale, originally containing 75 items, was reduced through content analysis to 38 items. All items were then placed in a 7 point Likert format ranging from strongly agree to strongly disagree. A reliability analysis of the subscales was undertaken using a series of pencil and paper puzzles. Following selection of specific puzzles (those with high ratings on interest and difficulty), the resulting set of puzzles was administered to 245 subjects for reliability estimation and item analysis purposes. The analysis resulted in the elimination of 5 intrinsic, 4 extrinsic and 3 distraction items. The results of the reliability study supported the contention of high internal consistency amongst the selected items. Subsequent application of the Crowne-Marlowe social desirability scale indicated that neither of the motivational scales appeared to be associated with a social desirability response set. Another interesting finding concerns the apparent lack of linear association between the intrinsic and extrinsic scales (ie, r=.06). Thus, one may hypothesise that intrinsic and extrinsic variables do not define opposite ends of the same continuum. That is to say, an individual may score high on both scales, low on both scales, or some other combination. However, several researchers have assumed some theoretical link between intrinsic and extrinsic variables (eg, Deci, 1971). This may not hold in an experimental situation using the TRQ.

Mayo (1977) further assessed the construct validity of the scale in an experimental context. Two experimental groups were exposed to a manipulation consisting of a threat to esteem induction (adapted from Karman, 1968) or a control condition. One group signed a consent form implying that their task reactions would be compared to a `superior ability' group, whilst a second group was not given that information. Analysis of scores on the intrinsic motivation index indicated a statistically significant effect as predicted (the mean for the threat group was lower than the mean for the no threat group). On the basis of these findings, it was concluded that the scale was useful in the motivational assessment of experimental effects.

A final study by Mayo examined the validity of Deci's (1975) hypothesis concerning the negative impact of financial incentive upon intrinsic motivation. The intrinsic motivation scale revealed a significantly lower mean for the incentive group, thus offering more conclusive support for the Deci hypothesis than had previously been reported. In addition, the TRQ also duplicated the free time effect, measured by a behavioural trace measure of involvement, a self-report of how much free time subjects spent on the task, and actual free time performance.

Task Reaction Questionnaire Applications

The TRQ has been successfully utilised in several research studies. As mentioned previously, Fisher (1978) found significant correlations between the TRQ and other self-report measures, although the correlation with a behavioural free time measure was not significant (for the reasons discussed earlier). The TRQ was also used by Lopez (1981) to study the effects of contingent rewards on employees' performance and intrinsic motivation in an organisational setting. Performance-contingent bonuses were shown to increase performance and intrinsic motivation as a result of the employee's perception of personal control over their performance and feedback from the job.

The TRQ has also been used in sport situations by Vallerand and his colleagues (Vallerand, 1983; Vallerand and Reid, 1984). Vallerand (1983) used the questionnaire to study the effects of differential amounts of positive verbal feedback on intrinsic motivation. Subjects receiving positive verbal feedback displayed significantly higher levels of intrinsic motivation and feelings of competence than control subjects.

Vallerand and Reid (1984) used the questionnaire to assess initial levels of intrinsic motivation on a task (stabilometer), and to identify subjects displaying a moderate to high level of intrinsic motivation towards the task for further experimental manipulations. Again using the TRQ, results were reported which supported the findings of Vallerand (1983) regarding the effects of positive verbal feedback on intrinsic motivation and perception of competence.

CHAPTER 4

INTRODUCTION TO HUMANISTIC CONCEPTS

Introduction To Peak Performance And Peak Experience

Humanistic psychology approaches the study of humans by emphasising the whole person and the internal components of a person's total self-motives, intentions and feelings. The work of humanistic psychologists, most notably Maslow (1943, 1954), has developed and emphasised the concept of self-actualisation. This can be regarded as a motivational construct in that Maslow considered man to be motivated to actualise his unique potential and become all that he is capable of. The concept of self-actualisation will be considered in more depth at a later point. Self-actualisation bears some resemblance to the notion of effectance motivation mentioned in Chapter 2. However, Maslow suggested a hierarchical structure of needs, such that self-actualisation is the salient need only after all other needs have been satisfied. Effectance motivation, on the other hand, is supposedly present and motivates behaviour at all times rather than just after other needs have been satisfied.

During the last two decades, a `quiet revolution' (Rogers, 1977) has nudged psychology towards becoming a human science which addresses the whole person and is adequate for a broad based helping profession. Psychology has traditionally stressed behaviour with laboratory type research, and pathology with clinical treatment. Emphasising a more holistic psychology, the emerging humanistic and phenomenological perspective includes experience with behaviour as well as the positive with the pathological (Maslow, 1962). This type of psychology offers a technology which encourages the explicit inclusion of both experience and behaviour as basic categories in personality studies.

Two constructs from the humanistic psychology literature describe intense, positive experiences: peak experience (Laski, 1962; Maslow, 1962, 1964), defined as an intense and highly valued moment, and peak performance (Privette, 1964, 1968, 1981, 1982; Privette and Landsman, 1983), defined as an episode of superior functioning. Neither peak performance nor peak experience are dependent on particular types of behaviour and could feasibly occur in any situation or event. Consequently, it would seem that a combination of peak performance and peak experience provides a model for superior human functioning and experience.

Peak Experience And The Research Literature

Maslow (1962) wrote that peak experiences are "moments of highest happiness and fulfilment". In peak experiences he recognised a level of psychological experience that surpassed the usual level of intensity, meaningfulness and richness. Leach (1963) defined the peak experience as:

> "that highly valued experience which is categorised by such intensity of perception, depth of feeling, or sense of profound significance as to cause it to stand out in the subject's mind, in more or less permanent contrast to the experiences that surround it in time or space."

Studying `ecstacy', Laski (1962) further defined peak experience as "being characterised by being joyful, transitory, unexpected, rare, valued, and extraordinary to the point of often seeming as if derived from a pre-eternatural source".

Although there seems to be a considerable amount of theorising in this area of research, the distinct sparsity of quantitative evidence on the subject may be a result of the difficulty in measuring and scientifically studying individuals' subjective experiences. Some progress has recently been made however in studying nonpathological psychological experience. The limited research dealing with peak experiences in sport has revealed that participation provides the athlete with a wide range of subjective experiences (Leonard, 1975; Slusher, 1967). The general paradigm used in this type of research has been an interview technique to retrospectively ascertain the personal experiences of subjects and thereby achieve a general characterisation of a particular subjective experience; for example, those experiences involved in an athlete's `greatest moment' while participating in sport (Ravizza, 1977).

In studying peak experiences in lif, Maslow (1962) identified psychological experiences that surpassed the usual levels of intensity, meaning and richness. Both his research and that of Laski (1962) examined retrospective self-reports of peak experiences from a varied but not random sample of respondents. Other studies have investigated a variety of personality attributes and activities associated with peak experience (McCain and Andrews, 1969; Breed and Fagan, 1972; Ravizza, 1977).

Ravizza (1977) interviewed a small sample of athletes who gave accounts of their experiences in sport. These reports and descriptions contained many similarities to Maslow's (1968) description of peak experience. Athletes reported their experiences as demanding their total attention resulting in loss of self, fusion with the experience as a whole, and disorientation in time and space. Some athletes described feeling in total control of the situation, which is similar to Maslow's report of feeling Godlike, and experiences were also reported as being `perfect'. In addition to the similarities, Ravizza also found that certain features of peak experience listed by Maslow (1968) were not reported by his athletes. For example, Maslow referred to attention being very broad and total during the peak experience. This was not the case in Ravizza's sport peak experiences, where the athletes' attention was total but narrow in focus. There was no consciousness of the fusion of dichotomies, or abstract thought, or awareness. Thus, the experiences tended to be of a body experience, and less of a cognitive or reflective nature. Presumably, this is a result of the nature of athletic activity. Similarly, although the experiences were invariably reported as intense in nature, few athletes regarded them as of pivotal importance to their lives. This contrasts markedly with many peak experiences from general life (through religious experiences, etc). No athletes reported a life change following their sport experience.

McCain and Andrews (1969) designed a study to look more directly at the relationship between peak experiences and Maslow's concept of self-actualisation. Subjects described peak experiences and completed three questionnaires. These three instruments were assumed to have some relevance to self-actualisation. They were used in an attempt to differentiate subjects whose reports were classified as peak experiences from those whose reports were classified as non-peak. The three instruments were the California F-scale (Adorno, 1950), selected to measure authoritarian and anti-authoritarian attitudes; Rokeach's Dogmatism Scale (Rokeach, 1960) to measure open and closed-mindedness; and the 16 Personality Factor questionnaire (Cattell, 1957). It was hypothesised that subjects who describe transcendent experiences for themselves would be differentiated from those who did not by means of personality measure. More precisely, it was hypothesised that personality in some way influences the accessibility of peak experiences. The subjects' responses were classified by a panel of judges as peak or non-peak experiences according to criteria taken from the writings of Maslow.

Of the sample, 42 subjects were given peak classification and 99 non-peak. On the F-scale, peak subjects held significantly more anti-authoritarian attitudes than non-peak subjects ($p<.01$). On the Dogmatism Scale, the difference between groups ($p<.05$) suggested that peak subjects were more open-minded and flexible in the application of their beliefs. Among the 16PF scores, 5 factors were significantly different at the .01 level; the differences suggesting that the subjects who reported peak experiences were more intelligible, tender-minded, forthright, experimenting and self-sufficient. Differences at the .05 level also suggest that peak subjects were more exped assertive and imaginative.

McCain and Andrews suggested that their results indicated that from the peak/non-peak distinction made in this sample, the peakers were more self-actualising than the non-peakers. Peak experience is therefore associated with the notion of self-actualisation. McCain and Andrews further imply that peak experiences occur as a result of the ability to self-actualise, although it is unreasonable to imply this causality from these results. It might therefore be more reasonable to suggest that this is a reciprocal relationship. Of course, the implications of these findings for mental health regarding the personality correlates of the peak experience construct may be quite important, and this is an issue which will be examined in more detail at a later point.

In fact, with this last point in mind, it is probably worth reflecting on an earlier study by Margoshes and Litt (1966), which examined the relationship between peak experiences and psychological well-being. The subjects were normal or psychotic individuals, and were required to list the life experiences they remembered most vividly. These were then classified as peak, nadir (negative), or doubtful experiences. The results indicated that the normal subjects reported significantly more peaks and significantly fewer nadirs than did psychotics, which may suggest that there is some relationship between self-actualisation and mental health. However, a more likely explanation would seem to be that psychotics are unable or unwilling to recall positive experiences.

Peak Performance And The Research Literature

Acts of superior performance arouse widespread interest, yet there have been few systematic attempts to examine such performance. Most related studies have focussed on specific types of superior functioning; Maslow (1971) has investigated a valued moment in the peak experience; May (1975) explored creativity in contemporary life; and Rogers (1977) studied the meaning of personal power.

Peak performance refers to the superior use of human potential; it is more efficient, creative, productive, or in some way better than ordinary or habitual behaviour. Although it has been operationally defined for research purposes as "behaviour which exceeds typical behaviour" (Privette, 1983), peak performance is usually regarded as a high level of functioning rather than a type of activity. It may occur in any activity as creative expression through an art form, physical strength in a crisis, prowess in an athletic event, intellectual mastery of a problem or a particularly rich human relationship. Peak performance may further be isolated as a once-in-a-lifetime event, or it may occur often, or in rare instances, frequently. Consequently, the peak performance construct is useful as an aid to understanding human potential and for the examination of qualities common to all experiences that significantly tap human power (Privette, 1964, 1968).

The concept of peak performance makes it possible to examine different types of superior performance to learn what, if anything, they have in common (for example, in sport, the arts etc). Factors which are common to different types of activities might be related to the peak level of behaviour generally (Privette, 1978). Peak performance shares semantic similarities with Maslow's (1962) concept of peak experience and other humanistic and transpersonal concepts. Correlates of peak experiences have already been examined and it is likely that peak experience and peak performance occur together in many events, particularly in sport and aesthetic events as studied by Ravizza (1977) and Panzarella (1980).

Privette's Research On Peak Performance And Other Humanistic Constructs

Much of the work directed at the peak performance phenomenon has been the result of research by Privette (1981, 1982, 1983, 1985, 1987). In attempting to discover whether there are psychological conditions common to all experiences of peak performance, an exploratory study by Privette (1981) initiated a research basis for understanding the superior use of human potential. A questionnaire was used to collect descriptions of experiences from 4 groups of subjects: students in introductory psychology, students in the creative arts, students in adult education and graduates in counsellor education. The questionnaire included 4 parts: an open question requiring a narrative of a personal peak performance, a Likert-type scale rating the importance of 73 items for that peak performance, an open question related to average behaviour, and a Likert-type rating scale of the 73 items for average behaviour. A factor analysis of the peak performance variables resulted in the identification of 22 factors with eigenvalues greater than 1, of which 13 had a positive association with peak performance. Comparison of overall scores for peak performance, obtained from the total factor scores, with those for average behaviour revealed a significant difference ($p<.001$). Factor scores did not differ significantly when comparing peak performance among the 4 subject groups, or between males and females. Descriptions of the dimensions relevant to peak performance included: clear focus upon self, object and the relationship between the two; spontaneity and freedom from inner and outer restrictions; and the expression of self, strength and vitality.

Privette (1981a) considered an extra group of subjects who reported experiences related to sport in addition to the data from those groups described above, using the same questionnaire method. Nine factors were identified as having scores indicating a strong positive association with peak performance for both the total group and the sports group. These factors were identified with reasonable clarity: prior interest and fascination, clear focus, awareness of peak performance, peak experience, intentionality, immediate involvement, movement towards closure (often in sports, the intention is to move towards a successful closure and completion of the event), spontaneity and inner freedom.

This data was subsequently further analysed and reported by Privette (1982) in an attempt to develop a tentative typology of peak performance in sports. This typology was based upon the factor structure of the peak performance construct and the factor and item subset scores of the sports respondents. Key experiential discriminators of peak performance in sports seemed to include spontaneity, functional autonomy, power and joy, loss of time and space, intention, peak experience, a strong sense of self and fascination. Sports respondents denied the importance of global awareness, consistency, pleasant and easy beginnings, and playfulness.

Several of these findings are supported by more contemporary research. Privette has suggested that although attention is clearly focussed with a loss of time and space, together with global awareness and non-awareness of anything extraneous, attending to the activity does not exclude a strong sense of self. This may appear to contradict Maslow's notion of loss of self with absorption, but it is supported by Gould, Weiss and Weinberg's (1981) findings that both focussed attention and self confidence were variables which differentiated successful from non-successful wrestlers.

Maslow (1971) offered theoretical arguments which suggest that peak experience is often the result of peak performance. However, as suggested earlier, although this relationship is implied, the data do not necessarily suggest a causal relationship. Conversely, Mogar (1967) in studying methods and results in LSD research, provided tentative evidence that peak experience may facilitate peak performance. A subsequent comparative analysis of these two experiential phenomena (Privette, 1983), suggests that the interrelationship of peak performance and peak experience is both significant and, more interestingly, reciprocal (discussed in more detail later). The evidence of Maslow and Mogar would therefore appear to confirm the reciprocal nature of this relationship as opposed to providing contradictory evidence on the relationship.

Comparisons Of Humanistic Constructs

Privette and Landsman (1983) also attempted to identify common factors associated with descriptions of peak performance, and to differentiate peak performance from modal or usual functioning. The questionnaire used to gather and evaluate descriptions of peak performance was similar to that used in Privette (1981, 1982). Of the 74 items used in the rating scale, 40 were sufficiently reliable and relevant to include in the analysis following test-retest administrations. Again, the questionnaire required narrative descriptions of a personal experience of peak and of modal functioning, and completion of the rating scale for both peak and modal events. Results relating to the specific hypotheses of the study demonstrated that peak performance is identifiable and measurable in divergent activities and amongst different groups of people. There are also characteristics associated with peak performance which are different from those associated with modal functioning. These conclusions were supported by differences between peak and modal functioning indicated by factor analysis and t-tests, and the similarity of peak performances amongst the three groups of subjects as indicated by discriminant function analysis.

The factor analysis also allowed the identification of factors exclusive to peak and to modal performance, and factors common to both type of performance. One of the more important factors found exclusively in peak performance is clear focus on self, object and their relationship. Described previously by Privette (1981), this dimension emphasises clarity and sharpness of focus. Intense involvement is another important factor of peak performance which does not appear as a modal factor. Privette and Landsman (1983) suggest that the task which elicits peak performance possesses an intrinsic value for the person, culminating in a direct and rewarding engagement. Both factor structures contained the dimensions of spontaneity and intention. Both factors also identified positive awareness of other people, and overt response to other people, although scoring patterns suggested that these dimensions were considered to be relatively unimportant to peak functioning. An exclusive modal factor, transcendence, which had no peak counterpart, was heavily loaded on items with low mean scores indicating a lack of transcendence as an important feature of modal experiences and functioning.

A criticism which may be levelled at the work of Privette reviewed up to this point (and that which will be reviewed later) is that the set of data under examination in the four or five research reports is essentially the same. The sample of 120 (4 groups of 30) in Privette (1981) is the same sample as used in Privette (1981a, 1982), although this research concentrates on a particular subgroup of the sample. Similarly, Privette and Landsman (1983) report on a sample of 90 subjects, which are in fact taken from the original sample of 120 (using 3 of the 4 groups). The subsequent results emphasise the multidimensional structure of the peak performance phenomenon, which is apparently reiterated by the findings of the later research. However, the findings do not appear to have been substantiated when one considers that the raw data is actually the same and only the statistical manipulation is varied. This should not be seen as a criticism of the original research or the research methodology, so much as an ethical consideration in which the repetition of an exercise to document further evidence for a hypothesis appears to be rather pointless and frustrating for the reader.

Probably the most significant outcome from the Privette research has been the development of the Experience Questionnaire. This is a research instrument designed to measure self-reported experiential data. The development of the questionnaire is documented elsewhere in this thesis. Privette and Bundrick (1987) used the Experience Questionnaire to gather data on a series of events extended to comprise positive and negative extremes of performance and feeling (ie, peak experience, peak performance, flow, average events, failure and misery) from a sample of 123 adults. The respondents were presented with six questionnaires randomised by construct event, which consisted of: peak performance (an incident in your life characterised by functioning at your best), peak experience (an incident in your life characterised by highest happiness), flow (the last time you played a sport or game), an average event (something you did between 3-6pm yesterday), misery (an incident in your life characterised by deepest misery), and failure (an incident in your life characterised by total failure). Ultimately, the procedure elicited narrative accounts and item ratings for each of the construct events.

Factor analysis reduced the data to a manageable number of variables after the scores were collapsed across the original events of interest (peak performance, peak experience and flow) for each item. Factor scores were computed for descriptive and comparative purposes. Repeated measures analyses on item and factor scores were used to test for overall event effects (ie, flow, peak performance, peak experience, misery, average event, failure). These were followed by a discriminant analysis on item scores to demonstrate the use of experiential variables to discriminate construct events. Analyses of variance and post-hoc tests were calculated on item and factor scores for descriptive and comparative purposes.

In reporting Privette's pre-factor analysis work here, although the terms used are those of Privette, they may be confusing to some readers. For example, `collapsing' usually means `taking means across' which does not seem to be an obvious thing to do. In addition, `overall' implies some sort of `global' experience measure which also fails to account for the notion of analysing individual item and factor scores.

The comparisons of factor and item scores yielded clear and differential experiential descriptions of the six construct events. Peak performance was characterised by the person experiencing a strong sense of self as powerful in a clearly focussed process. A sense of significance and fulfilment were important correlates of peak performance whilst the role of other people was seen as unimportant. Peak performance was also not primarily spiritual, playful, or structured from outside.

Peak experience was characterised by fulfilment and a sense of ecstacy, a strong sense of significance, strong meaning and personal value. It also shared with flow the importance of other people, and was only surpassed by peak performance in full focus and self in clearly focussed process. Finally, peak experience was absorbing and overwhelming, but was not characterised by outer structures or playfulness.

Flow was differentiated from all other events by play. Involvement with other people, outer structure, intention and absorption were also characteristic of the flow event. Moderate levels of self in clear focus, reward and positive performance were reported, but significance was not endorsed, with spirituality uniquely denied in the flow event. Of course, as we shall see in the more detailed anaysis of flow which follows later, these experiential phenomena are characteristics of `sport' and not necessarily `flow'. The assumption that the one implies the other is a slight misconception on the part of Privette and Bundrick (1987).

Outer structure was the most common characteristic of average events, although most of the related experiential characteristics were at moderate levels (which is perhaps not suprising when considering the descriptor of the event). Play was not seen as characteristic of average events, but prior related movement was acknowledged, and the events described were active. Full focus was a uniquely negative correlate of average events, whilst spirituality, significance and fulfilment were all denied as characteristics of average events.

Misery was uniquely characterised by negative spiritual qualities, and was considered with peak experience to be a highly significant event. There were strong feelings of being overwhelmed, intensity and a sense of emergency. Outer structure, full focus and fulfilment were not apparent in misery, and enjoyment of other people, playfulness and self in clear focus were uniquely negative correlates of misery.

Failure was best characterised by spirituality although this quality was seen as particularly negative. Outer structure and full focus were also denied, so that the event was seen as intense, overwhelming senses and thoughts, and involving a personal sense of responsibility. In addition, though the event involved a high degree of action, fun and playfulness were specifically absent. Other people were not positively involved or enjoyed in the failure event although they may have influenced the outcome. Performance was uniquely poor as one would expect, with positive feelings and reward both missing.

Previous studies had differentiated experiential correlates of peak performance from those of average behaviour (Privette and Landsman, 1983), whilst not substantiating major differences amongst groups of respondents, types of activity or between men and women. Likewise, in this study peak experience was described in essentially the same way. At a basic level, this research (together with Privette, 1986, described later) affirms the accessibility of experiential phenomena via accounts and descriptions of personal events.

The construct events described above had been postulated to be independent units identified by specific gradients of performance and feelings that could be recognised and described. The key question concerning independence of construct events is whether these concepts have experiential qualities that differentiate them from one another. The results which have been given here suggest this independence and demonstrate the qualities. A discriminant analysis and series of analyses of variance demonstrated that experiential data had extremely powerful discriminative and differentially descriptive powers. Linear combinations of experiential variables correctly classified 97.7% of cases by construct event - displaying a high degree of independence. Analysis of variance indicated differences among construct events on all eight factors identified from the factor analysis, and 44 out of 47 items were significant ($p<.001$). This evidence provides support for the validity of construct events as independent units, although, of course, discriminant functions should be validated using seperate samples of subjects.

In summary, Privette and Bundrick's study provides quite strong support for both the independence of construct events and the accessibility of experiential correlates of human events. The flow event is perhaps weak because challenge and skill (on which the flow idea is based) are often unmatched in sports and games. The full context of this remark will be clearer after the discussion of flow which follows this section. The document more importantly lends weight to the construct and content validity of the Experience Questionnaire, and provides experiential descriptions of the 6 construct events studied.

Research by Privette (1986) using the Experience Questionnaire to assess descriptions of human experiencing produced data to support the experiential content of Privette and Bundrick (1987). Unfortunately, the criticism which was levelled earlier at Privette's work arises again here, as the sample and data were simply reproduced from the Privette and Bundrick (1987) study. The minor difference in the 1986 report was the absence of flow amongst the construct events under consideration.

In addition to identifying the experiential constructs and their underlying factors, Privette (1983, 1985) has also attempted comparative analyses of the constructs, although these are essentially forerunners to the actual experimental work. Nevertheless, they are probably worth drawing attention to as they provide an interesting insight into how the constructs may be both unique and shared in terms of performance and feeling. The model presented in Figure 1 operationally defines two experiential phenomena by means of two scales: feeling (ecstacy, joy, enjoyment, boredom, worry, depression, misery), and performance (personal best, effectiveness inefficiency, failure).

Each quadrant indicates a particular relation between the two dimensions. The upper right quadrant shows happy, productive functioning, capped by peak performance and peak experience (for example, Ravizza's greatest moment in sports). Flow, described by Csikszentmihalyi (1975) could also be a familiar experience in this quadrant. The lower right quadrant represents a high level of performance and low feeling. A driven worker would probably typify this quadrant, and the miserable genius would be an extreme case. The lower left quadrant represents low feeling and low performance, and may be typified by various types of mental illness with varying degrees of severity as well as periods of situational failure and unhappiness. The upper left quadrant representing high feeling and low performance may appear in many passive recreational pastimes such as watching TV or listening to music. Again, the `stoned' individual represents an extreme case.

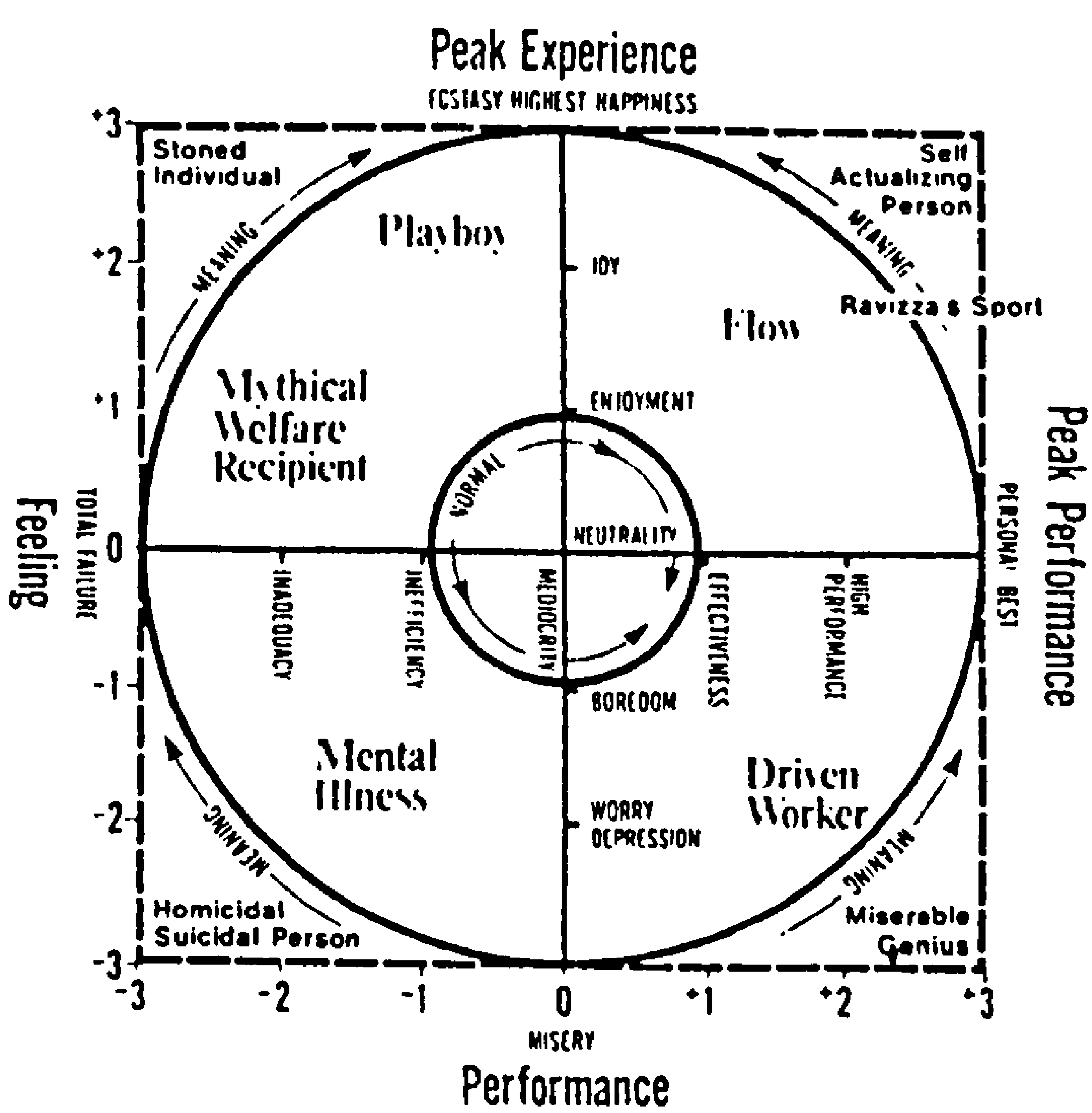
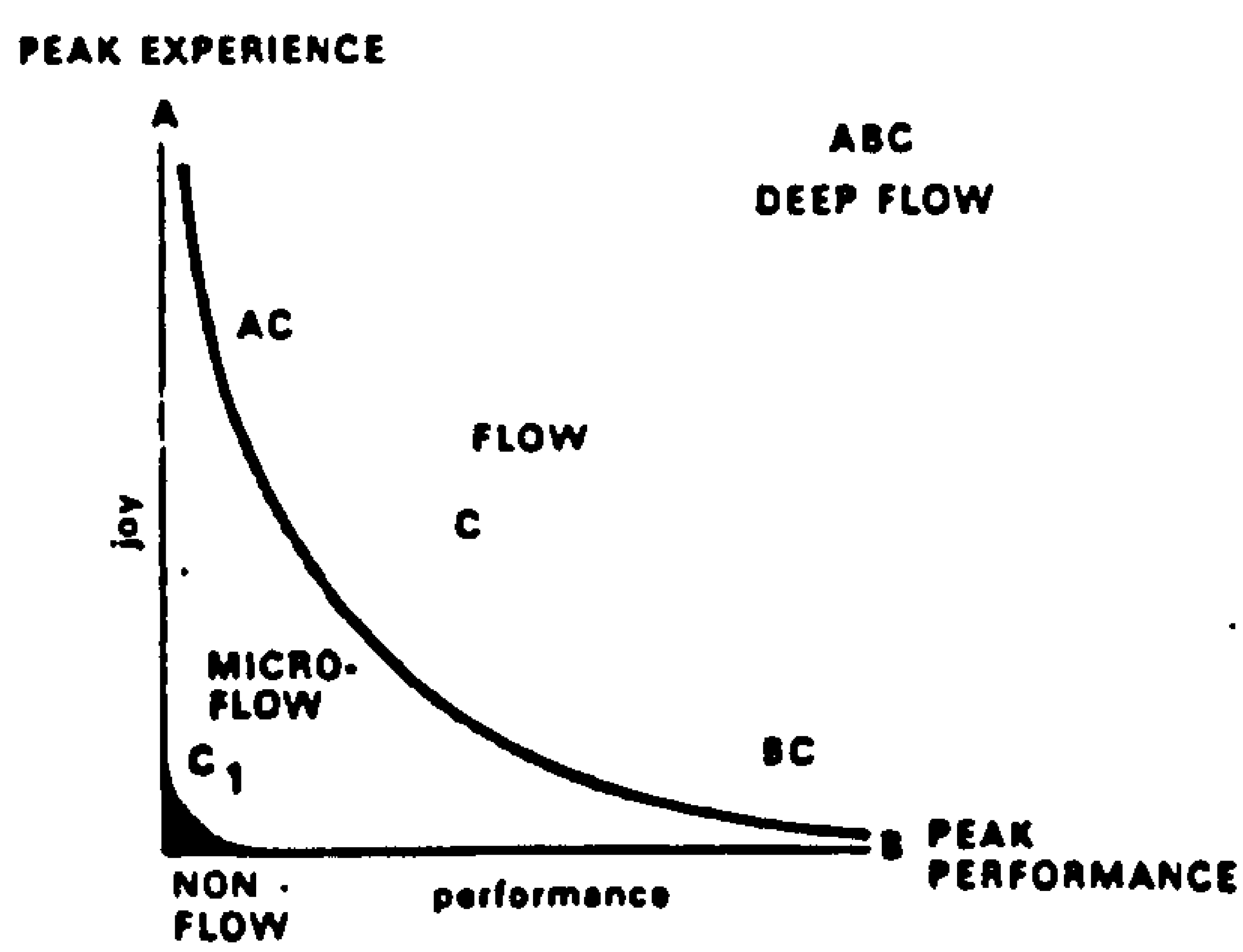


Figure 1 : An Experience Model Of Feeling And Performance (Privette, 1986)

The four construct events shown in Figure 1 are therefore each identified by a certain level of performance and feeling. The model also suggests interrelationships and possible behavioural and personality correlates. The relationship between peak performance, peak experience and flow has been similarly described by Privette (1983). Although the characteristics of each event are discussed elsewhere, a basic comparison of peak performance, peak experience and flow are represented in Figure 2 together with their interrelationships.

An excellent example which has already been mentioned and which contains all three experiences is Ravizza's (1977) great moments in sport. The characteristics that his subjects designated are clearly related not only to peak experience, but also to peak performance and flow. On the other hand, peak experience may not be peak performance as is evident in the example of listening to music. Music listening, although flow, is defined at a very low level of performance, and therefore may be considered as microflow, although of course, feeling while listening to music could well be high. Childbirth and sexual experiences are other frequently mentioned peak experiences, neither of which involve peak performance, although again, there are some who might argue that performance is an important part of peak sexual experiences (Hardy, personal communication). Conversely, although childbirth is not flow, sexual activity often is. Crisis events may trigger peak performance, but do not necessarily include peak experience and usually do not include flow. Csikszentmihalyi (1975) does not specify that flow involves superior performance. However, it is likely that many sports and games are flow events, but not necessarily entailing a high level of performance, or accompanied by the intense feelings found in peak experiences.

In the context of a human science, Privette's (1983) analysis provides a reasonable topology of the mutual and exclusive qualities of intense positive experience. The resultant topology is based on several interpretations, and appears to be most useful as a reference point upon which to base further study.



A = Peak experience: listening to music, childbirth
B = Peak performance: crisis, placebo
C = Flow: bicycle riding, game playing
ABC = Ravizza's peak experience during great moments in sport
AC = Peak experience and flow: sky diving, sex
BC = Peak performance and flow: superior running, painting
c1 = Microflow: chewing gum

Figure 2 : Interrelation Of Constructs

Origins Of The Flow Concept

When a child plays, when a man sits by a river with his fishing rod, or when someone is engaged in solving a crossword puzzle, the aim of the activity is not usually something external to be achieved, but simply to experience the activity for it's own sake. Clearly, the underlying concept of intrinsic motivation discussed earlier, is at work here (although this is not necessarily the case if we accept Deci's definition proposed in Chapter 2). Catching fish or solving a puzzle are really the only purpose to which the activities tend. Consequently, such activities might be labelled `autotelic', because their goal is the activity itself. Obviously, it would be much easier for a fisherman to buy fish at the supermarket, yet fishing allows him to spend time attending to an autotelic goal, and thereby experience an inner state which is rarely available in daily life with it's competing and often contradictory demands.

It is therefore possible to define optimal experiences in formal terms as an `ordered state of consciousness' (Csikszentmihalyi, 1986). Order as used here, depends on certain characteristics of the information flow; for example, if there is too much or too little information, or if information is random and/or incongruous, consciousness cannot cope and various forms of inner stress are thought to occur.

Within the range of ordered experience, optimal experience may be further defined in terms of two dimensions: what there is to do, and what one is capable of doing. In other words, the perception of challenge and skill. When artists, athletes or creative professionals describe their best times or experiences in their chosen activities, they frequently mention the dynamic balance between opportunity and ability as being a crucial element of the experience. Consequently, optimal experience is differentiated from states of boredom in which there is less to do than one is capable of, and from the anxiety which results when there are more demands than one is capable of dealing with (Csikszentmihalyi, 1975).

Interest in such a phenomenon was originated by Csikszentmihalyi (1965). In studying a group of artists, he observed that on completion of a piece of work involving considerable time, the artist lost all interest in his/her creation. None of the extrinsic rewards that usually motivate behaviour appeared to be present. In the case of artists, the most likely causal explanation for such behaviour would seem to be the notion of `sublimation'. According to such an explanation, they enjoy painting because it is the closest socially acceptable symbolic explanation of an artist's true desires. However, Csikszentmihalyi commented that such an hypothesis is insufficient when one considers why an artist continues to tackle ever more complex challenges, and why he/she constantly perfects his/her skills if the whole point is to vicariously experience unfulfilled desires.

The fact that the reason for painting did not appear to be the usual desire to achieve extrinsic goals suggests that the reasons may be within the activity, and that rewards may be gained from the act of painting, or more generally, performing an art or action. The only conceptual framework close to the phenomenon under consideration at this time was Maslow's distinction between `process' and `product' orientations in creative behaviour, and in particular, his identification of `peak experiences' (Maslow, 1962, 1965). In his studies, he described people who worked hard, not in order to get conventional rewards, but because the work itself was rewarding.

Maslow attributed the motivation for performing such actions to a desire for self-actualisation, defined earlier as a need to realise one's potentialities and limitations through intense activity and experience.

The theoretical justification for the movement towards research into intrinsic motivation can be traced, in part, to Hunt's (1965) optimal arousal hypothesis. This hypothesis was an attempt to account for laboratory experiments demonstrating that rats were motivated by novelty, curiosity and competence drives (Butler, 1958; White, 1959). This research line was continued by Deci (1971, 1973) with his contribution of the 'overjustification' hypothesis which stated that under certain conditions, extrinsic rewards (eg, money) could prove to be a disincentive for doing things one may have wanted to do anyway, although the extrinsic reward of verbal praise actually increased intrinsic motivation. A similar effect, refining and replicating the overjustification findings, was demonstrated by Lepper and colleagues (Greene and Lepper, 1974; Lepper and Greene, 1975). However, probably more significant was the work of de Charms (1968) in studying schoolchildren who felt in control of their lives. They were labelled `origins', as opposed to `pawns' who were defined as children who felt they had no control over what was happening to them. An important characteristic of the `origins' was their intrinsic motivation, and it might also be hypothesised that they had an internal locus of control (although this was not examined).

Consequently, Csikszentmihalyi (1975) argued that there were sufficient theoretical grounds for believing that people can be motivated to act by a wide range of rewards, much wider than traditional psychologists had suspected. However, demonstrations of the importance of intrinsic rewards were still based upon laboratory studies, where behaviours of small children were observed according to experimental paradigms (for example, Deci, 1971, 1972). Very little was known about intrinsic motivation in natural settings. Neither did laboratory based researchers appear to be concerned with how the `intrinsically motivated' person felt, or the qualities of the subjective experience which made the behaviour intrinsically rewarding.

In an attempt to provide evidence to answer such questions, Csikszentmihalyi (1975) interviewed over 200 people who were presumed to be familiar with intrinsic rewards. These individuals spent vast amounts of time in strenuous (mental or physical) activities for which they received little or no financial reward or recognition. Subjects included rock climbers, athletes, dancers, chess masters and composers. The aim of the interview was to find out how such people described their activity when it was going particularly well. Although this might appear to resemble peak performance, it should be remembered that flow does not necessarily involve superior performance. The results, and subsequent observations will be detailed in the next section, with a more systematic presentation of the flow model of intrinsically motivated behaviour. The major theoretical contribution of the study was to identify a common experience across diverse activities which subjects felt was autotelic, or rewarding in itself. He named this experience "flow". The study also explored the characteristics of those activities that provided intrinsic rewards. Again, despite the differences between the activities, a common set of structural characteristics was found to distinguish the actions which resulted in flow from the rest of everyday life. However, the major practical implication of this exploratory study was that flow not only resulted from play, leisure and creative pursuits, but could also be built into any activity, including work.

The Structure Of Flow Situations And A Model Of The Flow State

Probably the clearest definition of flow is a dynamic feeling state denoting the holistic sensation one experiences with total involvement (Csikszentmihalyi, 1975). Some people appear to be able to enter a flow state simply by directing their awareness to limit the stimulus field in such a way as to allow the merging of action and awareness. However, it seems likely that most people rely on external cues to enter the flow state, and therefore one might speak of flow activities as those structured systems of action which usually allow the production of flow experiences. It would be useful then to begin a formal analysis of how some activities make it possible for the flow experience to occur.

The model initially proposed by Csikszentmihalyi and Bennett (1971), and shown in Figure 3, describing the interaction of a person with the environment is based on the consideration that at any given moment, people are aware of a large number of opportunities which challenge them to act. At the same time, they are also aware of their skills, that is, their capacity to cope with the demands imposed by the environment. The model suggests that when people perceive themselves as unable to meet the demands of a situation (ie, they view the challenge as exceeding their level of skill), the resulting state is one of anxiety. When the challenge is less, yet people still perceive themselves as unable to meet the demands (ie, the challenge is still viewed as exceeding their level of skill but to a lesser extent), the resulting experience is worry. The state of flow is hypothesised to exist when people perceive opportunities for action (challenges) as being evenly matched by their capabilities (skills). Finally, it is hypothesised that if people perceive their skills to greatly exceed the challenge, then anxiety will result. If their skills are perceived to be greater than the challenge, although to a lesser extent, then such a situation would result in boredom.

At this formative stage, the model and it's predictions are quite vague, particularly in it's use of the terms `worry', `anxiety' and `boredom'. These are Csikszentmihalyi's terms, which exist to provide labels for the model, without seriously considering the definitions and differences between the terms.

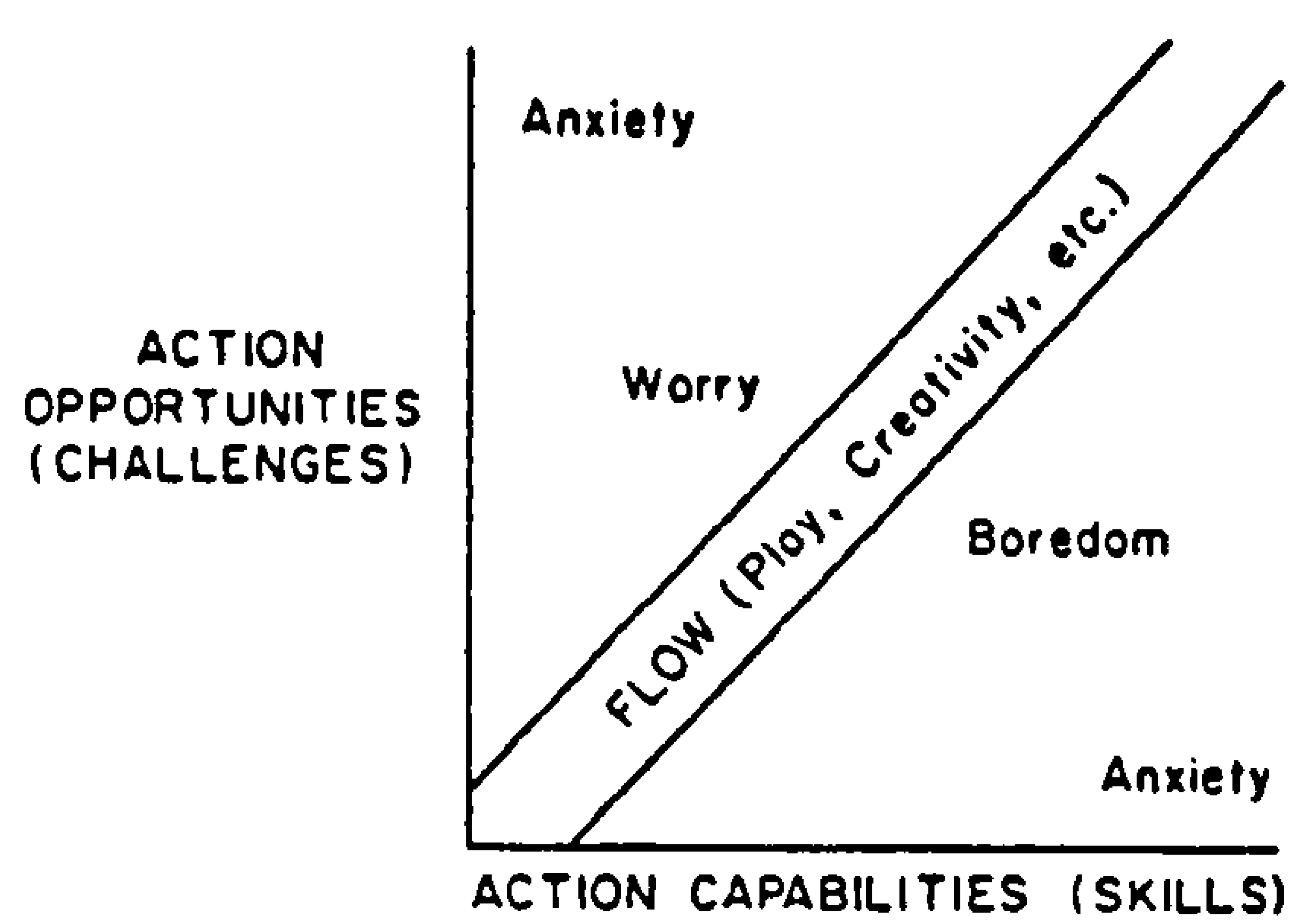
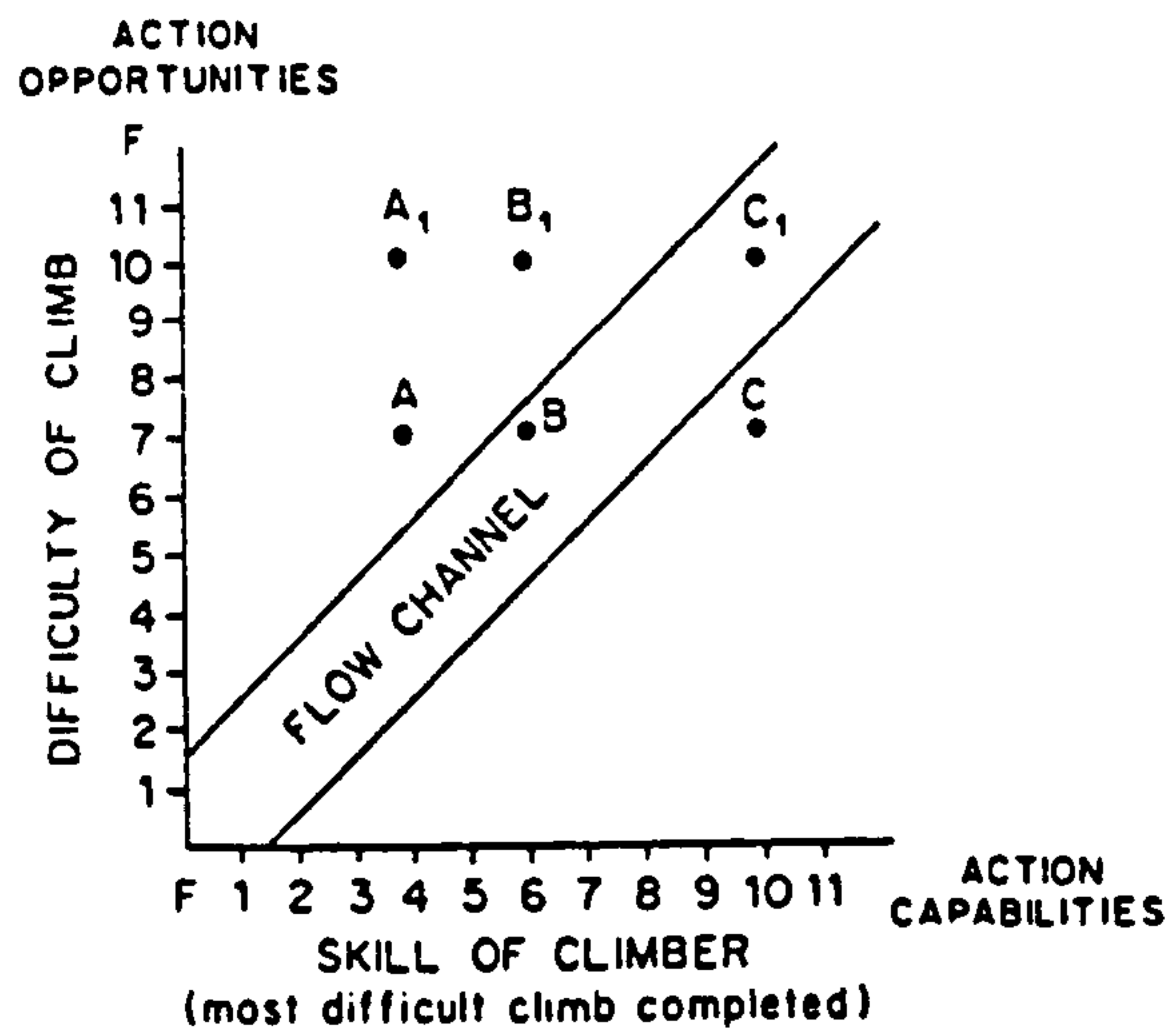


Figure 3 : Model Of The Flow State (Csikszentmihalyi, 1975)



A = Rock climber with F4 skills
B = Rock climber with F6 skills
C = Rock climber with F10 skills

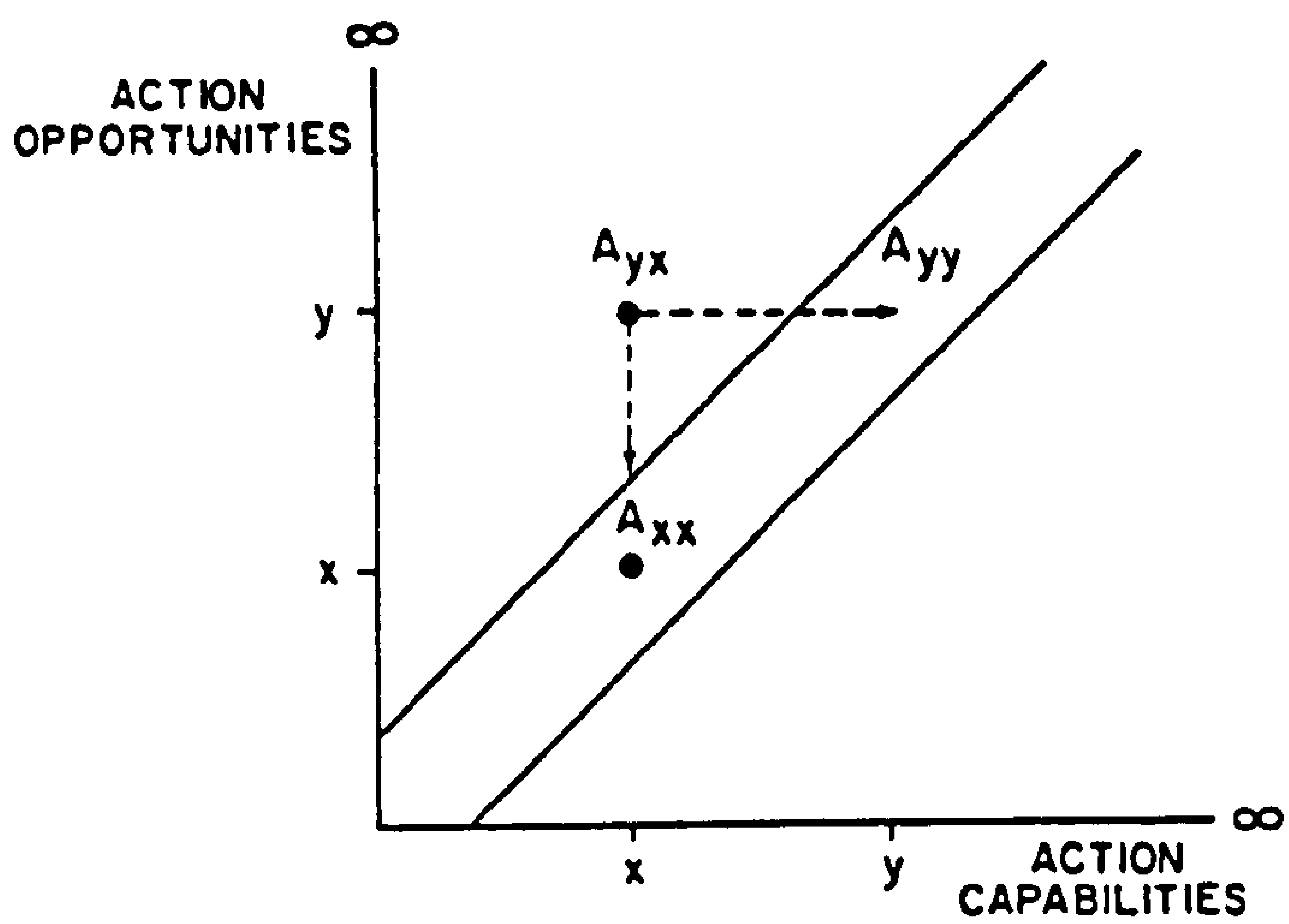
Confronted with a rock face whose difficulty is rated F7, A will feel worried, C bored and B will experience flow. On a rock face whose difficulty is rated F10, A will feel anxious, B worried and C in flow.

Figure 4 : Example Of Flow And Non-Flow Situations In Rock Climbing

An example of what the model implies is presented in Figure 4. In rock climbing, the essential challenge consists of the difficulties of the rock face which one is about to climb. Each climb, and each move on a climb can be reliably rated in terms of the objective difficulties it represents. In the example featured here (taken from Csikszentmihalyi, 1975), the generally adopted system of ratings in the USA range from F1 (a scramble) to F13 (the limits of human potential). A climbers skills can also be rated on the same contiuum, depending on the difficulty of the hardest climb completed. If the hardest climb a person had ever done was rated F6, then his/her skill level could also be expressed as F6. However, in practice it is not quite as simple as this, since most climbers are better at some types of climbs than others. In addition, this says nothing about current ability ('usual leading' grade might be a better definition). Figure 4 suggests some of the predictions one might make about the experiential state of climbers if one knows both the ratings of the rock and the climber. For example, F4 climbers on a F7 pitch will tend to be worried and on a F10 pitch they will be anxious. In actual climbing terms, this is a gross understatement. It is simply meant as an example to illustrate the model in action. Similarly, people with F10 rated skills will be bored climbing a F7 pitch unless they decide to increase the challenge by adopting some tacit rule such as using no footholds or climbing without protection.

Rock climbing is a good example of a flow activity because it is virtually impossible for any individual to master all the F13 pitches in the world, and also because even the same climb can be rendered more challenging by weather conditions or self-imposed handicaps. Athletics also has theoretically unreachable ceilings as do other flow activities such as art and creativity, therefore allowing an individual an indefinite increase in the development of skills, or in the ability to organise experience.

This naturally leads to a discussion of Figure 5. It follows from the model that the quality of the flow experience is different depending on how high on the abscissa and the ordinate one is operating. People in a state of worry can return to flow through any combination of two basic vector processes: decreasing challenges and increasing skills. If they choose the latter, the resultant flow state will be more complex as it will involve more opportunities and a higher level of capabilities. Conversely, if one is bored, one can return to flow either by finding a way to increase environmental challenges or by handicapping oneself in order to reduce the level of skill. The second option is therefore less complex than the first.



Player A with x level of skill in a situation rated at y level of challenge will be worried. To re-enter the flow state, there are two options: (i) encountering a challenge with difficulty level x (Axx), or (ii) increasing skills to level y (Ayy). Flow state Ayy is more complex than Axx, since the former involves the use of greater skills in overcoming greater challenges.

<u>Figure 5 : Two Ways Of Experiencing Flow</u>

From an empirical point of view, there are clearly several limitations to the model outlined in Figure 3. The first problem is that whether or not a person is going to be in flow does not depend entirely on the objective nature of the challenges present or the objective level of skill. Rather, it depends upon an individual's perceptions of what the challenges and skills are. With the same objective level of challenge in a situation, a person may feel anxious one moment, bored the next, and in a state of flow immediately afterwards. It is therefore impossible to say with complete assurance whether a person will be bored or anxious in a given situation. A further limitation which the model does not consider, which will be considered shortly, is the effect of below average or less than normal behaviour, and the various degrees of imbalance between challenge and skill outside the flow channel.

Elements Of The Flow Experience

Csikszentmihalyi (1975) hypothesised that there are a number of conditions which define a flow experience, and relied on extensive interviews with people who were likely to report optimal experiences (Csikszentmihalyi, 1975, 1979, 1981) to successfully identify the following elements of the flow experience.

One of the first characteristics mentioned by people who described how they felt at the height of enjoyment was the merging of action and awareness. This involves a concentration that temporarily excludes irrelevant thoughts and conscious feelings. This means that stimuli outside the activity in hand have no access to consciousness, and past and future cease to exist subjectively. For example, a tennis player pays undivided attention to the ball and opponent, and a chess player focuses on the strategy of the game. Once an activity is perceived from the 'outside', flow is interrupted and becomes difficult to maintain without at least momentary interruptions. Such interruptions occur when a person considers "am I doing well ?", or "should I be doing this ?".

The continuous focus on the present produces a distortion of time perspective. Moments may seem to stretch for hours, or hours elapse in minutes. Actual time becomes replaced by experiential sequences structured according to the demands of the activity.

Both of these flow characteristics are made possible by the centering of attention upon a limited stimulus field consisting of only those stimuli which are relevant. In games, the rules define what the relevant stimuli are and exclude everything else as irrelevant. The structure of games provides motivational elements which draw a player into play. Probably the simplest of such inducements is competition. The addition of a competitive element to a game may therefore ensure the attention of a player who would otherwise not be motivated. Another inducement is the possibility of material gains. Finally, certain activities rely upon physical danger and it's threat to produce centering of attention and hence flow. One example is rock climbing, where one is forced to ignore all distracting stimuli in the knowledge that survival depends upon complete concentration.

Csikszentmihalyi (1982) has suggested that ultimately, deep concentration on the present ongoing activity is possible because the goals of the activity and the demands for action (challenges) are clear. Ambiguity and conflict, which are typical in everyday life, become replaced by undivided intentionality. In addition, not only are the goals clearly defined, but the means to reach them are also clear. As mentioned above, the rules of a game leave no doubt about what can or cannot be done. Pursuit of the goal is aided by clear feedback, which works to help the actor adjust his/her behaviour as the interaction with the environment proceeds.

Immersion in the activity produces a loss of self-consciousness whereby there is neither need nor opportunity to reflect on oneself. As the focus of attention is taken up by the demands of the activity and the responses given to it, the self as an object of awareness recedes. This, of course, relates back to the fusion of action and awareness. Self-forgetfulness does not mean that that a person in flow loses touch with his/her own reality. On the contrary, such a person becomes more intensely aware of his/her internal processes. Such heightened awareness obviously occurs in yoga and many religious rituals. Climbers also report a great increase in kinesthetic sensations and increases in ordinarily subconscious muscular movements (Csikszentmihalyi, 1975). What is lost in flow is not the awareness of one's body or functions, but only the self-construct - the intermediary which one learns to impose between stimulus and response.

Another characteristic of the flow state is control of actions and the environment. There is no conscious awareness of control, but more a condition of not being worried by the possibility of a lack of control. In reminiscing about the activity, the actor will be aware that for the duration of the flow episode his/her skills were adequate for meeting environmental demands. These reflections may well become an important component of a positive self-concept. In non-flow states, this feeling of control is difficult to sustain for any length of time. Many situations, such as personal relationships, career obstacles and health problems are always, to some extent, beyond control or at least strongly influenced by other people. Flow experiences occur in activities where one can, theoretically, cope with the demands for action. For example, the dangers in rock climbing and similar activities are real, but they are also finite and therefore potentially predictable and manageable. Consequently, a climber can work up to mastering them. Many climbers say that driving a car is more dangerous than climbing, and in a sense, such anecdotes may hold some truth. In driving, the elements which lie outside one's control (the environment and other drivers) are certainly more numerous and more dangerous than on a rock face. In any case, a sense of control is definitely one of the more important components of the flow experience, whether or not an `objective' assessment justifies such a feeling.

The final characteristic of the flow experience identified by Csikszentmihalyi (1975, 1982) is it's <u>autotelic nature</u>. Although people often get involved in activities which result in optimal experiences (either accidentally or for extrinsic reasons), once they have experienced the exhilaration produced by the interaction, they continue the involvement for intrinsic reasons (Csikszentmihalyi, 1982). Thus, the experience is autotelic, or intrinsically rewarding, and in time may become addictive. Writers who have dealt with play have remarked on the autotelic nature of the activity (eg, Callois, 1958). Csikszentmihalyi (1975) draws on interviews with climbers, chess players, surgeons and composers to illustrate the autotelic nature of their activities:

"The justification of climbing is climbing, like

> the justification of poetry is writing; you don't conquer anything except things in yourself. The purpose of the flow is to keep on flowing, not looking for a peak or utopia, but staying in the flow. It is not a moving up but a continuous flowing; you only move up to keep the flow going."

> "The most rewarding thing is the competition, the satisfaction of pitting your mental prowess against someone else."

From such observations, it can be seen that the various elements of the flow experience are linked together and dependent upon one another. By limiting the stimulus field, a flow activity allows people to concentrate on their actions and ignore distractions. As a result, they feel in control of their environment. Since flow activities have clear rules and demands for action, people engaged in these activities can become involved within them, and temporarily forget their identity and problems.

CHAPTER 5

EXPERIMENTAL RESEARCH ON THE FLOW MODEL

Introduction And Early Work

The flow model has several implications for human motivation. For example, it may be possible to restructure standard settings for various activities (work, school, etc) in such a way that the flow experiences provided by the activity are increased. Similarly, the flow model has direct implications for social and cultural institutions, as it would appear likely that the effectiveness of political, religious and cultural movements depends partly upon the amount of flow experience they make possible (hypothesised by Csikszentmihalyi, 1975). For example, a religious system which fails to provide clearly detailed activities in which the faithful can participate, would not be able to offer the intrinsic rewards (and therefore the flow experiences) to sustain the interest of followers (although they may still be motivated by the extrinsic reward of absolution).

Another important question which will be examined within the context of this study is the extent to which people derive the same rewards from the same activities. It would seem reasonable that people may not, as personality differences probably result in differential responsiveness to flow activities. It may therefore be useful to categorise personality in terms of the different situations in which people experience flow. A person who functions fully when playing chess is quite different from one who does so while dancing, or one who experiences flow in composing music, or in rock climbing. A `flow profile' may be a useful way of describing people for the purpose of finding the best match between their potential and the demands in the environment.

It is perhaps not suprising that much, if not all research concerning the type of question indicated in the previous paragraph has come from Csikszentmihalyi and his associates.

Early Flow Studies

The earliest attempts to provide some data to substantiate the claims of the model are reported by Csikszentmihalyi (1975). The experiment was reported not as a test of the flow model, so much as an exploratory study of whether involvement leads to flow, and whether this occurs when skills and challenges are matched. The investigation dealt with 'rock dance' practised by white, middle class Americans. Data were gathered from 12 subjects via observations, casual discussions, interviews and questionnaires. Of the sample, 6 subjects were expected to experience flow and 6 were not. In selecting the sample, flow was assumed to occur if subjects verbally expressed an enjoyment of rock dancing. Another way of determining the presence of flow was the person's appearance while dancing. If subjects appeared to be 'into' the dancing (ie, deeply involved), they were assumed to be in flow. In addition, non-flow in rock dance was presumed to occur if subjects verbally professed a dislike of dancing, or if they refused or never danced. The skill level of the dancer as perceived by the experimenter was not a criterion for determining the presence or absence of flow.

The emphasis with the interview was on how rock dancing is experienced by the participants. Of great value were the phenomenological accounts of the dancing experience and the emotions involved. In addition to the interview, each subject completed a questionnaire consisting of a list of challenges and a list of skills relevant to rock dancing. The list of challenges included releasing energy, looking good, lacking self-consciousness, relaxing, feeling in control of the situation, concentrating, and so on. The list of skills included knowing a lot of dance steps, ability to follow the partner and the beat, being graceful and enjoying the dancing.

Unfortunately, the absence of an operational definition of flow in this study makes the report somewhat lacking in clarity. With the data at hand, the presence of flow was determined in two ways: (i) If a subject were in flow, he/she would presumably experience a greater number of flow elements in the activity. A checklist of the elements of the flow experience derived from the model with appropriate degrees of intensity was constructed. Subjects were then scored for the incidence of each element on the basis of their interview; (ii) If the perceived challenges were commensurate with perceived skills for a particular subject, that subject would presumably be in flow. If the ratio of skills to challenges deviated significantly from one to one, the subject would presumably not be in flow, although this seems to be circular evidence if it is supposed to provide some support for the model (ie, does a 1:1 ratio imply flow or vice versa ?). The questionnaires in which subjects provided this data were used as the basis for these calculations.

The basic hypotheses were that the 6 dancers with intense enjoyment and involvement in the activity would differ from the remaining 6 in two aspects: (i) They would mention more of the flow elements in their interview, and (ii) they would list a more equal proportion of challenges to skills in the questionnaires.

As regards intensity of flow, most of the flow elements were usually experienced by all subjects, but the 6 subjects expected to experience more flow mentioned a more intense experience of the flow elements. The largest difference was in terms of "knowing the right things to do" ($p<.005$). The lack of clearly knowing the right things to do may also be attributed to the improvisational nature of rock dance. Alternatively, level of ability may play an important role, although this was not assessed as explained earlier. The disregard for level of ability would seem to be a little naive, as Csikszentmihalyi clearly associates degree of skill with depth of the flow experience at this stage of his theorising. Not to consider skill level would therefore confound any conclusions drawn. The next largest difference between the two groups concerned self-consciousness; uninvolved dancers being "often" self-conscious, whilst involved dancers were rarely self-conscious. Other elements which distinguished the two groups were clarity of feedback, control over the social situation, and a sense of self-transcendence which resulted in harmony with the environment ($p<.005$). The results confirmed that those subjects selected with the expectation that they would experience flow more intensely, did in fact do so.

In assessing the challenge/skill relationship, the optimum ratio was determined for each area of challenges and skills (movement, music, partner, and total dance activity). This was done by dividing the score on challenge items by the score on skill items for each subject in each area. Finally, the distance of each subject's ratio from the optimum ratio was calculated. Those subjects closest to the optimum ratio were expected to experience flow. Results indicated that the mean distance from the optimum ratio was less for subjects expected to experience flow. Most notably, these people rated "moving well" as very important and rated their skills as high on this dimension. It should also be noted that as all subjects were equally active in rock dancing, the differences were not due to greater or lesser experience with the activity, but the ability to derive enjoyment from it.

The Experience Sampling Method

Much of the later research on the flow phenomonen has adopted a general paradigm of using the Experience Sampling Method (Larson and Csikszentmihalyi, 1983) to obtain information at random moments during people's daily lives.

The Experience Sampling Method (ESM) is a research procedure for studying what people do, feel and think during their daily lives. It requires individuals to provide systematic self-reports on random occasions to create a file of daily experience. Using this information, it becomes possible to address such questions as: How do people differ in their psychological states ?, and What do people feel when engaged in various activities ?

The objective of the ESM is to obtain self-reports for a representative sample of moments in people's lives. Signals via electronic paging devices cue the subject to complete a self-report form which asks about their experience at that moment in time. A typical schedule specifies one signal at a random moment within every two hour block between 8.00am and 10.00pm over one week. Variations include sending fewer daily signals over a longer period of time (see Savin-Williams and Demo, 1983). Participants are required to respond to a number of questions about their objective situation and subjective state at that moment in time. Although the content of the questionnaire has varied in the reported research, questions about the objective situation have included items dealing with where subjects were, what they were doing and who they were with. Questions about subjective states have included items dealing with the content of their thoughts; their cognitive, motivational and emotional states; and their perception of their current status (skills/challenges). These questions are generally arranged in Likert type scales. Clearly, a great deal of latitude is possible in the items which may be included in the questionnaire, although the main concern is that the method obtains a comprehensive picture of each random moment.

In comparison with time budget studies of full-time working men and women (eg, Robinson, 1977; Szalai, 1972) the ESM has been shown to produce almost identical patterns of daily activities as those produced by these diary techniques (Csikszentmihalyi and Graef, 1980). Only two activities were underrepresented by the ESM - TV watching and sexual activity (probably a result of stopping signalling at 10.00pm). On the other hand, the ESM produced a higher percentage of idling type activities (relaxing, daydreaming). The ESM therefore seems to be an accurate way in which to assess how people spend their time, how they feel about the things they do, and the situations in which they find themselves.

The next section of this chapter will report and examine the research findings recorded by the use of this random sampling technique. It should be remembered that the research applies an analysis of fluctuations in daily experiences based on the flow model to data obtained from the ESM. More specifically, the theory predicts that people will report their most positive experiences (or flow) when their capacities to act (skills) match the environmental opportunities for action (challenges). When challenges are perceived to be greater than skills, the typical condition of consciousness would be hypothesised to be worry or anxiety; whilst when skills are perceived to be greater than the challenges, boredom is predicted (Csikszentmihalyi, 1975).

ESM Based Studies

Csikszentmihalyi, Larson and Prescott (1977) applied the random sampling technique to examine adolescent activity and experience. The technique was ideally designed to answer the following types of question: What do adolescents do all day ?, How is their attention channelled through these activities ?, How do they perceive the quality of the interaction ?, What challenge do they perceive in the various activities and what do they see that there is at stake ?, How are they affected by involvement in these activities ?, What feedback do they receive from the interaction and how does it change their affective states ? The sample consisted of 25 male and female volunteer subjects aged 13-18, of varying ethnic origin and socio-economic status. All the subjects lived in the Chicago area. The socio-economic status of subjects' guardians was coded according to Hollingshead's two factor scale, and showed the sample skewed towards the highest class (32%), with only 12% in the lowest class. The ESM schedule involved 5-7 signals being transmitted per day between the hours of 8am and 11pm, and included all seven days of the week. A total of 42 signals were transmitted according to the same random pattern for each subject. Over the data collection period, the subjects completed between 21 and 38 reports per person, with a mean of 30 out of a possible 42 reports, corresponding to a response to 89% of signals. Consequently, the sample data did not include 11% of the sample activity. Clearly, this was not a representative sample of adolescent activity. In addition to the imbalance of the subject sample and the 11% of missing records, the sampled time was also restricted to a 2 month period, and the hours of 8am to 11pm. However, it is still worthwhile to examine the data as a pilot study to illustrate the potential of the methodology for collecting experiential data.

The most prevalent activity in this sample was found to be conversation with peers, involving one third of the total time sampled. This was also voluntary in nature and was associated with positive moods. In contrast, any type of work was rare - 13% of the time involved study, and 5% other work. These activities were the least voluntary and were associated with negative moods. The second most prevalent activity in this sample was television viewing, although subjects reported that they tended to choose this activity because they had nothing else to do. When they did watch TV, they reported feeling worse than they did when they did anything else. However, rather than labelling the subsequent moods as negative, the responses tended to indicate that mindless would be a more apt term, as subjects watching television tended to respond "do not feel either" rather than either one of the two extremes on the semantic differential scale. In short, they did not feel anything ! Such non-feeling is characteristic of the sociopathic personality described by Cleckley (1955) and Lykken (1957), and as part of the research, subjects were also administered a self-report delinquency questionnaire (based on Short and Nye, 1958), Maddi's Alienation Index (Maddi et al, 1976), and the Jackson Personality Inventory (1965). Correlation coefficients were calculated between these indices and the proportion of time that each individual had watched TV during the sampled week. The amount of TV watching was significantly correlated with a tendency to engage in 3 of the 7 `delinquent' acts: vandalism ($r=.50$, $p=.01$), taking small things from stores ($r=.48$, $p=.02$), and skipping school ($r=.40$, $p=.06$). TV watching was also correlated significantly with vegetativeness ($r=.41$, $p<.05$), and positively, although not significantly, with 4 out of 5 scales of alienation. Such findings lend support to the hypothesis that the emotionless state characteristic of TV watching is associated with the development of antisocial behaviour and personality.

As mentioned earlier, although the sample in this study was not representative in socio-economic terms, or meant to produce generalizations across the entire age span of adolescence, the authors suggested that the trends would probably hold for a large sample of the same age, background, race and so on. The exact basis on which this statement was made is not clear. However, as an initial study, the research suggests the importance of a systematic approach to studying people's activities and experiences in an ecological context.

Using the data from the same Chicago sample, Larson and

Csikszentmihalyi (1978) examined the experiential correlates of time spent alone in adolescence. Time alone was established from the self-report form by the question "Were you: alone, with friends, with family, with strangers, other". The percentages of a subject's records marked `alone' served as the estimate of time spent alone. Several activities were reported more often when alone: free-floating thought (daydreaming, self talk, etc), and passive entertainment (listening to music, radio, reading, etc), were typical examples of activities during time alone.

There were substantial differences between ratings when alone and when with others on the 13 mood items. When alone, most respondents were more lonely and hostile ($p<.001$), and also significantly less happy and less alert ($p<.006$). Furthermore, they also rated themselves as weaker and more passive. Major differences existed between individuals in the amount of time they spent alone. One subject was never alone, whilst another was alone for 57% of the times sampled. Adolescents who spend very little time alone could well be deprived of opportunities for integrative thought, mental reflection and related activities. Aloneness has been found under some conditions to enhance creativity (Taylor, Berry and Block, 1958) and memory (Zuckerman et al, 1968). As a result, subjects who are never alone may engage in fewer integrative thought processes thus reflecting greater alienation. At the other extreme, adolescents who spend too much time alone may lack affiliative and socialising contact, resulting in greater alienation. While this interpretation seems most parsimonious with the findings, additional evidence is clearly warranted before causal or reciprocal relationships between these variables can be inferred.

Csikszentmihalyi and Graef (1980) examined the daily life experiences of a sample of 106 subjects from assembly line to management levels. The sample was not representative of a particular population, but a diverse adult sample whose responses would hopefully reflect normal psychological patterns. Data was collected by means of the ESM over an 8 day period, with signals transmitted at random times within 2 hour periods from 7.30am to 10.30pm.

Examining the degree of subjective freedom experienced across the activities reported in the ESM, 51.3% of all observations were rated as voluntary, 25.2% as compulsory, and 23.5% as mixed or 'nothing else to do'. As one may expect, work was rated as the least free activity, being experienced as voluntary only 15% of the time, significantly less ($p<.01$) than any other activity. Activities perceived as most free included sports or games, which were rated as voluntary over 90% of the time, significantly more ($p<.01$) than the other 13 activities reported.

Sex differences indicated that the structure of daily activities was perceived to be more voluntary by working men than working women (53.4% vs 46.4%), and this is probably a reflection of how both sexes perceive their life roles. The typical masculine role is paid work, where women presumably feel less free as it conflicts with their identification as homemakers.

Perhaps the main question arising from this study was, why in some cases was even work seen as free and leisure perceived to be compulsory. For example, working on the job was seen as free 15% of the time, while personal leisure activities were done because one `has to do it' 30% of the time. It might be important to identify at what point activities which are viewed as compulsory become voluntary, and vice versa. It seems probable that intrinsic motivation would be an important moderating variable, underlying it's crucial role within flow theory. At times, the demands of one's job may become so stimulating and enjoyable that one becomes involved and motivated towards the task. At other times, when one is tired or in unwelcome company, even a leisure activity becomes burdensome. The dynamics of this attribution, based on the experience of intrinsic motivation, provide vital research questions regarding the quality of life.

Graef et al (1983) utilised ESM data to answer specific questions regarding the measurement of intrinsic motivation in everyday life. The sample consisted of 107 employees from Chicago companies, with occupational status ranging form clerical staff to managers and engineers, and with an age range of 19 to 63 (mean age was 37). 62% of the respondents were female and 38% male. Data was collected using the ESM over a period of one week. The authors addressed the issues of how often people describe their everyday experiences as being free and intrinsically motivating, and the extent of the relationship between intrinsically rewarding experiences and psychological affect (or the overall sense of satisifaction with one's life). It was considered that a person's sense of well being could be measured by his/her ratings of happiness and tension. It is an almost explicit, though somewhat sparsely documented, assumption in the literature, that people will experience greater enjoyment in intrinsically rewarding situations than in situations which are extrinsically motivated. For example, Kruglanski (1978) has suggested that positive affect accompanies intrinsically rewarding activities, so it follows that if one's daily experiences are more often perceived to be intrinsically rewarding, then one ought to feel more happy, confident and self-fulfilled.

By operationally defining intrinsic and extrinsic motivation, the authors discovered that people describe their daily experiences as intrinsically motivated about 20% of the time. People often experienced intrinsic motivation when situations contained obvious extrinsic rewards, and often perceived leisure situations as lacking intrinsic reward (the work/leisure dichotomy discussed earlier). However, it is important to note that obligatory activities were described as intrinsically rewarding almost 10% of the time, and discretionary activities as lacking intrinsic reward almost 13% of the time. Furthermore, levels of psychological `well being' and competence were higher in intrinsically rewarding experiences than in extrinsically rewarded situations. People consistently rated themselves as happier and less tense as the level of intrinsic motivation increased (a significant correlation). It also seemed that this general experience of `well being' measured by happiness and lack of tension was more influenced by motivation than by the type of activity a person is engaged in.

In addition, correlations were shown between moods and cognitive states, and between intrinsic and extrinsic motivation. People with higher percentages of extrinsic motivation rated themselves as less happy (-.29), less alert (-.22) and more tense (.37). They also described their lives as more boring (.24) and rated their sense of competence as lower (-.28). This is in comparison with people having high percentages of intrinsic motivation, who rated themselves happier (.28), more alert (.16), less tense (-.23), their lives as less boring (-.30), and more competent (.22) - all results $p<.05$. Therefore, the intrinsically motivating experiences were rated as significantly happier, more active, relaxed, interesting and more competent. There seems to be a positive relationship between these measures of well being and the percentage of intrinsically motivating experiences reported in daily situations. However, the cause and effect of this relationship is at this point unclear.

To examine the causality of the relationship between positive well being and the day to day experience of intrinsic motivation, the sample was divided into three equal groups according to the percentage of extrinsically motivated experiences reported: a high percentage group (averaging 52.7%), a moderate group (averaging 35.5%), and a low group (averaging 18.7%). It would therefore seem that these authors suggest that a lack of extrinsic motivation implies the presence of intrinsic motivation, an assumption which is at odds with Mayo (1977). The specific question to be answered was: do people who report fewer intrinsically rewarding experiences rate themselves less happy in an extrinsically motivated situation (as compared with people who report a moderate or high number of intrinsically rewarded experiences) ?

The ANOVA findings (see Table 1) indicate the relationship between intrinsically motivated experiences and sense of well being (as defined in this study). Again under the assumption that low extrinsic motivation implies the presence of intrinsic motivation, and vice versa, while the overall mean happiness ratings differentiate significantly between the motivational groups, a person in the high extrinsic motivation group would tend to rate happiness at the same level as a person in the low extrinsic motivation group when they both perceive the reward to be intrinsically motivating.

These findings, which demonstrate the association between psychological well being (albeit defined in a loose way) and the ability to perceive intrinsic rewards in routine everyday situations, have important implications for studies in psychological health. The fact that some people may perceive obligatory situations as more intrinsically rewarding than discretionary situations suggests the need to assess people's subjective experience of motivation. It is not always sufficient to assess the presence or absence of situational rewards and constraints.

	High EM percent (n=35)	Moderate EM percent (n=36)	Low EM percent (n=36)	One way ANOVA F	
IM % mean	15.0	22.6	33.2	19.14	p<.001
EM % mean	52.7	35.5	18.7	161.91	p<.001
Overall happiness	.88	1.05	1.24	2.92	p<.01
Mean happiness when situation is described as:					
EM	.67	.84	.91	1.00	
IM/EM	1.04	1.11	1.18	.33	
IM	1.49	1.34	1.59	.96	

Table 1 : The Impact Of Motivation On Well Being (from Graef et al, 1983)

Suggestions are made by the authors which point out that we need to be able to help people to develop ways of enhancing the intrinsic rewards they perceive across a wide range of typical daily situations. The authors suggest that some people may be able to maximise their sense of involvement across a wide variety of activities, and that those people ought to be examined in order to identify the dynamics of the intrinsically motivated person. At this point, it would appear to be some sort of inner quality, a psychodynamic dimension, which enables a person to find rewards in mundane events which others find neutral and unrewarding. Such identifications have important practical consequences, as many resources in society are used to motivate people into doing activities that they would not otherwise do (Csikszentmihalyi, 1975; Csikszentmihalyi and Larson, 1978). Economic and social systems are typically based on extrinsic rewards, and may waste resources without improving the quality of life. By understanding the determinants of intrinsic motivation within people, savings could be made in resources whilst directly improving the quality of life. The data from Graef et al (1983), and from other studies previously discussed to a smaller extent, also suggest that on occasions, even leisure activities may fail to provide purely intrinsic experiences (40% of the time in this study for instance), whereas obligatory activities may sometimes provide intrinsically motivating experiences. For leisure professionals, this may provide the opportunity to integrate the enjoyable feelings usually experienced in leisure situations into the fabric of everyday life. Even more important perhaps are the psychological well being and mental health implications, which will be considered in detail at a later point.

Recent Advances In Flow And ESM Research

In examining variations of experience in everyday life, Massimini, Csikszentmihalyi and Carli (1987) consider some further, and perhaps more serious, implications for psychiatric rehabilitation. Their hypothesis was that the flow model, based on varying ratios of challenges and skills, would account for variations in daily experiences ranging from the most positive to the most negative. The study used a cross cultural sample to examine this hypothesis. An Italian sample of 47 volunteers aged 16 to 18 (14 males, 33 females) completed the ESM form over a period of one week. Data from all measurements were standardised with reference to each subject's mean for the entire week.

To describe variations in the experiential state, a Cartesian plane was used with the axes representing standard scores of challenges and skills (see Figure 6). The graph was then divided into areas delimited by the ratio between challenges and skills, and also radial circles by the geometrical distance from the intersection of the two axes (0,0). The areas delimited by the challenge/skill ratio were called `channels', and in this study 8 were arbitrarily defined. Channels 2 and 6 represented the areas in which challenges and skills were relatively balanced: in Channel 2, there was a positive balance between challenge and skill, and the presence of consistently high challenges and skills (perceived as above average). Consequently, one would expect the most positive experiences to be reported in

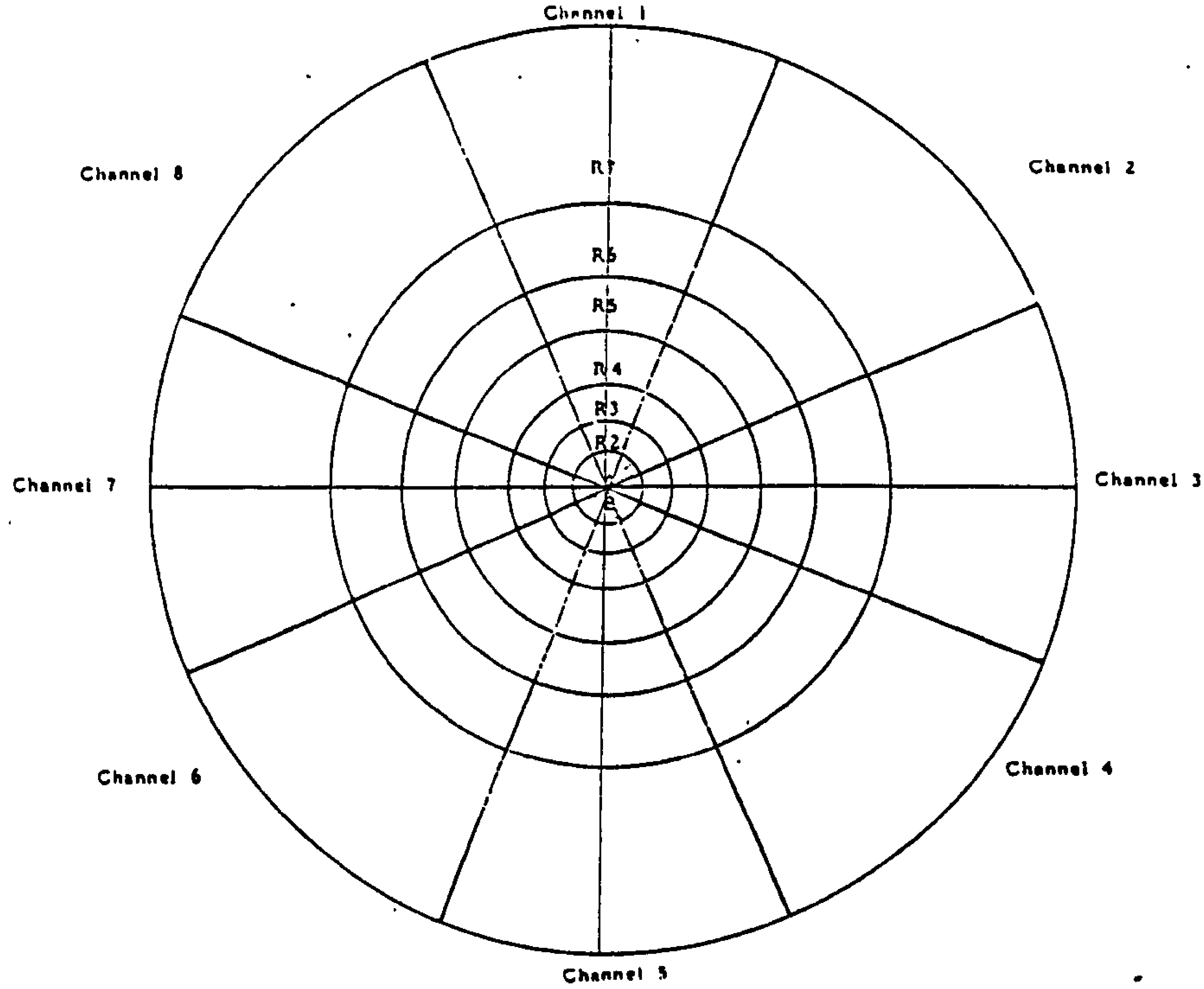


Figure 6 : Model for the analysis of experience (from Massimini et al, 1987)

this Channel. Channel 6 represented a low experience which was the mirror image of Channel 2: a challenge/skill balance was reported but both were low (below the weekly personal average). Channels 3, 4 and 5 reflected three different types of inbalance in which the skills were higher than the challenges, whereas Channels 7, 8 and 1 represented three areas of inbalance characterised by the dominance of challenges over skills. Figure 6 also shows a series of concentric rings subdividing the channels with regard to the geometric distance from the intersection of the axes. This allowed the study within each channel of the influence of the relative distance from the personal average upon micro and macroflow.

The standardized scores used to measure experience showed statistically significant fluctuations between the various channels. In particular, high positive values were reported for affect variables in Channel 2 and negative ones in Channel 6 (see Table 2 for examples). Intermediate channels showed combinations of positive and negative values; for example, high concentration but low control in Channel 8 where challenge was greater than skill, or high relaxation but low involvement in Channel 4 where skill was greater than challenge.

	CHANNEL							
	1	2	3	4	5	6	7	8
Concentration	.52	.50	-.02	-.30	-.40	-.52	.04	.35
Control	.16	.48	.41	.34	-.09	-.49	-.76	-.57
Alert	.16	.34	.02	-.03	-.22	-.32	-.07	.07
Happy	.14	.34	.14	.04	-.03	-.32	-.35	-.15
Cheerful	.09	.24	.17	.11	-.11	-.22	-.22	-.21
Involved	.41	.39	-.03	-.20	-.30	-.37	-.15	.35
Creative	.31	.51	.07	-.03	-.38	-.43	-.24	.10
Open	.23	.33	.09	-.03	-.25	-.28	-.23	-.02
Clear	.25	.46	.19	.10	-.13	-.40	-.53	-.31
Relaxed	.02	.21	.27	.19	.05	-.21	-.34	-.41
Wish doing	.34	.51	.09	.02	-.30	-.45	-.42	-.03
Satisfaction	.43	.68	.24	.04	-.37	-.59	-.49	-.25
Motivation	.40	.65	.23	.11	-.31	-.60	-.71	-.17

Table 2 : Showing Examples Of Mean z Score Values On Various Dimensions Of Experience In The 8 Channels Of The Flow Model Based On The Challenge/Skill Ratio - General Data From The Italian Sample (from Massimini et al, 1987)

Depending on the relative inbalance between skills and challenges, different types and degrees of negative and positive experiences were obtained which were generally in line with the flow theory. These findings expand on the original concept of flow since they consider the effects of negative (or at least less than average) skills and challenges upon experiences. In Channel 2, all variables were significantly positive, and it was in this channel that they reached their highest positive values, coinciding with the theoretically described optimal experience. In contrast, Channel 6 showed statistically significant decrements on all measures of experience. It represented a negative pole for the sample studied, ie, an area of `low' experience in daily life. In particular, the results from Channel 6 appear to be at odds with the original model discussed earlier (Csikszentmihalyi, 1975). This is probably at least influenced by the fact that negative skills and challenges are allowed when measuring relative to the mean, but not in the original model which in comparison, appears to be about the perception of absolute skill and challenge, rather than skill and challenge relative to current norms.

The pattern of data suggested that variations in the ratio of perceived challenges to skills allowed for the prediction between different experiential states. It should be emphasised that dealing with subjective perceptions of skills and challenges highlights the limitations of quantitative studies examining the quality of experience by measuring objective, behavioural data. For example, an athlete who clocks the fastest time in a race does not necessarily reach a subjective optimal experience. Winning the race could be connected to any experiential state depending upon what the athlete perceives the balance between challenge and skill to be. Consequently, the last athlete to finish could enjoy a peak experience whilst the winner could experience boredom, anxiety, or some other `low' experience. This observation has important implications in the field of rehabilitation, where it is often thought that a particular activity will improve a person's experiential state (for example, in work therapy). On the contrary, Massimini et al argue that every activity is represented in every channel; in other words, all the experiences reported from the most positive to the most negative can occur in any activity whatsoever, although no evidence is presented to support this statement; only a discussion of the affective states associated with each channel.

At the same time, the data also suggest that certain activities are more associated with certain experiential states, which could probably be inferred from earlier studies. When the teenage sample were involved in art or hobbies, there was a 50-50 chance of them being in the flow state (Channel 2). Alternatively, when they were involved in chores or errands, they were more likely to experience boredom (Channel 4). Apathy in Channel 6 was the characteristic state of persons watching TV or resting, whilst the anxiety typical of Channel 8 (where perceived challenge is greater than perceived skill) was relatively rare for adolescents in everyday life. When it occurred, it was associated with activities such as thinking, classwork, listening to music, and sport and games.

Another way of observing the relationship between activities and experiences is to follow the changes in one variable across the various channels. For example, the level of satisfaction reported while studying varies profoundly at a function of the ratio of challenges to skills. A positive peak is reached in Channel 2 and a negative one in Channel 6, and all the intermediate states of transition are experienced according to the variations in the challenge/skill ratio (see Table 3).

The experiential curve of `satisfaction' for the studying activity parallels that for the general data, shown by the satisfaction dimension in Tables 2 and 3, and diagramatically in Figure 7. This suggests that, like the experience of satisfaction in general, the experience of satisfaction while studying varies

	CHANNEL							
	1	2	3	4	5	6	7	8
Wish doing (motivation)	.11	.13	-.33	-.53	-1.07	-.94	-.81	-.32
Satisfaction	.35	.59	.09	-.08	-.34	-.84	-.50	-.09

Table 3 : Showing Mean z Score Values On Two Dimensions Of Experience When Subjects Are Studying (from Massimini et al, 1987)

with the ratio of perceived challenges to skills. However, in considering the motivational variable `wish to be doing the activity' in the general experience and studying conditions, the role of the activity plays a more conspicuous role (see Tables 2 and 3, and Figure 8). The two curves are still parallel, but at very different levels. The activity of studying appears to depress motivation. The similar pattern in the two curves shows how, in this case, the experience (of wishing to be doing something else) is influenced in the predicted way by the perceived ratio of challenges and skills. In conclusion, the role of the activity in determining experience is a complex one.

These findings suggest the potential of using the ESM technique in educational and rehabilitative establishments to give the appropriate emphasis to the subjective perception of the situation. In addition, the data suggest that the same considerations which apply to activities are relevant to the issue of social companionship. Whether a person was alone or with others had important effects on the quality of experience, and

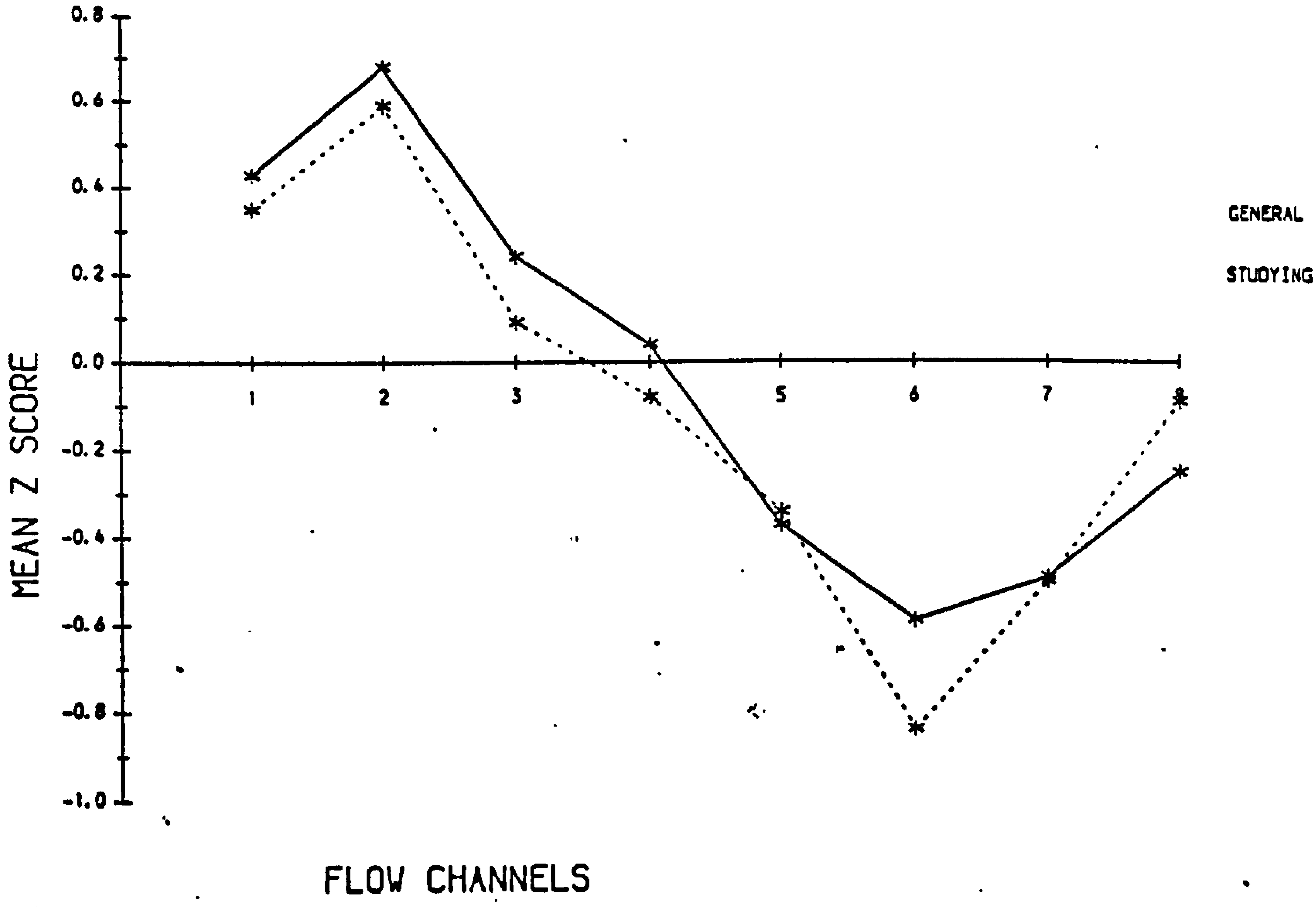


Figure 7 : Variations In The Experience Of Satisfaction In General And While Studying, In The 8 Channels Of The Flow Model

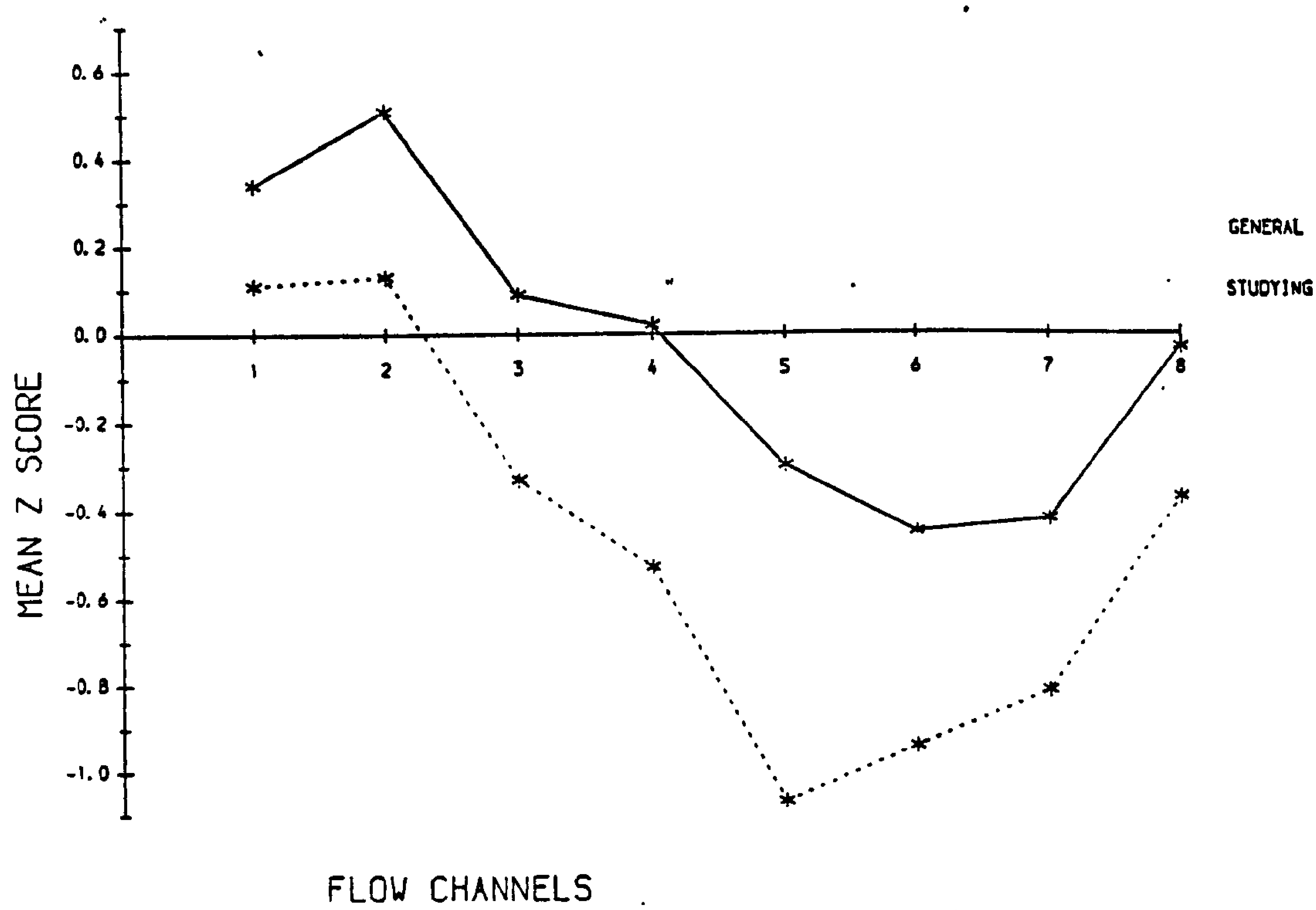


Figure 8 : Variations In The Experience Of Motivation In General And Whilst Studying, In The 8 Channels Of The Flow Model

should be considered by educational and rehabilitation institutions. The important fact to note is that anxiety, boredom, apathy and optimal states are not determined by the simple fact of being in solitude or company, or by the type of company. The subjective perception of challenge and skill is also a crucial variable in determining variations in the experiential state. When an individual was in Channel 2, he/she showed an increase in activation, perceived cognitive efficiency and motivation. In other words, a state of optimal attachment to reality in addition to positive affect or mood. Massimini et al (1987) suggest that `being well' therefore involves more than having good moods; this condition is necessary but not sufficient. The fact that an individual is concentrating, is in control of the situation, is active and so on, supplies a definition of a person as operating at the maximum of their capacity. However, it is probably oversimplistic and a slight exaggeration at this point to suggest that simply being in the `flow channel' implies that a person is well, or healthy, which is the impression given by Massimini et al (1987). Indeed, whilst it may or may not be unreasonable to equate flow with well being, no data is presented to imply any association or degree of causality.

The convergence of variables in Channel 2 suggests the outline of maximum human potential. The identification of this positive pole makes it possible to give a direction to psychiatric rehabilitation. Rehabilitation does not simply refer to the reduction of anxiety, but implies tending towards positive convergencies of all the dimensions of human experience.

In contrast to the flow experience, the `low' experience typified by Channel 6 could be compared to the inferior limits of psychological functioning. In Channel 6, we can observe the deterioration of, for example, affect, activation, cognitive efficiency and motivation. Channel 6 therefore represents an important concept in both rehabilitation and prevention. In both situations, a levelling of fluctuations in personal experience, with a prevalence of reports in Channel 6, would indicate an abnormal situation of risk.

As Channel 6 represents a match between challenge and skill below the subjective average, this would suggest that `low' experiences are regressive as opposed to developmental situations. The situations represented in this channel would not appear to be problematic in as much as the subject perceives that he/she has suitable skills (after all, skills and challenge are matched). The most obvious implication here is the importance of perceived competence, as well as the balance between challenge and skill. This bears some resemblance to Deci's work on perceived competence which has been demonstrated to be an important motivational variable (as was considered much earlier). If this argument is correct, it might imply an important variable which Csikszentmihalyi either overlooks, or chooses to represent as being the result of constant involvement with facile situations requiring low skills. The data so far discussed certainly appear to confirm the parable of the oarsman on the river; if he stops rowing upstream, he goes backwards.

The channels of inbalance between skills and challenges represent areas of transition in experience between the two opposite poles. Channels 3, 4 and 5 represent types of everyday situation where, often due to repetitive activity, disruption of optimal experience is caused by boredom. These represent an accumulation of excessive skills without the possibility to use them on more complex challenges. However, it is interesting to note the absence of the terms worthwhile or meaningful in Csikszentmihalyi's work when he discusses challenges. The opposite is demonstrated in Channels 7, 8 and 1. Here, people confront more complex challenges although they perceive that they do not have adequate skills. In this case, the disruption of optimal experience is due to anxiety. However, considering the previous remark, it might be hypothesised that challenges must be perceived to be worthwhile (whatever this means to the individual), before flow can occur. The work of Csikszentmihalyi seems to imply that challenge is all that is necessary, whereas other researchers have indicated that the value of a task is an important variable in goal commitment (Hardy and Nelson, 1988), and for perceived competence to occur (Deci, 1975).

The obvious questions arising from this study are, can the study of healthy subjects offer suggestions for the treatment of psychopathologies, and is it possible that a better collaboration between psychologists and psychotherapists would bring forth results comparable to those provided by physiology for pathology in the medical sciences ? The preliminary investigations and explorations of not only Massimini et al (1987), but those discussed elsewhere in this chapter, suggest that affirmative answers to such questions might be in order. Indeed, this is likely to be an area in which the flow phenomenon has considerable impact. It would appear from the research literature reviewed here that people who experience flow, or are able to experience flow more often (by some kind of regulation of either themselves or the information/environment), may have the potential to be healthier individuals than people whose experience fluctuates greatly, or who live in `negative' flow. Several implications regarding mental health and rehabilitation have been touched upon in this chapter, which will be examined more fully later in this thesis. What is already clear is that it would be of considerable relevance to be able to instruct people in how to live in the flow channel, or at least teach them how to be able to enter the flow channel with more regularity.

Practical Applications And Implications Of The Flow Model

The flow concept was developed (Csikszentmihalyi and Bennet, 1971; Csikszentmihalyi, 1975) as a result of a desire to solve an intriguing puzzle in the mechanism of human behaviour. One criticism of the theory may centre on the lack of hard empirical evidence in support of it. However, despite this criticism, the practical applications of the model that have been reported so far have been both considerable and widespread.

One of the first areas in which flow was seen to be potentially useful was education. Mayers (1978) had already demonstrated that the amount of enjoyment which high school students gained from a given course was a better predictor of their final grades than either previous measures of scholastic achievement or aptitude. Approaching this problem from a different perspective, Plihal (1982) showed that the amount of enjoyment teachers got from teaching was related to the amount of attention which students showed in class. Such studies imply that there is much that could be done to improve the educational process by increasing and exploiting the amount of enjoyment potentially contained within it (Csikszentmihalyi, 1982).

Perhaps more importantly, the flow concept is not only relevant to education in general, but also to various forms of special education. For example, at Oklahoma State University, the flow model has been instrumental in the development of a textbook and a Summer course designed to train teachers of physically handicapped children to enhance pupil's enjoyment despite their handicaps. At the other end of the continuum to special education, gifted children have also been studied to examine the conditions under which they most enjoy using personal computers (Mayers, 1978).

The possibility that psychotherapy could benefit from the flow perspective is a notion which a few clinicians are beginning to entertain. Instead of focussing exclusively on past causes of mental illness, this perspective attempts to identify and develop those actions and situations that provide the most positive subjective experiences. A similar idea suggests the application of flow to a USA anti-drug campaign (cited by Csikszentmihalyi, 1987); the idea being to present youths with a series of examples of `natural highs' of complex, involving experiences in productive contexts. An earlier paper on school delinquency (Csikszentmihalyi and Larson, 1978) had already suggested that much crime and vandalsim were the result of boredom. Efforts at various forms of rehabilitation would appear to benefit from this point of view, and from the theoretical basis of the flow model which points at some possible means of improvement.

It would seem that wherever the quality of human experience is at issue, flow becomes relevant. It helps to explain how people enjoy their work, their leisure, or the sight of some artistic creation. It helps to explain why people in some circumstances, such as work or school, are bored and frustrated. When boredom becomes a major part of life, it helps explain the alienation and apathy underlying much of personal pathology and some of the societal forms as well.

In focussing attention on the flow model, it's theory and hypotheses, the flow state itself has, perhaps not suprisingly, received most attention in the research literature. Consequently, there is rather less information available regarding those states which lie outside the flow channel, where skills and challenges occur as mismatches. The most obvious lines of research from this point of view concern individual and situational differences: do some people experience flow more often than others and why ? Is the flow experience a good thing in terms of mental and physical health (something which is implied in the literature although no direct evidence is available)? Are people able to put themselves into a `flow' situation, and is doing so a learned skill ?

In considering individual differences, we are obviously concerned with differences in dimensions of personality. It might therefore be justifiable to hypothesise that people who experience flow more often or more intensely, exhibit different, and perhaps more desirable personality characteristics than people who experience flow less often or intensely. Additionally, we might consider how wide a variety of situations exist across which people can experience flow. In this case, it may be that some people are able to regulate themselves, or the information from the environment, to congruity thereby achieving the flow experience. For example, where the nature of the activity cannot be altered, restrictions or adjustments to oneself could be made. However, it should be remembered that flow theory is based on perceptions of abilities and challenges, so that how a person perceives his/her ability or the task is the essential factor. Again, this points to characteristics of personality as important variables in achieving the flow experience, and as mentioned previously, wherever the quality of human experience is at issue, flow becomes a relevant consideration. Finally, it would appear from the research of Csikszentmihalyi and his colleagues that they almost equate flow with health. This suggestion is addressed in a later chapter, together with the influence of personality characteristics in examining the flow experience.

Statement Of The Problem And Hypotheses

The major purpose of the first part of this study was to provide an empirical controlled test of the theory of flow states, and the factors which underlie the flow experience. The following hypotheses were proposed:

Experiment One

One of the underlying concepts of the flow model is intrinsic motivation. It follows that any task examining the flow model should be a potentially intrinsically motivating activity. In addition, the challenge of the activity should be such that it is possible to vary it across measurable levels. A computer game was designed with these qualities in mind to examine the flow model. It was hypothesised that there would be no significant differences in intrinsic motivation between the experimental task and tasks possessing obvious face validity as intrinsically motivating activities. Conversely, it was hypothesised that there would be significant differences in intrinsic motivation between the experimental task and tasks possessing obvious face validity as intrinsically unmotivating activities. Such findings would then confirm the suitability of the task to examine the flow theory.

Experiment Two

To formally examine the flow theory, it was necessary to be able to manipulate the challenge of a task relative to an individual's skill on that task. It was hypothesised that the flow experience would be at it's greatest where challenge and skill were matched. More specifically, highly skilled subjects should literally pass into or through the flow channel, where skill exceeds challenge at lower levels of challenge, and where skill is equal to challenge at higher levels. Conversely, lower skilled subjects would experience flow at the lower levels of challenge, where skill matches challenge, and expect to 'pass out' of the flow channel as challenge increases beyond their level of skill. Significant differences in the experience of flow between low and high skilled individuals should therefore occur at low levels of challenge, with the lower skilled subjects more 'in flow' than the high skilled subjects, and also at high levels of challenge, where high skilled subjects should be more 'in flow' than the low skilled subjects.

CHAPTER 6

A CONTROLLED EXAMINATION OF THE FLOW MODEL

EXPERIMENT ONE

Experiment One was designed to assess the validity of using computer games in studies of intrinsic motivation and flow (of which intrinsic motivation is an underlying concept).

Methodology

Subjects: Consisted of 12 randomly selected male and female undergraduate Physical Education students at U.C.N.W.Bangor aged 19-26, who had no prior knowledge of the task. No prerequisites were made.

Apparatus: Consisted of a Sinclair Spectrum computer, cassette player, colour monitor and joystick, together with 2 computer games. Intrinsic (and extrinsic) motivation was assessed using the Task Reaction Questionnaire (Mayo, 1977) shown in Appendix 1. A behavioural measure of intrinsic motivation was not used because of difficulties in incorporating behavioural measures of intrinsic motivation into the experiment, and also because of the high correlations between the TRQ and other (behavioural) measures of intrinsic motivation reported in Chapter Three. As a result of this evidence, it was considered that the TRQ alone should be reliable enough to assess intrinsic motivation.

Experimental procedure: Each subject was asked to complete the TRQ following four structured situations, presented in a balanced order (see Appendix 2). The four situations were:

1. Lecture - subjects were asked to complete the questionnaire after attending a lecture they found unstimulating (hypothesised to be an example of an intrinsically de-motivating activity).
2. Hobby - subjects were asked to complete the questionnaire after engaging in a hobby activity (unspecified) which included other people (due to the nature of the questions on the TRQ).

This was hypothesised to be an example of an intrinsically motivating situation.

3. Computer game I - subjects were asked to complete the questionnaire following performance on a computer game. Instructions were given on the game (see Appendix 3) and the experimenter demonstrated the task. Subjects were then allowed three practice trials (1 game) followed by a further six trials (2 games). The task involved directing a cursor about a 5x6 square grid (30 squares), painting in one square at a time. The task was made more difficult by a moving object randomly careering about the grid, contact with which meant the loss of one life; each game consisted of three lives. If a grid was completed, the subject moved onto the subsequent difficulty level (ie, 2 objects moving about the grid).

4. Computer game II - subjects were required to complete the questionnaire following performance on a second computer game. Again, subjects were given instructions on the game (see Appendix 3), and the experimenter demonstrated the task. Subjects were allowed a practice game (consisting of four lives) to familiarise themselves with the task, followed by a further two games. The task involved directing a character about a maze which was filled with dots, whilst being pursued by four objects. The aim was to eat all the dots and move onto the subsequent, more difficult maze. Subtleties included eating one of the four dots positioned in the corners of the maze allowed the cursor character to attack the pursuing objects for extra points, although this facility lasted for only a few seconds.

The questions on the TRQ remained in their original form for both computer games, although the intrinsic and extrinsic items were randomly ordered. To account for the three situations, the only variation in the questionnaires was the interchange of the words 'lecture', 'hobby' and 'experiment' to represent the particular situation. Copies of the full questionnaires are included in Appendix 1. The questionnaires were presented in a balanced order (see Appendix 3), although no control could be gained over the periods between the completion of the different questionnaires as the experimenter had no control over the pursuit of hobbies or attendance at lectures (particularly unstimulating ones !).

Results And Analysis

Intrinsic and extrinsic motivation scores were calculated from the questionnaires for each of the four situations, resulting in eight scores per subject (4 intrinsic, 4 extrinsic). Each item on the questionnaire was scored on a 7 point scale (1 - strongly agree to 7 - strongly disagree). The intrinsic score was therefore calculated by the addition of the 23 scores from items 1, 2, 4, 6, 8, 10, 13, 14, 16, 17, 19, 21, 22, 24, 26, 27, 28, 30, 32, 34, 35, 37 and 39; thus allowing a maximum score of 161 and a minimum score of 23. Extrinsic scores were calculated by the addition of the 16 scores from items 3, 5, 7, 9, 11, 12, 15, 18, 20, 23, 25, 29, 31, 33, 36 and 38, allowing a maximum score of 112 and a minimum score of 16. These raw scores are shown in Appendix 4. Although not relevant to this study, Vallerand and Reid (1984) defined a moderate to high level of intrinsic motivation as a minimum score of 92 on the TRQ intrinsic scale (which constitutes a minimum average score of 4 on each of the 23 item intrinsic scale). Although the analysis is primarily concerned with the intrinsic motivation scores, both sets of scores were standardised because of the unequal numbers of intrinsic and extrinsic items. The resulting set of standard scores is presented in Appendix 5.

A single factor multivariate analysis of variance was performed on the intrinsic and extrinsic motivation scores (see Table 4). The MANOVA results showed a significant difference between groups; $F(7,77) = 27.12$, $p<0.001$ (see Appendix 6).

	INTRINSIC	EXTRINSIC
LECTURE	33.24	41.20
HOBBY	56.94	57.40
GAME 1	55.20	51.39
GAME 2	54.67	50.00

Table 4 : Showing Standardised Group Means Of Intrinsic And Extrinsic Motivation Scores

Consequently, separate one way analyses of variance with repeated measures were performed on both the intrinsic motivation and the extrinsic motivation scores. Analysis of the intrinsic motivation scores also indicated significant differences between group means; $F(3,33) = 320.7$, $p<0.001$, (see Appendix 6)

Newman Keuls post hoc comparison of group means (see Appendix 7) revealed that hobbies and the computer games were significantly more intrinsically motivating than unstimulating lectures. In addition, and more interestingly, there were no significant differences in intrinsic motivation between hobbies and computer games.

Analysis of the extrinsic motivation scores also indicated significant differences between group means; $F(3,33) = 14.33$, $p<0.001$, (see Appendix 6). Newman Keuls post hoc comparisons (see Appendix 7) revealed that hobbies and computer games had more extrinsic value than uninspiring lectures. In addition, hobbies also had significantly more extrinsic value than one of the computer games, although there was no significant difference in extrinsic motivation between hobbies and the computer game it was proposed to use in the next experiment.

Discussion

This study demonstrated the intrinsic value of a variety of tasks. Whilst there was no significant difference in intrinsic motivation between the computer games and hobbies, all three were shown to be significantly more intrinsically motivating than an unstimulating lecture. This would therefore seem to confirm the experimental manipulations. It is possible to conclude that this analysis demonstrates the intrinsically motivating qualities of computer games: Consequently, it was proposed to use one of the computer games from this study in the next experiment, which was designed to examine the flow theory of intrinsic motivation.

EXPERIMENT TWO

Experiment Two was designed to provide an empirical test of Csikszentmihalyi's (1975) model of flow states, both by varying the challenge of the task relative to each subject's ability, and by assessing affective states at each point through self-reports.

Methodology

Subjects : Consisted of a random selection of 24 male and female adults aged 19-46 who had no prior knowledge of the task. The subjects were split at random into two groups of 12 for treatment procedures.

Apparatus : Consisted of two Sinclair Spectrum computers, a cassette player, colour monitor, joystick and computer software. Two computers were necessary due to memory restrictions meaning that the 'warm up' programme and experimental programme had to be loaded on separate machines. The experimental phenomonen (flow) was measured using two self-report forms - the Experience Questionnaire (Privette, 1984), and the Experience Sampling Method (Larson and Csikszentmihalyi, 1983) shown in Appendices 9 and 10 together with their methods of scoring. Subject's perceptions of their skill and the challenge of the task, which formed the basis of the first part of this experiment, were measured on a 1-10 continuum (low -high) by two scales in the ESM.

The task : Consisted of one of the two video games shown to be of intrinsic interest in Experiment One. The screen display consisted of a 5x6 square grid (30 squares) and a cursor. As in Experiment One, the aim of the game was to direct the cursor about the grid, filling in squares whilst losing as few lives as possible (through contact with a pursuer which moved randomly about the grid). It was only possible to complete one small square at a time, since each section had to be built on the already completed sections. The difficulty/challenge of the game was varied across 16 levels by (i) increasing the number of objects moving randomly about the grid, contact with which meant the loss of one life, from 1 to 8; and (ii) once the maximum number of pursuers (8) were on the screen, increasing the speed at which they moved over the final 8 levels (see Appendix 8). A pilot study had previously shown that these 16 levels of difficulty represented an approximately linear increase in difficulty.

Each subject's level of skill on the task was operationally defined as that level of difficulty which they could achieve within a three life limit, once out of two consecutive attempts. Subject's performance on the task was measured by the number of lives lost in completing the grid. This was made possible by inserting a short subroutine into the game which made an infinite number of lives available to the player. Time taken to complete the grid was also recorded.

Pre-performance procedure : As previously mentioned, subjects were split randomly into two groups of 12. Group 1 received no prior practice on the task before data collection, so that their ability at the outset was level 1. All subjects in Group 2 took part in an extensive training period prior to data collection. This consisted of 9 sessions on alternate days. Each session comprised 5 sets of 4 games, with a game being complete once three lives had been lost (the session therefore involved 20 games, giving 180 in total over the 9 sessions). Both performance and ability were recorded over this period with the result that all subjects in Group 2 began experimental treatments at a higher level of ability than Group 1. The ability level of both groups was monitored throughout the experiment, and as one would expect, both groups improved their ability level during the course of the experiment. However, as will become clearer, these improvements in performance do not in fact constitute a source of confounding.

Experimental procedure : Each subject was tested individually on alternate days at two levels of difficulty which were eight levels apart (for example, Day 1 - levels 1 & 9, Day 3 - levels 2 & 10, etc). Full details of the presentation of difficulty levels are shown in Appendix 9. Furthermore, the difficulty levels were always consecutive for consecutive testing days. Performance on each difficulty level was preceded by four 'warm up' games, and each game again consisted of three lives. Performance on warm up games was recorded in case any increase in level of ability occurred during practice (according to the criterion discussed previously).

Following completion of the four 'warm up' games, set at a difficulty level to match the subject's ability, each subject transferred immediately to the grid at the set difficulty level and was instructed to complete the grid as quickly as possible, but losing as few lives as possible. Again, performance (lives lost and time taken to complete the grid), ability level and difficulty level were recorded. On completion, subjects were given the two self-report forms to fill in. A five minute rest period followed whilst the next difficulty level was loaded into the computer. Subjects were allowed a further four 'warm up' games to avoid a warm up decrement (Nacson and Schmidt, 1971) followed immediately by performance on the next difficulty level with infinite lives. Both questionnaires were again presented on completion of the game. This procedure was then repeated over eight alternate days in order to complete all 16 levels of difficulty. Level of ability was monitored throughout so that the skill/challenge ratio could be constantly observed throughout any fluctuations.

Results And Analyses

Skill And Difficulty Manipulations

The purpose of this analysis was to confirm and clarify the hypothesised skill and difficulty manipulations; that is to say, that the ability perceptions of the high skilled group were greater than the low skilled group, and that the higher levels of difficulty were perceived to be more challenging than the lower levels. As indicated earlier, the perceived skill and perceived challenge data was obtained from the ESM self-report form.

In the first instance, two factor Group by Difficulty multivariate analysis of variance was performed on the perceived skill and perceived challenge data, and followed up by univariate tests on the significant MANOVA effects. Tests of simple main effects were used to examine any significant interactions, following the recommendation of Winer (1962). Newman Keuls post hoc tests were then used on any significant tests of simple main effects. It should be stressed at this point that the resulting 16x16 critical difference matrix required by these Newman Keuls tests will not be described in detail for the sake of brevity.

Differences will be discussed generally, with the emphasis on crucial changes and the points at which they occur.

Multivariate Analysis

Group effect : The MANOVA revealed a significant main effect for Group; $F(3,44) = 16.1653$, $p<0.001$ (see Appendix 12, Table 1).
Difficulty effect : The MANOVA revealed a significant main effect for Difficulty: $F(3,44) = 56.76525$, $p<0.001$ (see Appendix 12, Table 1).
Group X Difficulty interaction : The MANOVA revealed a significant Group X Difficulty interaction; $F(3,44) = 10.51308$, $p<0.001$ (see Appendix 12, Table 1).

These significant MANOVA effects were then examined in individual studies of perceived skill and perceived challenge.

Analysis Of Perceived Skill

Group effect : Univariate tests of perceived skill did not reveal a significant main effect for Group; $F(1,22) = 2.515$, $p>0.126$ (see Appendix 12, Table 2), which suggests that there were no significant differences between the low skilled and the high skilled groups in the perception of their skill.
Difficulty effect : Univariate tests of perceived skill revealed a significant main effect for Difficulty; $F(15,330) = 6.5052$, $p<0.001$ (see Appendix 12, Table 2), which indicated that there were significant differences in the perception of skill across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 13), and should be studied with reference to Figure 9. No significant differences

were present in the perception of skill at difficulty levels 1 to 11, so that the main differences concerned the perception of skill at the higher levels of difficulty. Perceived skill at levels 1 to 15 was significantly greater than perceived skill at level 16. Perceived skill at levels 4, 6 and 7 was significantly greater than perceived skill at levels 13 to 16. Perceived skill at levels 2 and 8 was significantly greater than perceived skill at levels 15 and 16.

Group X Difficulty interaction : Univariate tests of perceived skill revealed a significant Group X Difficulty interaction; $F(15,330) = 2.92578$, $p<0.001$ (see Appendix 12, Table 2). This interaction was followed up with tests of simple main effects. Tests of simple main effects of the perceived skill of the low skilled group did not reach significance; $F(15,165) = 1.55$, $p<0.095$ (see Appendix 12, Table 3), indicating that there were no significant differences in the low skilled group's perception of their skill across the 16 difficulty levels.

The simple main effect of difficulty upon perceived skill for the high skilled group reached significance; $F(15,165) = 8.59$, $p<0.001$ (see Appendix 12, Table 4), which suggested that there were significant differences in the high skilled group's perception of their skill across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 13), and should be studied with reference to Figure 9. Again, there was no significant difference in perceived skill scores from levels 1 to 11. Perceived skill at level 7 was significantly greater than perceived skill at levels 12 to 16. Perceived skill at levels 1 to 9 was significantly greater than perceived skill at levels 13 to 16. Perceived skill at levels 10

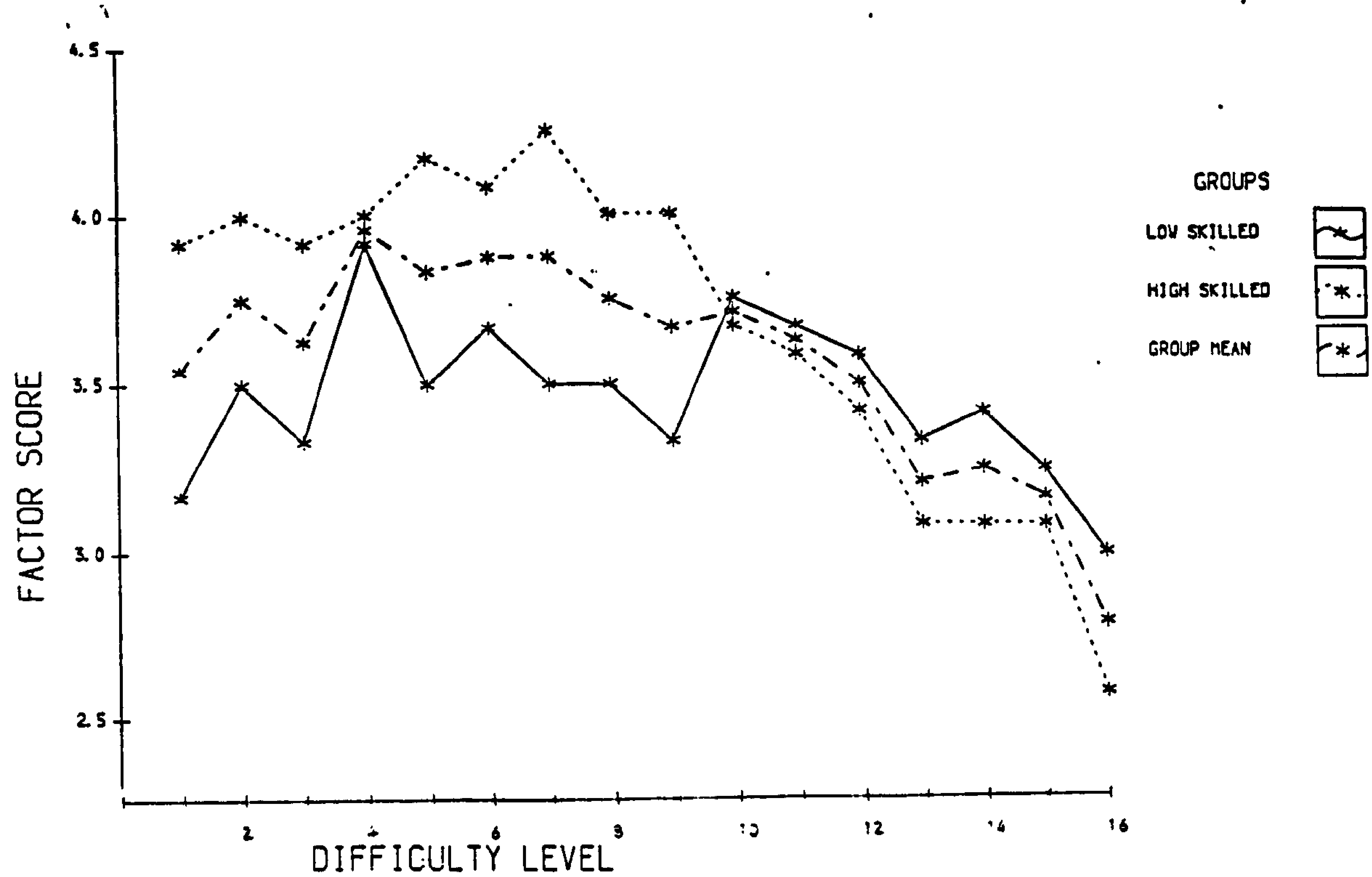


Figure 9 : Analysis Of Skill And Challenge Manipulations - Perceived Skill

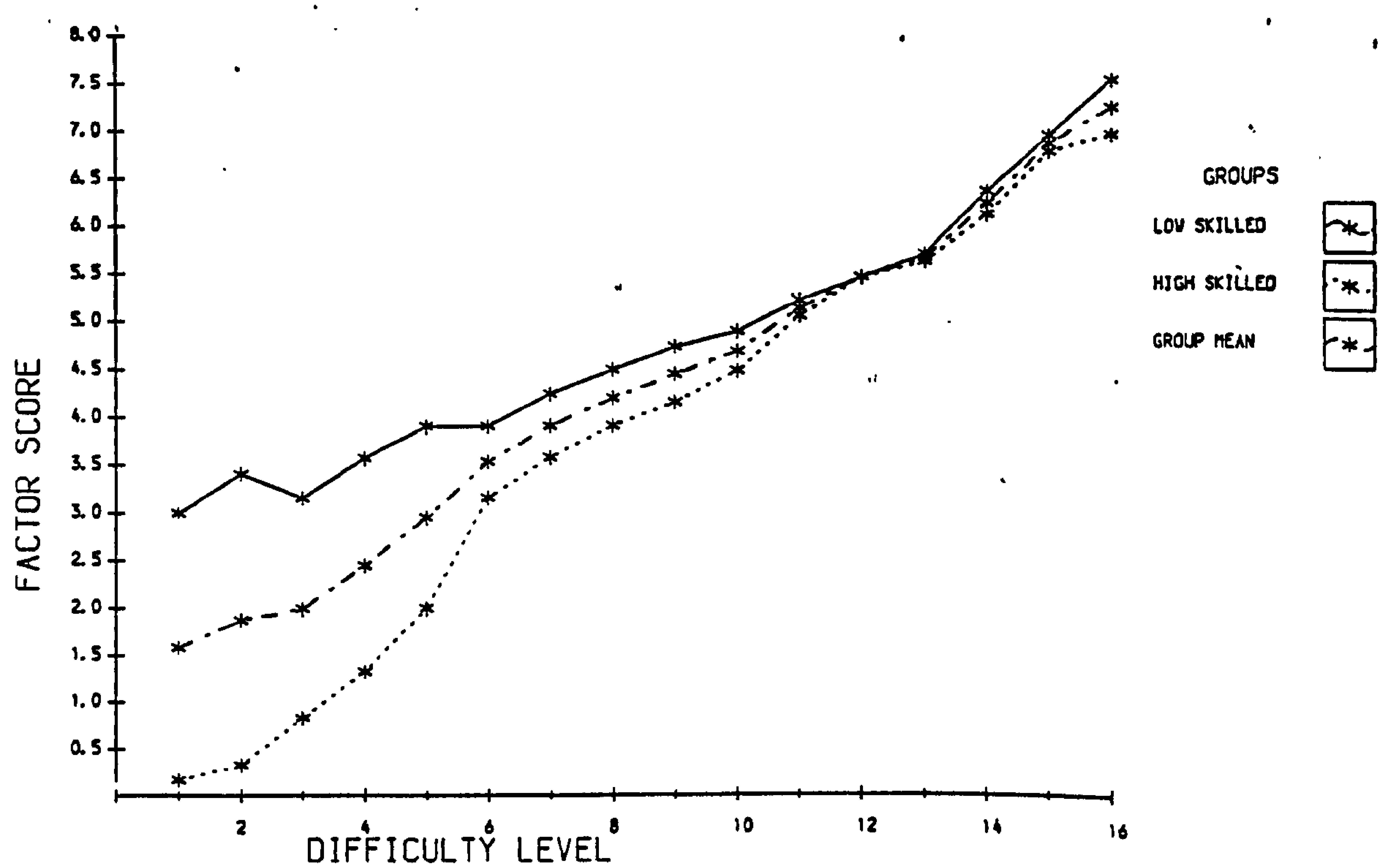


Figure 10 : Analysis Of Skill And Challenge Manipulations - Perceived Challenge

to 12 was also significantly greater than perceived skill at level 16.

Analysis Of Perceived Challenge

Group effect : Univariate tests of perceived challenge revealed a significant main effect for Group; $F(1,22) = 32.18727$, $p<0.001$ (see Appendix 12, Table 5), which indicated that the low skilled group perceived the challenge to be significantly greater than the high skilled group.

Difficulty effect : Univariate tests of perceived challenge revealed a significant main effect for Difficulty; $F(15,330) = 170.35129$, $p<0.001$ (see Appendix 12, Table 5), which indicated that there were significant differences in the perception of challenge across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 13), and should be studied with reference to Figure 10. The trend seemed to be for perceived challenge to increase with difficulty, with significant differences in perceived challenge occurring at every second or third level of difficulty. For example, perceived challenge at level 16 was significantly greater than at levels 1 to 14; perceived challenge was significantly greater at level 15 than at levels 1 to 13; and perceived skill at level 14 was significantly greater than at levels 1 to 12.

Group X Difficulty interaction : Univariate tests of perceived challenge revealed a significant Group X Difficulty interaction; $F(15,330) = 14.61697$, $p<0.001$ (see Appendix 12, Table 5). The interaction was examined using tests of simple main effects (Winer, 1962).

The simple main effect of difficulty upon perceived challenge for the low skilled group reached significance; $F(15,165) = 48.89$, $p<0.001$, which indicated that there were significant differences in the low skilled group's perception of the challenge over the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 13), and should be studied with reference to Figure 10. Not suprisingly, the differences reflected the trend shown by the difficulty main effect, with perceived challenge increasing as level of challenge increased, although the significant difference occurred every third or fourth difficulty level. For example, perceived challenge at level 15 was significantly greater than at levels 1 to 13; perceived challenge at level 13 was significantly greater than at levels 1 to 9; and perceived challenge at level 8 was significantly greater than at levels 1 to 4.

The simple main effect of difficulty upon perceived challenge for the high skilled group also reached significance; $F(15,165) = 136.61$, $p<0.001$ (see Appendix 12, Table 6), which indicated that there were significant differences in the high skilled group's perception of the challenge across the 16 difficulty levels. Again, these differences were examined using the Newman Keuls procedure (see Appendix 13), and should be studied with reference to Figure 10. As with the low skilled group, the trend was for perception of challenge to increase as objective difficulty increased. However, this time, the rate of increase was greater, with significant differences occurring every second or third level. For example, perceived challenge at level 13 was significantly greater than at levels 1 to 10; perceived challenge at level 10 was significantly greater than at levels 1 to 7; and perceived challenge at level 6 was significantly greater than at levels 1 to 5.

Discussion Of Skill And Difficulty Manipulations

Clearly the first comment to make refers to the significant MANOVA main effects, which in general would seem to suggest that the manipulations were successful in terms of there being significant differences in the perception of skill and challenge between the two groups ($p<0.001$) and across the 16 levels of challenge ($p<0.001$).

Examining the findings from the analysis of perceived skill next, the absence of a main effect for Group indicates that there were no differences in the overall perception of skill between the two groups ($p>0.126$). The Group main effect in the MANOVA was therefore the result of one Group effect in the two sets of univariate tests (perceived skill and perceived challenge), rather than the combined influence of two Group effects. That is to say, the Group effect for perceived challenge (which will be discussed later) was highly significant ($p<0.001$) whilst the Group effect for perceived skill was not significant. In addition, some evidence will be presented at a later stage to suggest that the high skilled group is really an example of a 'moderately' skilled group, which may account for the lack of significance between the perceived skill levels of the two groups. It is possible, therefore, that further training would have brought the significance level between groups to below $p = 0.127$.

Perceived skill was shown to change significantly across the

16 difficulty levels ($p<0.001$). The absence of significant differences over levels 1 to 12 suggests that perception of skill was relatively stable over these levels. The crucial point seems to be around level 13, where perception of skill decreased significantly. This trend will be discussed in more detail at a later point with specific reference to the two groups.

The significant Group X Difficulty interaction in the analysis of perceived skill ($p<0.001$) was examined by tests of simple main effects of both the low skilled and the high skilled group's perception of skill across difficulty. The analysis of the low skilled group's perceived skill scores showed that they did not significantly change across difficulty ($p<0.096$). That is to say, their perception of their competence remained stable despite increases in the level of challenge. It might be hypothesised that as difficulty increased, the low skilled subject's perception of their ability should become lower as the skill to challenge ratio becomes smaller. However, this does not seem to be the case, and it may be that this group was more concerned with learning the task than their performance or how difficult the task was. This suggestion would confirm the ideas proposed by Sansone (1986), who considered the processes of perceived competence and perceived valuation of the task. She suggested that the less certain people are of their competence (which would certainly apply to the low skilled group - see Figure 9 showing the erratic nature of their perception of ability), the more challenging an activity appears (hence the main effect of skill on challenge shown later). This could make the activity seem more attractive, but only if doing well is not perceived to be central to the task. This would seem to suggest that the low skilled subjects were more concerned with simply acquiring the task than immediate success.

A similar argument may be applied when considering the high skilled group's perceived skill scores from levels 1 to 11 which were not significantly different. This finding is not too suprising as this group's skill should have been greater than, or equal to, the challenge at the early difficulty levels. Consequently, in relation to the challenge, these subjects should regard their ability as relatively high. At the higher levels of difficulty, there seems to be a point around levels 10 to 12 (see Figure 9) where perception of skill drops significantly. This is probably the point at which the skill/challenge ratio became imbalanced in favour of challenge, and also emphasised by `failure', or at least poorer performance relative to the success which had previously been experienced at the earlier levels. Where the low skilled group may have attributed poorer performance to the increased difficulty rather than decreased skill, the high skilled group seems to have attributed poorer performance to a decrement in ability. In other words, there may be some changes in self-efficacy at this point as failure is viewed as a result of lack of ability.

It is perhaps worthwhile to stress the importance of the perception of one's skill or ability. One of the predictions of cognitive evaluation theory (Deci and Ryan, 1985), is that perception of competence, or incompetence, affects intrinsic motivation. Indeed, perception of competence has been shown to mediate changes in intrinsic motivation (Vallerand and Reid, 1984). More specifically, Deci and Ryan have argued that perceiving oneself as competent should increase one's motivation for an activity; whilst perceiving oneself as incompetent should decrease one's motivation for an activity. It would therefore be interesting to examine (in some future study) whether subjects' perception of competence shown by this analysis is associated with changes in their motivation associated with the challenge of the activity.

The findings from the analysis of perceived challenge confirmed the findings from the multivariate analysis. The main effect for Group indicated that there was a significant difference between the low skilled and the high skilled group in their perception of the challenge ($p<0.001$). It can be seen from Figure 10 that the low skilled group's perceived challenge scores are greater than those of the high skilled group. This would also seem to be a reflection of the skill levels of the two groups, as it would not be suprising to find that the low skilled group to consider the challenge to be greater than the high skilled group's perception of the challenge at a similar difficulty level.

The significant main effect for Difficulty indicated that there were significant differences in perceived challenge across the 16 difficulty levels ($p<0.001$). Not suprisingly, the perception of challenge increased as objective challenge increased. These differences will be discussed in more detail in the discussion of the tests of simple main effects for each group, which revealed a similar trend.

The Group X Difficulty interaction in the univariate tests were examined using tests of simple main effects. Analysis of the low skilled group's perception of the challenge indicated that this group perceived the challenge of the activity to increase as difficulty increased ($p<0.001$). Significant changes in perceived challenge occurred every third or fourth difficulty level. Incidentally, no two consecutive difficulty levels were significantly different, and as a result there was not a point at which difficulty was perceived to increase to a greater extent than usual (see Figure 10 which shows this trend to be relatively linear).

Analysis of the high skilled group's perception of challenge also demonstrated the trend for perception of challenge to increase as difficulty increased ($p<0.001$). Unlike the low skilled group's more `linear' trend of challenge increasing significantly every third or fourth difficulty level, the high skilled group's perception of challenge appeared to increase faster, every second or third difficulty level. In addition, there seem to be two points at which perception of challenge increased markedly. These occurred around difficulty levels 5 and 6, and levels 10 to 12, which can be observed quite clearly in Figure 10. It might be suggested that difficulty levels 1 to 5 were `too easy' for this group (hence the low perception of challenge). Levels 6 to 10 appear to be grouped together, and perhaps represent the points where skill and challenge were approximately matched. The significant difference between levels 10 and 12 may then represent the point at which challenge began to significantly exceed skill. Difficulty levels 10 to 12 were also identified as important points in the analysis of the high skilled group's perception of skill. In the case of this group, the increase in perceived challenge was accompanied by a decrease in perceived skill. However, the important point to note here is the difference between the low skilled and the high skilled group in the rate of increase in perception of challenge (shown statistically by the significant Group X Difficulty interaction). Some comment should be made here with reference to the analyses performed on the data in this experiment, and also with reference to analysis of data in future experiments. As recommended by Winer (1962) tests of simple main effects were, and will be, used to examine significant interactions. Intergroup comparisons at each difficulty level are not possible following such tests. As a result of the complexity of the follow up tests required to perform Newman Keuls comparisons directly upon the cell means of the interaction (32x32 Newman Keuls tests), direct intergroup comparisons will not be made.

Finally, it should be stressed again that the experimental manipulations appear to have been successful in terms of manipulating both perceived ability and perceived challenge as shown in the multivariate analysis. It confirms the skill manipulations between groups, and also that the objective levels of difficulty were identified by both groups.

Factor Analyses Of Affective States

A total of 384 ESM and 384 Experience Questionnaire self-reports were obtained from the 24 subjects pertaining to 16 levels of difficulty. The two sets of data were factor analysed separately in order to extract underlying factors from the sets of variables, thereby clarifying the states of flow and experience. It was then proposed to examine the experiences of the subjects in terms of their scores on these factors under the group by difficulty manipulations - low skill/low difficulty, low skill/high difficulty, high skill/low difficulty, high skill/high difficulty (see Hardy and Whitehead, 1984).

(i) Factor Analysis : ESM Data

Principle components factoring was used to extract factors with eigenvalues greater than 1, and subsequent varimax rotation used to assign items to factors. The factor analysis of the ESM data extracted three factors with eigenvalues greater than 1 (see Table 5). A full table of eigenvalues is given in Appendix 12.

FACTOR	EIGENVALUE	% VAR	CUM %
1	10.18872	39.2	39.2
2	5.17270	19.9	59.1
3	1.55537	6.0	65.1

Table 5 : ESM Data Eigenvalues For Factor Analysis Extraction

Factor loadings for the subsequent rotated factor matrix are shown in Table 6. All factor loadings were converted to reflect the positive direction of each item, so that in terms of interpreting each factor, the larger factor loadings represent the more positive aspect of each item (shown by underscoring). It therefore follows that in the analysis and discussion of factor scores that follows, positive values also reflect the more positive aspect of that factor.

FACTOR 1	item 23	(.90359)	bored - excited
	item 21	(.89096)	dull - creative
	item 22	(.87347)	constrained - free
	item 20	(.87044)	anxious - relaxed
	item 24	(.86610)	closed - open

	item 13	(.78350)	sad - happy
	item 14	(.76911)	irritable - cheerful
	item 19	(.75325)	detatched - involved
	item 18	(.75075)	lonely - sociable
	item 16	(.73719)	angry - friendly
	item 17	(.73110)	passive - active
	item 15	(.68389)	weak - strong
	item 12	(.64180)	drowsy - alert
	item 25	(.59038)	confused - clear
	item 11	(.30325)	skill in the activity (low - high)
FACTOR 2	item 2	(.93574)	in control of the situation (not at all - very)
	item 6	(.90080)	in control of own actions (not at all - very)
	item 8	(.86738)	satisfied with self (not at all - very)
	item 4	(.84800)	selfconsciousness (very - not at all)
	item 3	(.81092)	difficult to concentrate (very - not at all)
	item 10	(.73588)	challenge of task (high - low)
	item 5	(.68755)	degree of concentration (not at all - very)
	item 7	(.63399)	wish to be doing something else (very - not at all)
	item 11	(.44342)	skill in the activity (low - high)
	item 25	(.34559)	confused - clear
	item 15	(.34023)	weak - strong
FACTOR 3	item 26	(.82838)	choice in selecting the task (very much - none)
	item 9	(.60134)	anything at stake in the activity (very - not at all)
	item 7	(.41541)	wish to be doing something else (very - not at all)
	item 1	(.35985)	passage of time (slow - fast)

Table 6 : ESM Factor Items

In addition to the extraction of these three `flow' factors from the factor analysis, each subject's three factor scores at each difficulty level were calculated and added to the original data file for subsequent analysis.

Factor Labelling

A tentative attempt was made to give names to the three factors based on the items loading on each factor. This gave an early indication of what the three factors represented, which was then confirmed using multivariate analysis of variance techniques to examine the behaviour of subjects' factor scores under the experimental manipulations (Hardy and Whitehead, 1984).

Factor 1 : appeared to consist of items relating to the positive emotions hypothesised to be prevalent in flow situations (Csikszentmihalyi, 1975), indicating the extent to which flow is experienced from a low level (microflow) to a high level (macroflow). It may be reasonable to hypothesise that, as the activity has been experimentally shown to be of intrinsic interest, all subjects should theoretically experience some type of flow at some stage; ie, the low skilled subjects at the low level of challenge, and the high skilled subjects at the higher levels of challenge. Similarly, according to flow theory (Csikzsentmihalyi, 1975) it might also be suggested that the higher skilled individuals should experience more macroflow due to their level of ability. It seems then, that this factor is concerned with how much flow people experience on a continuum from microflow to macroflow; in other words, the intensity of the flow experience. The relationship of this factor to the flow model is illustrated in Figure 11.

Factor 2 : included items relating to the control of actions and situations, together with self-satisfaction and ease of concentration. This suggests both self control and concentration, which points towards coping (in terms of performance on the task). It follows that in a non-coping situation, subjects should feel a lack of control over self and situation, dissatisfaction with the task, find difficulty in concentrating, wish to be doing something else, less intrinsic motivation (Deci, 1975) and, therefore, less flow. One would normally expect subjects to be in a coping situation until they perceive the challenge of the task to exceed their skill level, although the precise point at which this occurs is almost certainly dependent upon individual differences. More specifically, low skilled subjects should cope with a low level of challenge, but not with a higher level of challenge. High skilled subjects should cope with greater challenge (higher levels of difficulty), although again, this should again tail off if and when the difficulty level significantly exceeds skill. The relationship of Factor 2 to the flow model is shown in Figure 12.

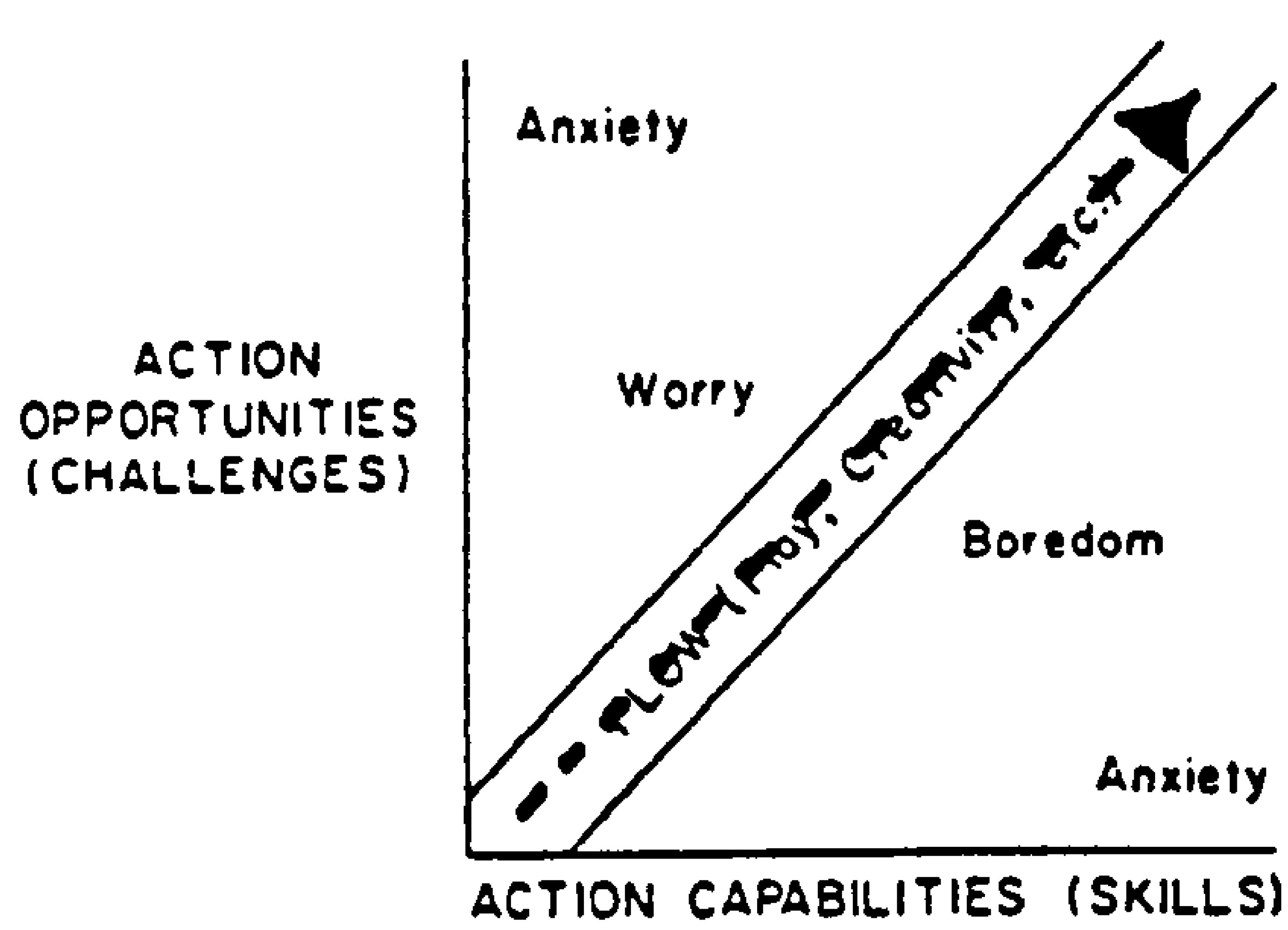


Figure 11 : ESM Factor 1 And The Flow Model

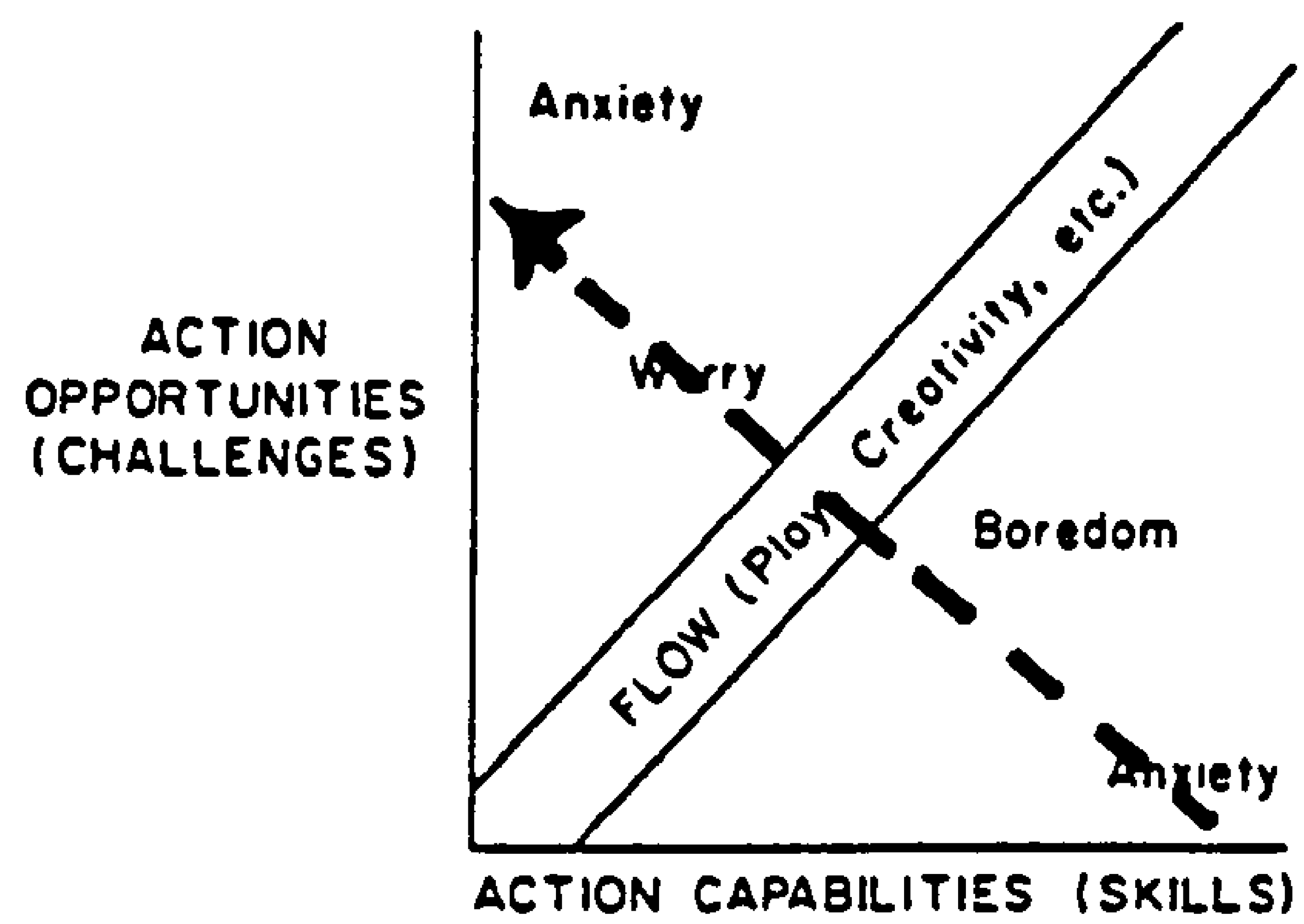


Figure 12 : ESM Factor 2 And The Flow Model

Factor 3 : appeared to include items which were specific to the task, and the fact that subjects were in an experimental situation for which they had volunteered. This factor is therefore perhaps best thought of as being concerned with subject's responses to task demands over which they have no control. It is perhaps a motivational factor associated with external challenge. According to the theorising of Deci (1975), subjects with little ability (low perceived competence and no control over the task), should get increasingly less motivated and committed to the task as the challenge increases. Conversely, the higher skilled subjects should start with little motivation or committment to the task (as skill exceeds challenge), but as the demands of the task increase, and match ability, their motivation to perform should also increase. In other words, it is hypothesised from the intrinsic motivation and flow literature that Factor 3 should vary in line with the skill/challenge ratio.

The relationship between Factor 3 and the flow model is illustrated in Figure 13.

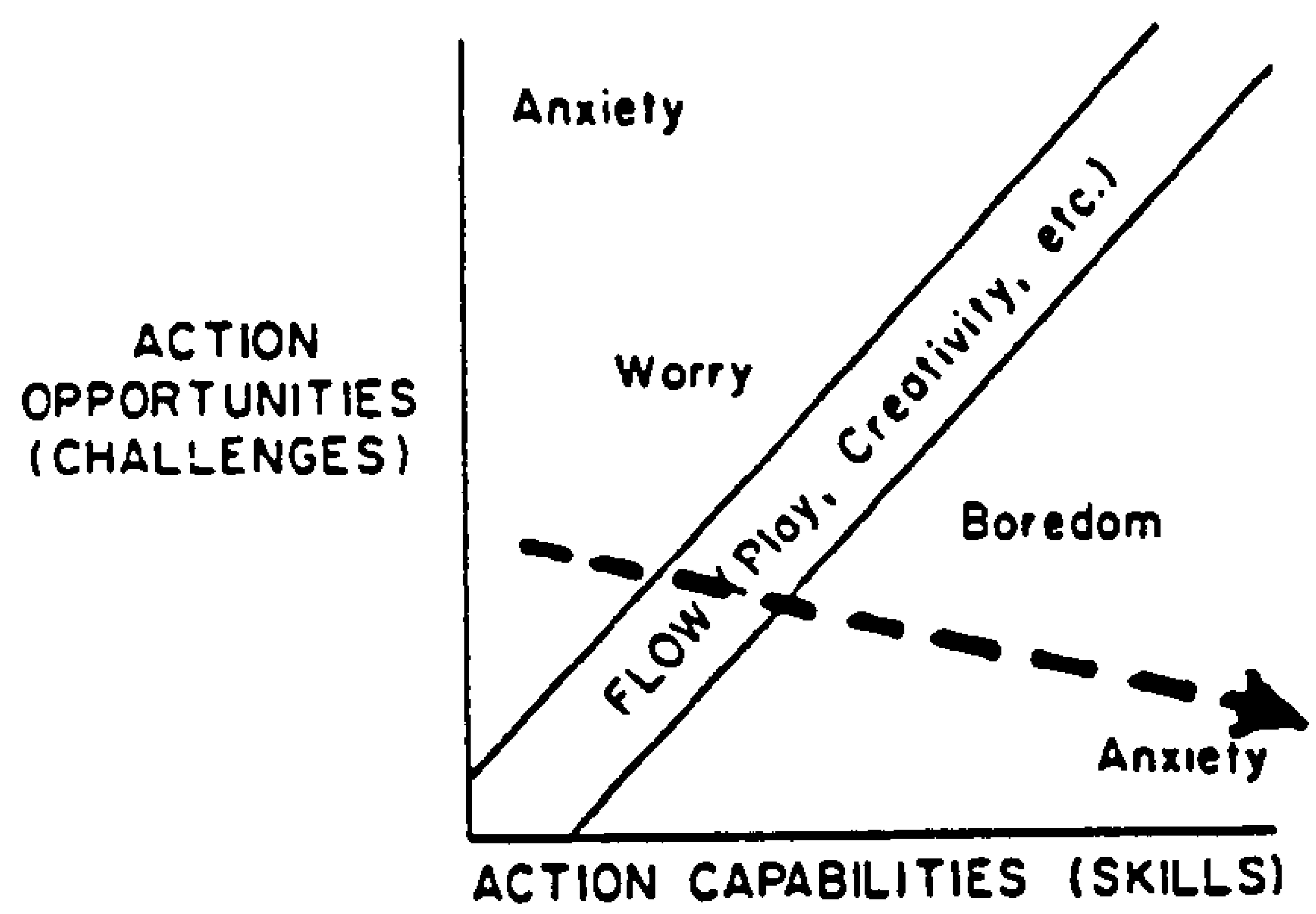


Figure 13 : ESM Factor 3 And The Flow Model

These labels and hypotheses were examined in more detail by a multivariate analysis of variance to determine how the factors behaved in accordance with the skill/challenge ratio.

The Multivariate Analysis Of Variance

A two factor Group by Difficulty multivariate analysis of variance with repeated measures on the difficulty factor was performed on the three ESM factor scores, followed by univariate tests on each significant MANOVA effect. Significant univariate effects were examined using tests of simple main effects as recommended by Winer (1962), and the significant simple main effects followed up using the Newman Keuls procedure. Significant differences in the Newman Keuls 16 x 16 critical difference matrices will not be presented in detail for the sake of brevity. The findings will be discussed in terms of trends, and attention drawn to crucial changes together with the levels at which they occur. Results will be reported factor by factor.

Multivariate Analysis

Group effect : The MANOVA revealed a significant main effect for Group; $F(1,22) = 3.81163$, $p<0.027$ (see Appendix 15, Table 1).

Difficulty effect : The MANOVA revealed a significant main effect for Difficulty; $F(15,30) = 24.63545$, $p<0.001$ (see Appendix 15, Table 1).

Group X Difficulty interaction : The MANOVA revealed a significant Group X Difficulty interaction; $F(15,330) = 5.34776$, $p<0.001$ (see Appendix 15, Table 1).

Factor 1

Group effect : Univariate tests of Factor 1 scores did not reveal a significant main effect for Group; $F(1,22) = 2.73495$, $p>0.111$ (see Appendix, Table 2), which suggests that there were no significant differences between the low skilled and the high skilled group's Factor 1 scores.

Difficulty effect : Univariate tests of Factor 1 scores revealed a significant main effect for Difficulty; $F(15,330) = 37.44955$, $p<0.001$ (see Appendix 15, Table 2), which indicated that there were significant differences between Factor 1 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 16), and should be studied with reference to Figure 14. At the lower difficulty levels, there were no significant differences between factor scores at difficulty levels 1 to 9. Factor scores at levels 10 to 16 decreased as difficulty increased, with significant differences occurring every second or third level. For example, the factor scores at levels 1 to 13 were significantly greater than the factor score at level 15; and the factor scores at levels 1 to 10 were significantly greater than the factor score at level 13.

<u>Group X Difficulty interaction</u> : Univariate tests of Factor 1 scores revealed a significant Group X Difficulty interaction; $F(15,330) = 10.25162$, $p<0.001$ (see Appendix 15, Table 2). This interaction was followed up using tests of simple main effects as suggested by Winer (1962).

Tests of simple main effects on the low skilled group's Factor 1 scores reached significance; $F(15,165) = 33.98736$, $p<0.001$ (see Appendix 15, Table 5), which suggests that there were significant differences between the low skilled group's Factor 1 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 16), and should be studied with reference to Figure 14. There were no significant differences between factor scores at difficulty levels 1 to 6. Factor scores then decreased as difficulty increased, in clusters of three and four levels at a time. For example, the factor scores at levels 11 and 12 were significantly greater than factor scores at levels 1 to 6; the factor score at levels 2 to 4 were significantly greater than the factor score at level 9; and the factor scores at levels 1 to 8 were significantly greater than the factor score at level 13.

DIFFICULTY	LOW SKILLED	HIGH SKILLED
1	1.091	-.648
2	1.246	-.639
3	1.258	-.647
4	1.265	-.575
5	.952	-.173
6	.951	.239
7	.623	.398
8	.630	.614
9	.498	.274
10	.353	-.036
11	.188	-.321
12	.188	-.549
13	-.094	-.845
14	-.289	-1.229
15	-.535	-1.51
16	-.793	-1.861

Table 7 : Mean ESM Factor 1 Scores

Tests of simple main effects on the high skilled group's Factor 1 scores reached significance; $F(15,165) = 18.78656$, $p<0.001$ (see Appendix 15, Table 5), which suggests that there were significant differences between the high skilled group's Factor 1 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 16), and should be studied with reference to Figure 14. The trend was for factor scores to increase from levels 1 to 8, and decrease from levels 8 to 16. The main findings in significant differences in factor scores were that factor scores at levels 6 to 8 were significantly greater than factor scores at levels 1 to 4, and 12 to 16. Factor scores at levels 1 to 4 were significantly greater than factor scores at levels 15 and 16.

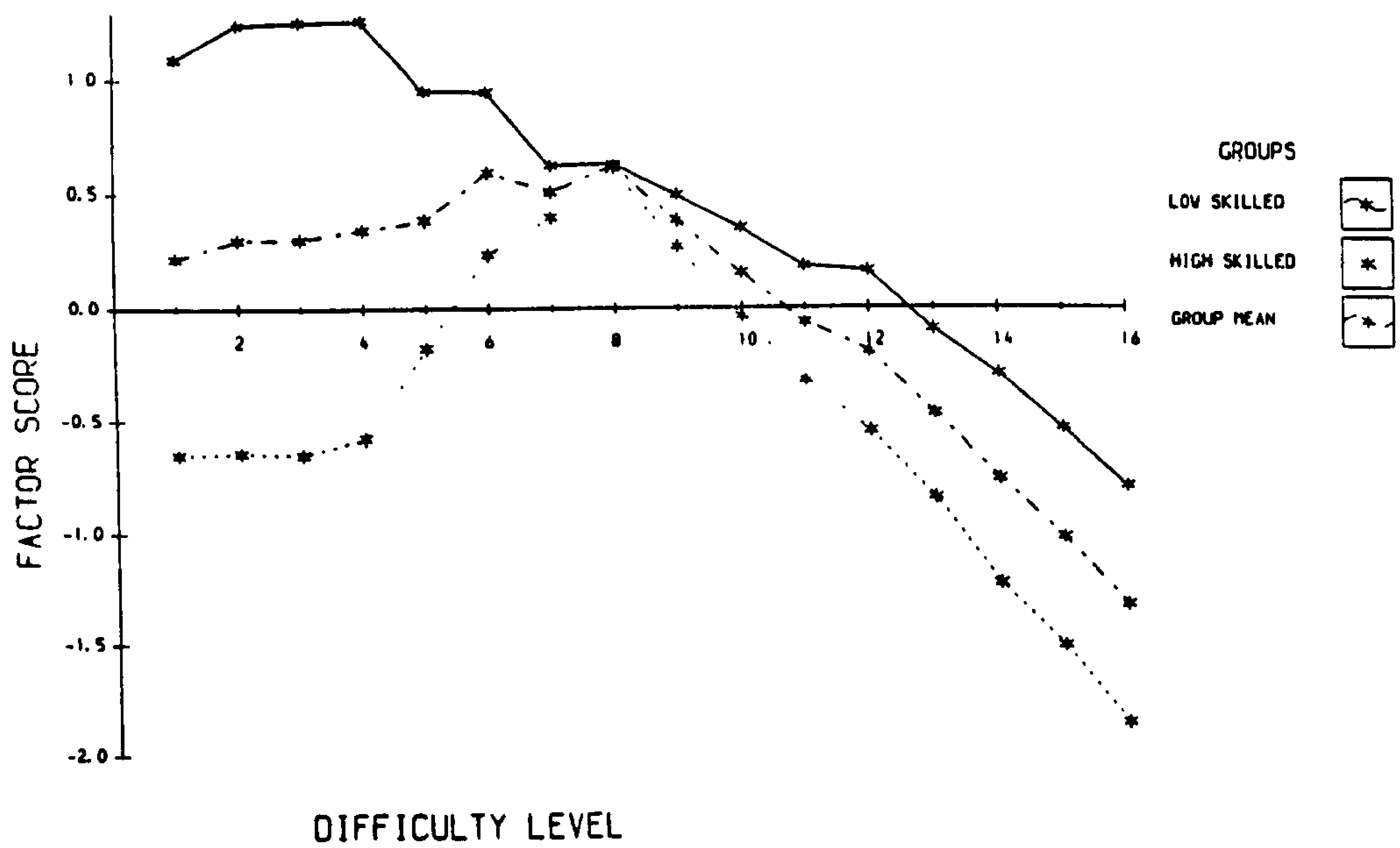


Figure 14 : ESM Factor 1 - Group X Difficulty

Factor 2

Group effect : Univariate tests of the Factor 2 scores did not reveal a significant main effect for Group; $F(1,22) = 1.83533$, $p>0.188$ (see Appendix 15, Table 2), indicating that there were no significant differences between the low skilled and the high skilled group's Factor 2 scores.

Difficulty effect : Univariate tests of the Factor 2 scores revealed a significant main effect for Difficulty; $F(15,330) = 93.89606$, $p<0.001$ (see Appendix 15, Table 2), which suggests that there were significant differences between the Factor 2 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 16), and should be studied with reference to Figure 15. The trend for Factor 2 scores was for the factor scores to decrease as difficulty increased.

Significant differences in factor scores were observed every second or third difficulty level, although there were no significant differences between factor scores at levels 1 to 5. For example, the factor score at levels 1 to 6 were significantly greater than the factor score at level 8; and the factor scores at levels 1 to 8 were significantly greater than the factor score at level 11.

<u>Group X Difficulty interaction</u> : Univariate tests of the Factor 2 scores revealed a significant Group X Difficulty interaction; $F(15,330) = 2.81277$ $p<0.001$ (see Appendix 15, Table 3).

Tests of simple main effects for the low skilled group's Factor 2 scores reached significance; $F(15,165) = 22.5386$, $p<0.001$ (see Appendix 15, Table 6), which suggests that there were significant differences between the low skilled group's Factor 2 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 16), and should be studied with reference to Figure 15. Again, the factor scores tended to decrease as difficulty increased, although there were no significant differences between factor scores at difficulty levels 2 to 7. For example, the factor score at level 7 was significantly greater than factor scores at levels 11 to 16; the factor score at level 9 was significantly greater than factor scores at levels 14 to 16; and the factor score at level 12 was significantly greater than the factor scores at levels 15 to 16.

DIFFICULTY	LOW SKILLED	HIGH SKILLED
1	-.541	1.62
2	-.267	1.579
3	-.177	1.489
4	-.156	1.355
5	-.275	1.213
6	-.194	1.068
7	-.472	.929
8	-.627	.778
9	-.664	.693
10	-.716	.457
11	-.845	.351
12	-.877	.255
13	-1.037	.126
14	-1.185	-.078
15	-1.377	-.269
16	-1.65	-.506

Table 8 : Mean ESM Factor 2 Scores

Tests of simple main effects for the high skilled group's Factor 2 scores reached significance; $F(15,165) = 111.66499$, $p<0.001$ (see Appendix 16, Table 6), which suggests that there were significant differences in the high skilled group's Factor 2 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 16), and should be studied with reference to Figure 15. Factor scores again tended to decrease as difficulty increased. For example, the factor score at level 1 was significantly greater than factor scores at levels 3 to 16; the factor score at level 4 was significantly greater than factor scores at levels 6 to 16; and the factor score at level 8 was significantly greater than factor scores at levels 11 to 16. However, it is important to note that with the high skilled group, the rate of decrease was generally greater than for the low skilled group, otherwise there would not have been an interaction.

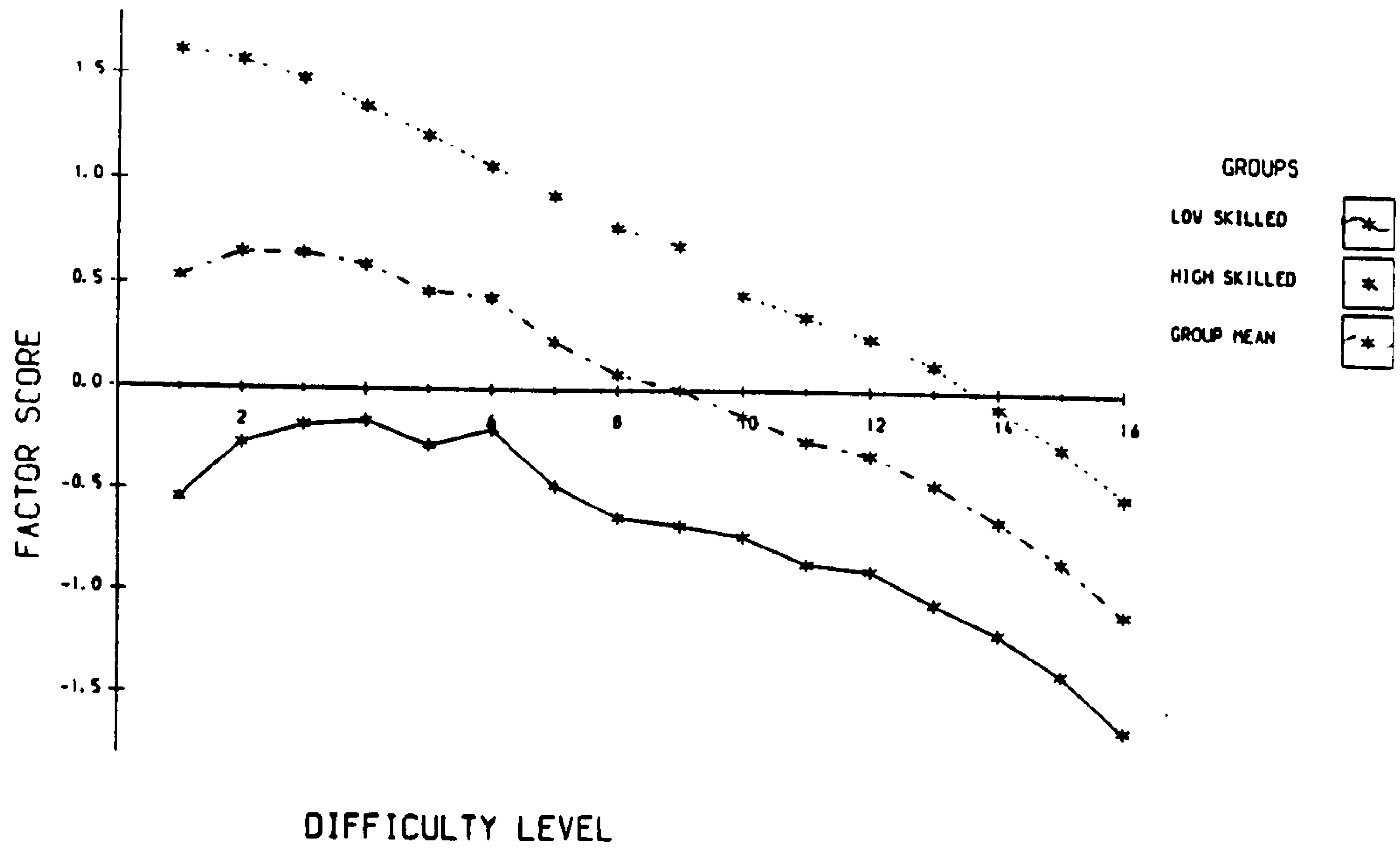


Figure 15 : ESM Factor 2 - Group X Difficulty

Factor 3

Group effect : Univariate tests of the Factor 3 scores did not reveal a significant main effect for Group; $F(1,22) = 0.02989$, $p>0.863$ (see Appendix 15, Table 4), which suggests that there were no significant differences between the low skilled and the high skilled group's Factor 3 scores.

Difficulty effects : Univariate tests of the Factor 3 scores revealed a significant main effect for Difficulty; $F(15,330) = 7.30949$, $p<0.001$ (see Appendix 15, Table 4), which indicated that there were significant differences between the Factor 3 scores across the 16 difficulty levels. These significant differences were examined using the Newman Keuls procedure (see Appendix 16), and should be studied with reference to Figure 16. Significant differences in factor scores occurred mainly between the lower and the higher difficulty levels. For example, the factor score at level 1 was significantly greater than factor scores at levels 10 to 16; the factor scores at levels 3, 4, 5 and 7 were significantly greater than the factor scores at levels 14 to 16; and the factor scores at levels 1 to 12 were significantly greater than the factor score at level 16.

Group X Difficulty interaction : Univariate tests of the Factor 3 scores revealed a significant Group X Difficulty interaction; $F(15,330) = 2.81277$, $p<0.001$ (see Appendix 15, Table 4).

Tests of simple main effects for the low skilled group's Factor 3 scores did not reach significance; $F(15,165) = 0.96901$, $p>0.5$ (see Appendix 15, Table 7), indicating that there were no significant differences in the low skilled group's Factor 3 scores across the 16 difficulty levels.

DIFFICULTY	LOW SKILLED	HIGH SKILLED
1	.403	.779
2	.376	.527
3	-.013	.512
4	-.100	.515
5	.193	.267
6	.111	.170
7	.289	.164
8	.174	-.140
9	.483	-.190
10	.195	-.334
11	.103	-.355
12	.206	-.394
13	-.153	-.509
14	-.200	-.628
15	-.242	-.838
16	-.315	-1.054

Table 9 : Mean ESM Factor 3 Scores

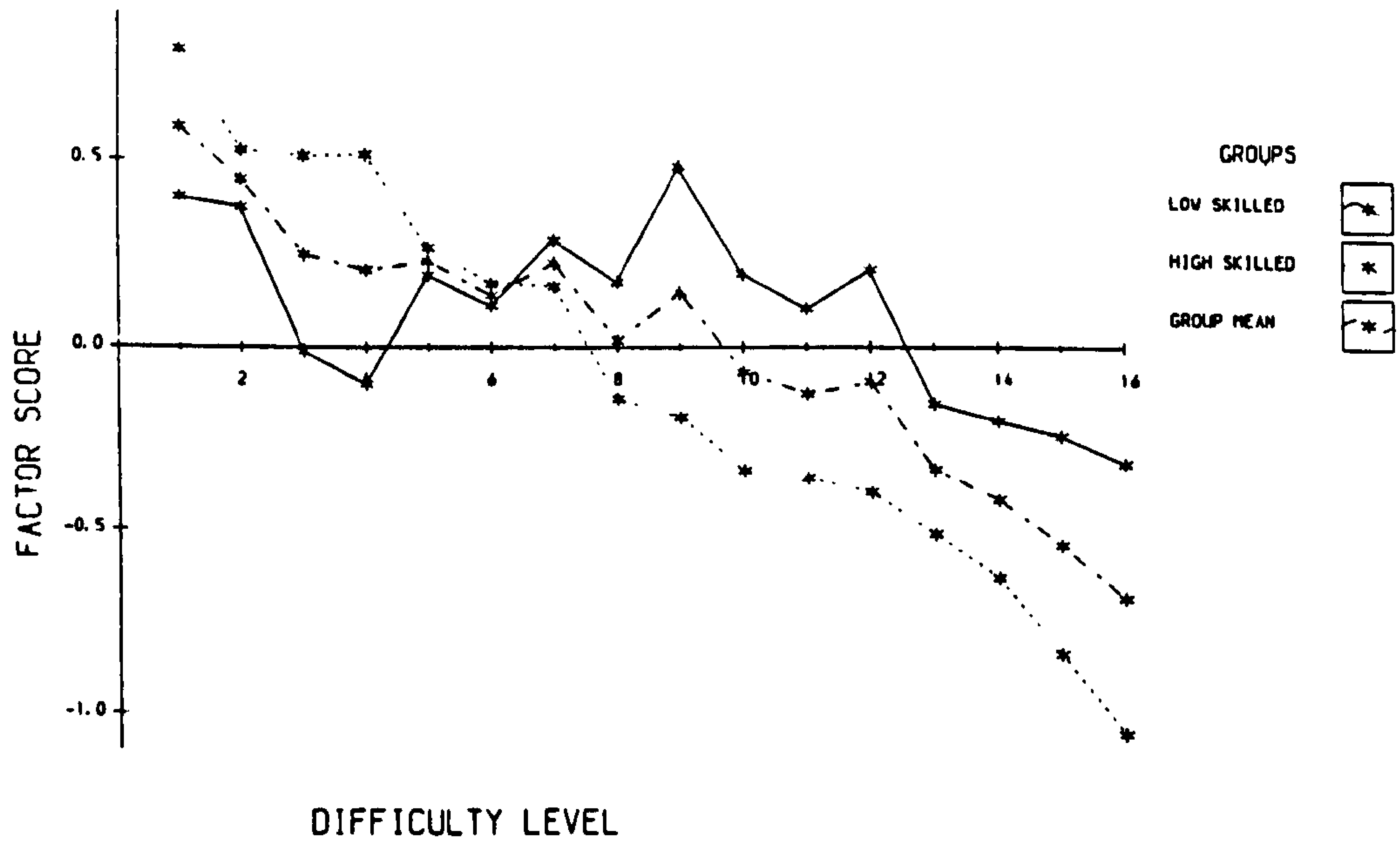


Figure 16 : ESM Factor 3 - Group X Difficulty

Tests of simple main effects for the high skilled group's Factor 3 scores reached significance; $F(15,165) = 36.72838$, $p<0.001$ (see Appendix 15, Table 7), which suggests that there were significant differences in the high skilled group's Factor 3 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 16), and should be studied with reference to Figure 16. The trend was for factor scores to decrease as difficulty increased. For example, the factor score at level 1 was significantly greater than the factor scores at levels 5 to 16; factor scores at levels 2 to 4 were significantly greater than factor scores at levels 8 to 16; factor scores at levels 8 and 9 were significantly greater than factor scores at levels 14 to 16; and factor scores at levels 10 to 13 were significantly greater than factor scores at levels 15 and 16. Although comparisons were not made between groups, it can be seen from Table 9 and Figure 16 that the general trend was for the high skilled group to score higher on Factor 3 than the low skilled group at low levels of difficulty, but lower than them at high levels of difficulty.

Discussion Of ESM Factors

The results of the MANOVA indicated that there were significant differences as a result of both the Group and the Difficulty manipulations, and also intergroup differences as indicated by the significant interaction. As with the analysis, the results will be considered factor by factor.

Factor 1 was hypothesised to represent the intensity of the flow experience. In line with this position, it was hypothesised that high skilled subjects should experience more intense flow (macroflow) than the low skilled group at the higher levels of difficulty, and that low skilled subjects should experience some flow, albeit less intense (microflow) at a lower level of challenge. Although the MANOVA revealed a significant main effect for Group ($p>0.027$), this finding was not upheld in the univariate analysis of Factor 1, indicating that there was no significant difference between groups overall ($p>0.111$). The univariate tests did indicate a main effect for Difficulty ($p<0.001$), suggesting significant differences in Factor 1 scores across difficulty. All differences occurred following difficulty level 9, where factor scores decreased as difficulty increased. These difficulty differences will be discussed in more detail in the examination of the Group X Difficulty interaction with tests of simple main effects.

The hypothesis for the low skilled group was that they should experience flow more intensely at the lower levels of difficulty, where skill and challenge are matched. The tests of simple main effects and Figure 14 would seem to confirm this hypothesis, and provide an excellent example of how flow behaves according to the skill/challenge ratio. By observing that higher factor scores represent a more intense flow experience, the low skilled subjects' experience of flow is most intense at the lower levels of difficulty (where skill=challenge), and becomes progressively less intense as challenge increases, in what approximates a linear relationship between intensity of flow and challenge. As flow was more intense at the lower difficulty levels, this may also mean that intrinsic motivation was greater at the lower difficulty levels (intrinsic motivation being a concommitant of flow - Csikszentmihalyi, 1975).

In accordance with the hypothesis stated earlier, the high skilled group's experience of flow (and therefore intrinsic motivation) began at a low level with low levels of challenge, and then gradually increased, reaching a peak of intensity at difficulty level 8. The flow experience then appeared to decrease in such a way that by the highest challenges (levels 14 to 16) the intensity of flow was significantly less than at any other point. This would again seem to confirm the first part of the hypothesis, that the intensity of the flow experience is greatest where skill and challenge are matched (seemingly around level 8 for the high skilled group), and that the experience is minimised where skill and challenge are mismatched (skill > challenge at levels 1 to 5, and challenge > skill at levels 14 to 16 for the high skilled group). If the hypothesis that flow is at it's most intense where skill and challenge are matched is correct (Csikszentmihalyi, 1975), then this finding seems to confirm the ability level of the high skilled group as being approximately level 8. This group therefore appears to provide a classic example of not so much a high skilled group, as a moderately skilled group, whose experience of flow intensifies as they move toward a match between skill and challenge, but then decreases again as a result of difficulty dominating skill at the highest levels of difficulty. The flow experience of these two sets of subjects therefore seems to provide a classic example of the flow theory in action, and provides a promising start to the examination of the theory.

Factor 2 was hypothesised to be concerned with coping in terms of performance. More specifically, it was hypothesised that the high skilled group should be able to cope with greater levels of challenge, whilst the low skilled group should cope reasonably well at lower levels of challenge but less well as the challenge increased. In other words, ability to cope with peformance on the activity was hypothesised to be related to level of skill.

Although it was hypothesised that the high skilled group should cope better than the low skilled group, this was not upheld by the results from the univariate tests. The univariate tests revealed that there appeared to be no overall difference in ability to cope between the two groups ($p>0.188$). It is also perhaps worth mentioning here that despite a significant main effect for Group in the MANOVA, none of the univariate ANOVA's produced significant effects. The probability levels obtained (see Appendix 15) seem to suggest that the significant MANOVA effect was due to a combination of Factors 1 and 2.

The univariate effect for difficulty ($p<0.001$) showed how the factor scores changed as a result of the difficulty manipulations. In terms of what Factor 2 was hypothesised to represent (high factor scores = coping), then the increase in difficulty was associated with coping less well with performance. Again, this is illustrated in more detail in the tests of simple main effects used to study the significant Group X Difficulty interaction.

The tests of simple main effects on both the low skilled and the high skilled groups (both $p<0.001$), demonstrated a general trend for Factor 2 scores, and therefore coping, to decrease as challenge increased, although the rate of decrease must have been different for an interaction to occur. The low skilled group coped significantly better at the lower levels of difficulty than at the higher levels of difficulty, as did the high skilled group. Again, there is no data on which to base intergroup comparisons, yet Figure 15 suggests that the high skilled group sustained their coping across increasing difficulty better than the low skilled group (and also start at a higher level). This would seem to be entirely in keeping with the predictions which were made from the flow model in the laboratory situation, since in such a setting, no one should actually fail to cope (hence the absence of a Group effect).

Factor 3 was earlier identified as a motivational factor associated with the challenge and task demands of the situation. Again, there was no main effect for Group ($p>0.863$), indicating that skill level had no overall effect upon the motivation associated with the challenge of the task. Univariate tests did reveal a significant effect for Difficulty ($p<0.001$), indicating that factor scores, and therefore motivation, changed significantly with challenge. There was no significant change in motivation from levels 1 to 9, although motivation decreased and showed significant differences from levels 10 to 16 (see Figure 16). In other words, the trend was for motivation to decrease as challenge and demands increased. This trend was examined in more detail by the tests of simple main effects of the significant Group X Difficulty interaction. As with the other factors, the interaction was not examined for intergroup effects.

Tests of simple main effects on the low skilled group's Factor 3 scores indicated that there were no significant differences in this group's motivation ($p>0.399$). In other words, their motivation for the activity did not change significantly despite any increase in level of challenge. It would therefore seem that the low skilled group's motivation was constant. Based on Deci's (1975) observations that perception of oneself as competent should increase motivation for the task, it also follows that as the low skilled group's perception of skill/competence did not change across difficulty levels (see analysis of perceived skill), so this should be reflected in their sustained (high) motivation for the task.

The high skilled group demonstrated a decrease in factor scores, and therefore motivation, as difficulty increased ($p<0.001$). In other words, motivation decreased with challenge. Figure 16 shows that motivation appeared to fall significantly around level 8, which was also identified in the discussion of Factor 1 as the point at which challenge began to exceed skill, and the flow experience became less intense for the high skilled group. The causality of the relationship between decrease in flow intensity and decrease in motivation will not be discussed here, suffice to say that this finding confirms the importance of motivation in the flow concept.

The findings from the analysis of Factor 3 and it's association with the other flow factors have some important implications for theories of intrinsic motivation. For example, it suggests that static perceptions of competence (cf Deci, 1971) are not as important as how perceptions of competence change dynamically as a result of feedback information. The findings also reflect the notions of White (1959) and de Charms (1968), that where there is failure, little sense of control, low feelings of competence and self-determination (ie, where the challenge is too great), there is also little motivation for the activity.

(ii) Factor Analysis : Experience Questionnaire Data

As with the ESM data, principle components factoring was used to extract factors with eigenvalues greater than 1, and subsequent varimax rotation used to assign items to factors. The factor analysis of the Experience Questionnaire data extracted 10 factors with eigenvalues greater than 1 (see Table 10). A full table containing all the eigenvalues is given in Appendix 15.

FACTOR	EIGENVALUE	% VAR	CUM %
1	19.44213	34.1	34.1
2	5.99278	10.5	44.6
3	3.43965	6.0	50.7
4	2.61861	4.6	55.3
5	2.07558	3.6	58.9
6	1.62889	2.9	61.8
7	1.44449	2.5	64.3
8	1.25674	2.2	66.5
9	1.11755	2.0	68.4
10	1.05453	1.9	70.3

Table 10 : Experience Questionnaire Data Eigenvalues From Factor Analysis Extraction

The subsequent rotated factor matrix attributed the following items to the 10 extracted factors (see Table 11). Again, as with the ESM data, factor loadings were reversed where necessary so as to indicate the contribution of items to each factor more clearly.

FACTOR 1	item 23	(.87312)	sense of personal responsibility
	item 24	(.87284)	thoughts and senses were overwhelmed
	item 11	(.85944)	absorbed in the activity
	item 19	(.85658)	intentions were strong
	item 26	(.84371)	loss of self
	item 13	(.83382)	interactive
	item 12	(.82684)	need to continue until task was completed
	item 42	(.82254)	joy and fulfilment
	item 27	(.82252)	event was playful
	item 17	(.81367)	inner process was clear
	item 29	(.81329)	rules and goals were inbuilt
	item 30	(.80467)	event was fun
	item 10	(.80308)	personal value was involved
	item 22	(.79903)	personal expression was involved
	item 25	(.78652)	fusion with environment
	item 14	(.78416)	strong sense of self
	item 18	(.77104)	awareness of power
	item 9	(.75707)	clear focus
	item 21	(.75418)	feeling all together
	item 35	(.75173)	loss of time and space
	item 41	(.74733)	experience was rewarding
	item 37	(.71899)	event was meaningful
	item 57	(.66066)	positive feelings afterwards
	item 45	(.64373)	positive feelings during event

	item 58 (.53692)	positive aftereffects
	item 43 (.49490)	good performance in event
	item 1 (.47939)	event involved action
	item 40 (.38730)	experience was beyond words
	item 32 (.32835)	event was perceptual
	item 15 (.31984)	actions and thoughts were spontaneous
FACTOR 2	item 15 (.73915)	actions and thoughts were spontaneous
	item 3 (.72562)	event was spontaneous
	item 20 (.69840)	event was nonmotivated
	item 7 (.68491)	actions and thoughts were new
	item 40 (.66223)	experience was beyond words
	item 32 (.66046)	event was perceptual
	item 16 (.64997)	free from outer restrictions
	item 33 (.56227)	receptive and passive
	item 56 (.52960)	active description of event
	item 41 (.47745)	experience was rewarding
	item 39 (.41092)	event was brief
	item 34 (.39414)	other persons during event
	item 38 (.35750)	others influenced outcome
	item 30 (.33635)	event was fun
	item 58 (.32124)	positive aftereffects
	item 5 (.32106)	process `clicked on'
	item 35 (.30669)	loss of time and space
	item 11 (.30066)	absorption
FACTOR 3	item 4 (.76000)	event was intense
	item 54 (.71672)	description of event
	item 49 (.71447)	time length of event
	item 8 (.70613)	event seemed an emergency
	item 43 (.66454)	performance in event
	item 39 (.60495)	event was brief
	item 57 (.55404)	positive feelings afterwards
	item 45 (.50844)	positive feelings during event
	item 42 (.31692)	joy and fulfilment
FACTOR 4	item 2 (.74301)	prior related movement
	item 6 (.71818)	event was practised
	item 5 (.54664)	process `clicked on'
	item 1 (.35435)	event involved action
	item 38 (.34323)	others influenced the outcome
FACTOR 5	item 53 (.77979)	description of event as inner
	item 52 (.71001)	description of event as active
	item 50 (.61169)	trigger of event
	item 33 (.39584)	receptive and passive
FACTOR 6	item 46 (.77626)	positive feelings in similar events
	item 44 (.74620)	performance in similar events
FACTOR 7	item 28 (.78586)	differences were resolved
	item 31 (.76622)	event was spiritual/mystical
	item 56 (.36551)	description of event as intellectual

FACTOR 8	item 47 (.60011)	actions prior to event
	item 36 (.59097)	event was an encounter with something outside self
	item 50 (.42939)	trigger of event
	item 34 (.38950)	others involved during event
	item 15 (.33757)	actions were spontaneous
	item 20 (.31178)	event was nonmotivated
FACTOR 9	item 38 (.35133)	others influenced the outcome
	item 48 (.56671)	role of other people
FACTOR 10	item 55 (.86642)	description of event

Table 11 : Experience Questionnaire Factor Items

As with the factors extracted from the ESM data, the 10 `experience' factor scores were added to the original data file, giving subjects an additional 10 scores for each difficulty level. However, it is clear that the sheer quantity of data generated by the Experience Questionnaire was not greatly simplified by the factor analysis. It therefore seemed that a strong argument could be made for only selecting the first five of the factors for further analysis. In particular, the first five factors all contributed substantially for the accounted variance (eigenvalues > 3); later factors have only a small number of items loading on them and it would seem inappropriate to consider Factor 1 (30 items and 34.1% of the variance) and Factor 10 (1 item and 1.9% of the variance) as being of equal importance. In terms of the subsequent analyses a MANOVA of five factor score is a much less daunting prospect than a MANOVA of ten factor scores; experimental predictions for the later factors might tend to be vague or weak due to the lack of items, and the subsequent follow up ANOVA's would therefore be difficult to interpret. On the basis of these arguments, only the first five factors were selected for subsequent labelling and further analysis.

Factor Labelling

Each of the factors derived from the factor analysis of the Experience Questionnaire data was tentatively labelled, and hypotheses made about how the named factors should behave according to the experimental manipulations of skill and challenge. These predictions were then confirmed or negated according to the results obtained from a multivariate analysis of variance of the Group x Difficulty factor scores.

Factor 1 : consisted of a large number of items. It is probably best understood by subdividing the items into four subfactors which correspond closely with the Privettian factors of **clear process** (clear inner process, felt all together, awareness of power, clear focus, sense of self, strong intentions, absorption, interactive), **fun** (event was playful, joy and fulfilment, fun), **significance** (great meaning, thoughts and senses overwhelmed, personal value, personal expression), and **altered states of consciousness** (awareness, loss of self, fusion with environment, loss of time and space). Unfortunately, it is not possible to make predictions for the MANOVA on the basis of these four subfactors unless they are analysed separately. Consequently, Factor 1 will be considered to be a general peak experience factor, which should then vary in line with predictions from the flow model (Csikszentmihalyi, 1975) and the peak experience model (Privette, 1986); namely, the high skilled group should generally exhibit their greatest factor scores at the higher levels of diffiulty, or where their skill and the challenge are matched (presumably at the higher difficulty levels), and the low skilled group should generally exhibit their greatest scores on this factor at lower levels of difficulty where their skill matches the challenge.

Factor 2 : items on this factor appeared to relate to what Privette (1986) terms Unpreparedness, which includes such items as spontaneous thoughts and actions, event was spontaneous, event was nonmotivated, actions and thoughts were new, and there were no outer restrictions. Factor 2 seems to refer to a similar unpreparedness in that subjects were required to make responses to task changes as they happened. If this factor is considered as `letting it happen', then it may be appropriate to adopt a `prior involvement' approach to the prediction of changes in factor scores across different levels of skill and challenge.

Since the high skilled group had spent a training period on the task, they might be less likely to let the performance happen in line with the task demands. They had already learned how to respond to the task (ie, the actions and thoughts were not new, and they were aware of the task restrictions). As learning for the low skilled group progressed occurred during experimentation, one might reasonably expect a regression in the factor scores as they become familiar with the demands of the task and their response to those demands (ie, actions and thoughts were new at the beginning, and became habitual by the later stages). This would clearly not be the case with the low skilled group during the initial stages of learning, where lack of experience on the task should be reflected by a `let it happen' approach.

Factor 3 : included the items, event was intense, event was brief, event seemed an emergency, and event was short in terms of time. This suggests that the factor relates to focused and intense involvement, and is probably concerned with the intensity of action together with task demands and pressure. In terms of how this factor might behave in relation to skill and challenge, it might reasonably be hypothesised that the task demands and pressure would reflect the objective challenge of the situation. More specifically, both groups should produce their highest factor scores at the highest levels of difficulty, where the task demands are greatest, and their lowest scores at the lower levels of difficulty. However, it might also be hypothesised that as a result of the difference in skill level, the low skilled group might find the task demands to be greater than the high skilled group at corresponding levels of difficulty (which is perhaps obvious when considering the flow model and the example shown in Figure 4).

Factor 4 : was made up of items which correspond to Privette's Functional Goal Drive, or goal directed behaviour (considered to be an important aspect of peak performance by Privette, 1986) - prior related movement, event was practised, a process seemed to `click on'. As before, differences in skill level might be hypothesised to play an important role in considering how the factor scores will behave in certain conditions. We might turn to theories of motor skill acquisition and control to explain hypotheses about this factor. For example, the high skilled group have obviously already experienced prior related movement and practised the task, and this must be an important factor in helping them formulate and execute an `action plan'. One would then perhaps expect functional goal drive to be high and remain at this level for the high skilled group. Conversely, the low skilled group would perhaps develop an action plan whilst progressing through the difficulty levels scoring higher at intermediate rather than lower levels of difficulty, as they have then had some practice and experience of prior related movement. This factor seems to be somewhat at odds with Factor 2, indicating conflicting demands between letting the response happen, and following goal directed behaviour. We might then expect the factor scores to reflect this paradox.

Factor 5 : contained the items, event was public, event was outer, and experience which triggered the event, which seem to be specifically related to the nature and design of the task. That is, the fact that subjects were in an experimental situation for which they had volunteered. Although this is probably not a perticuarly interesting factor at a conceptual level, it will still be examined. However, it would perhaps be suprising to find any group or difficulty differences as the nature of the event did not actually change.

The Multivariate Analysis Of Variance

A two factor Group by Difficulty multivariate analysis of variance with repeated measures on the Difficulty factor was performed on the five experience factor scores, and followed by univariate tests on each significant MANOVA effect. Tests of simple main effects were again used to examine any significant interaction effects (Winer, 1962), and these simple main effects were followed up using the Newman Keuls procedure. Again, for the sake of brevity, the significant differences in the Newman Keuls 16 x 16 critical difference matrices will not be discussed in detail. Findings will be discussed in terms of general trends, with reference to any critical changes and the difficulty levels at which they occur. As with the ESM data, the MANOVA results will be reported first, and then each factor will be considered in turn.

Multivariate Analysis

Group effect : The MANOVA did not reveal a significant main effect for Group; $F(1,22) = 1.32572$, $p>0.297$ (see Appendix 18, Table 1).

Difficulty effect : The MANOVA revealed a significant main effect for Difficulty; $F(15,330) = 14.40992$, $p<0.001$ (see Appendix 18, Table 1).

Group X Difficulty interaction : The MANOVA revealed a significant Group X Difficulty interaction; $F(15,330) = 5.60371$, $p<0.001$ (see Appendix 18, Table 1).

Factor 1

Group effect : As the MANOVA did not reveal a significant main effect for Group, $p>0.297$, univariate tests were not justifiable.

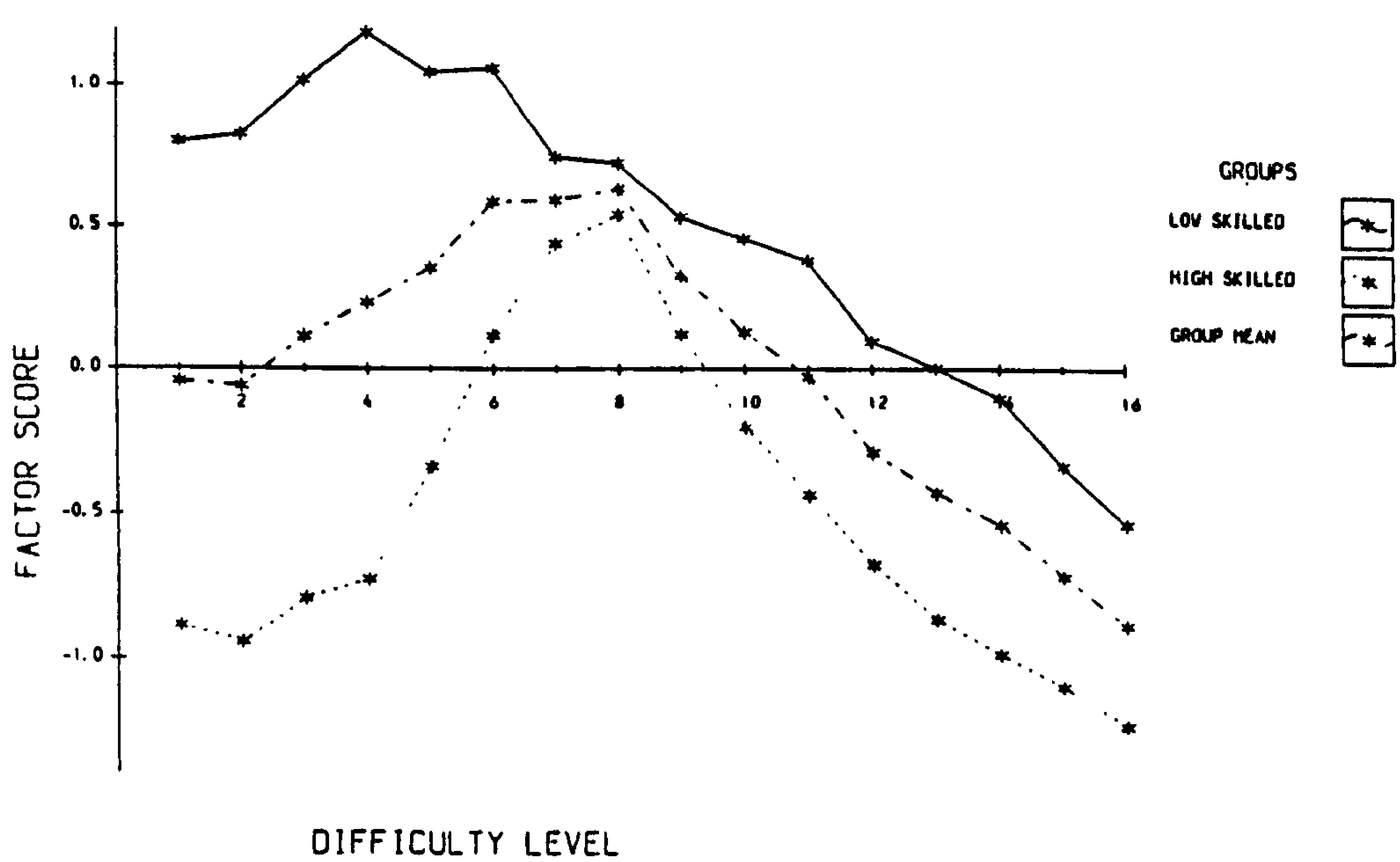
Difficulty effect : Univariate tests of Factor 1 scores revealed a significant main effect for Difficulty; $F(15,330) = 30.44104$, $p<0.001$ (see Appendix 18, Table 2), which indicated that there were significant differences in the Factor 1 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 17. The trend was for factor scores to increase from difficulty levels 1 to 8, and decrease from difficulty levels 8 to 16. Factor scores at levels 6 to 8 were significantly greater than factor scores at levels 1 to 3 and 10 to 16; factor scores at levels 3, 4, 9 and 10 were significantly greater than factor scores at levels 12 to 16; factor scores at levels 1, 2 and 11 were significantly greater than factor scores at levels 13 to 16; and factor scores at levels 14 and 15 were significantly greater than the factor score at level 16.

Group X Difficulty interaction : Univariate tests of Factor 1 scores revealed a significant Group X Difficulty interaction; $F(15,330) = 10.62443$, $p<0.001$ (see Appendix 18, Table 2). Tests of simple main effects on the low skilled group's Factor 1 scores reached significance; $F(15,165) = 27.72306$, $p<0.001$ (see Appendix 18, Table 7), which indicated that there were significant differences in the low skilled group's Factor 1 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 17. There were no significant differences between factor scores at levels 1 to 8. Factor scores at levels 3 to 6 were significantly greater than factor scores at levels 9 to 16; factor scores at levels 1, 2, and 7 to 9 were significantly greater than factor scores at levels 12 to 16; whilst from levels 10 to 16, factor scores were significantly worse at every alternate level.

Tests of simple main effects of the high skilled group's Factor 1 scores also reached significance; $F(15,165) = 16.58046$, $p<0.001$ (see Appendix 18, Table 7), indicating that there were significant differences in the high skilled group's Factor 1 scores across the 16 difficulty levels. These differences were

DIFFICULTY	LOW SKILLED	HIGH SKILLED
1	.800	-.885
2	.826	-.942
3	1.02	-.791
4	1.189	-.725
5	1.051	-.338
6	1.064	.116
7	.749	.442
8	.728	.546
9	.538	.121
10	.461	-.204
11	.383	-.437
12	.096	-.676
13	.003	-.863
14	-.099	-.983
15	-.337	-1.092
16	-.539	-1.225

<u>Table 12 : Mean Experience Factor 1 Scores</u>



<u>Figure 17 : Experience Factor 1 - Group X Difficulty</u>

examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 17. The trend for this group was for factor scores to increase from levels 1 to 8, and decrease from levels 8 to 16. The factor score at level 8 was significantly greater than factor scores at levels 1 to 5, and 10 to 16; the factor score at level 7 was significantly greater than factor scores at levels 1 to 5, and 11 to 16; factor scores at levels 6 to 9 were significantly greater than factor scores at levels 1 to 4, and 12 to 16; and factor scores at levels 5, 10 and 11 were significantly greater than factor scores at levels 15 and 16.

Factor 2

Group effect : As the MANOVA did not reveal a significant main effect for Group, $p>0.297$, univariate tests of Factor 2 scores were not justifiable.

Difficulty effect: Univariate tests of the Factor 2 scores revealed a main effect for Difficulty; $F(15,330) = 18.93972$, $p<0.001$ (see Appendix 18, Table 3), which indicated that there were significant differences between the Factor 2 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 18. The factor score at level 1 was significantly greater than factor scores at levels 2 to 16; the factor score at level 2 was significantly greater than the factor scores at levels 6 to 16; the factor scores at levels 3 to 5 were significantly greater than the factor scores at levels 8 to 16; and the factor scores at levels 6 and 7 were significantly greater than the factor scores at level 15.

Group X Difficulty interaction : Univariate tests of the Factor 2 scores revealed a significant Group X Difficulty interaction; $F(15,330) = 12.50520$, $p<0.001$ (see Appendix 18, Table 3). Tests of simple main effects on the low skilled group's Factor 2 scores reached significance; $F(15,165) = 17.70512$, $p<0.001$ (see Appendix 18, Table 8), indicating that there were significant differences between the low skilled group's Factor 2 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 18. The factor score at level 1 was significantly greater than the factor scores at levels 2 to 16; the factor scores at levels 2 to 5 were significantly greater than the factor scores at levels 10 to 16; the factor scores at levels 6 and 7 were significantly greater than the factor scores at levels 13 to 16; and the factor scores at levels 8 and 9 were significantly greater than the factor scores at level 15.

DIFFICULTY	LOW SKILLED	HIGH SKILLED
1	1.824	-.154
2	1.017	-.194
3	.938	-.306
4	.918	-.347
5	.873	-.386
6	.544	-.473
7	.600	-.563
8	.365	-.628
9	.332	-.592
10	-.068	-.497
11	-.001	-.504
12	.015	-.489
13	-.157	-.451
14	-.197	-.362
15	-.331	-.342
16	-.118	-.284

Table 13 : Mean Experience Factor 2 Scores

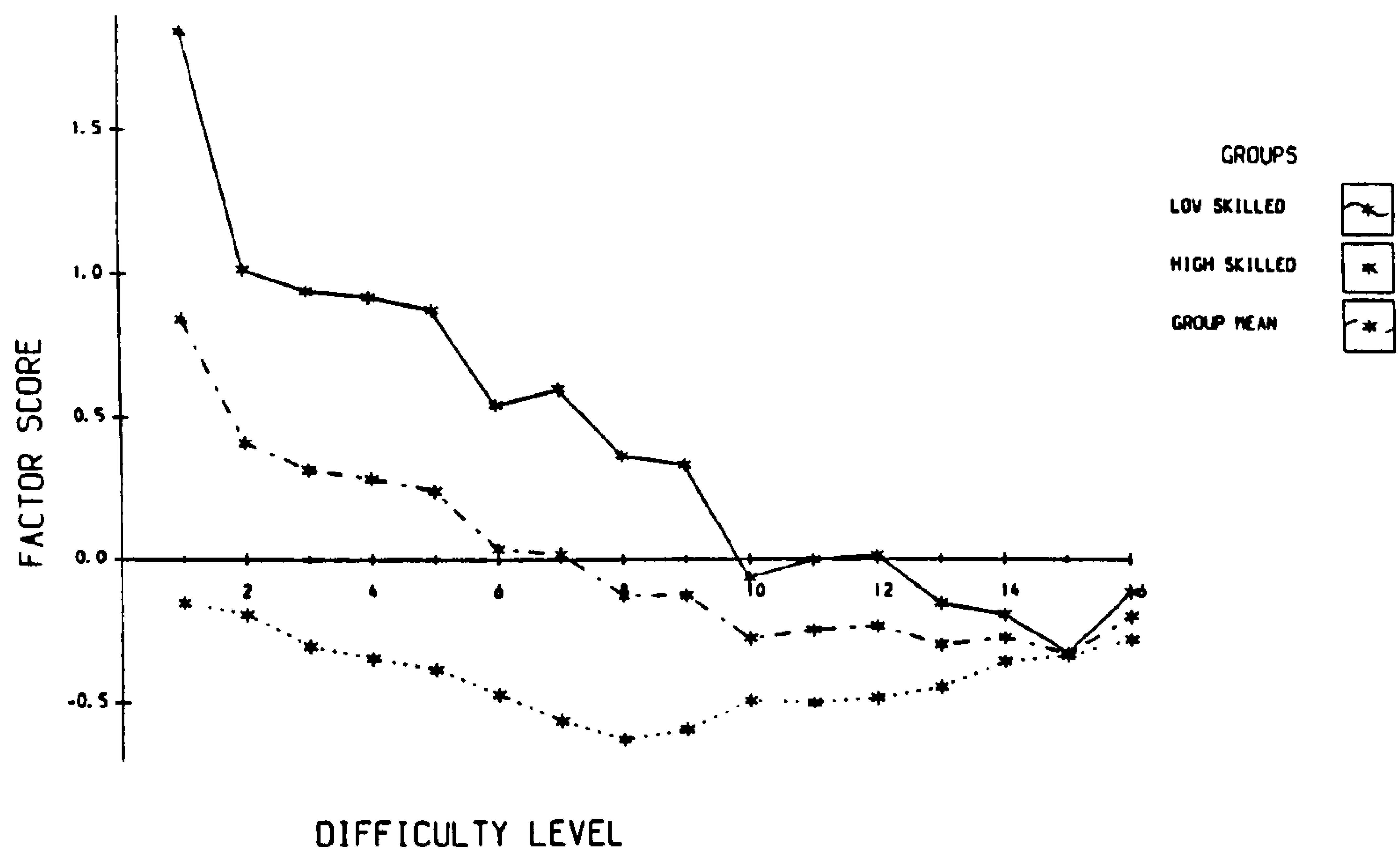


Figure 18 : Experience Factor 2 - Group X Difficulty

Tests of simple main effects on the high skilled group's Factor 2 scores also reached significance; $F(15,165) = 5.06942$, $p<0.001$ (see Appendix 18, Table 8), indicating that there were significant differences between the high skilled group's Factor 2 scores across the 16 difficulty levels. These differences were again examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 18. The trend shows that, for example, the factor score at level 1 was significantly greater than the factor scores at levels 6 to 13; the factor score at level 2 was significantly greater than the factor scores at levels 7 to 12; the factor scores at levels 3 and 16 were significantly greater than the factor scores at levels 8 and 9; and the factor score at level 15 was significantly greater than the factor score at level 8.

Factor 3

Group effect : As the MANOVA did not reveal a significant main effect for Group, $p>0.297$, univariate tests of the Factor 3 scores were not justified.

Difficulty effects : Univariate tests of the Factor 3 scores revealed a significant main effect for Difficulty; $F(15,339) = 39.10828$, $p<0.001$ (see Appendix 18, Table 4), which indicated that there were significant differences between the Factor 3 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 19. The trend was for factor scores to increase as difficulty increased. For example, the factor scores at levels 13 to 16 were significantly greater than the factor scores at levels 1 to 12; the factor scores at levels 10 to 12 were significantly greater than the factor scores at levels 1 to 6; and the factor scores at levels 8 and 9 were significantly greater than the factor scores at levels 1, 2 and 5.

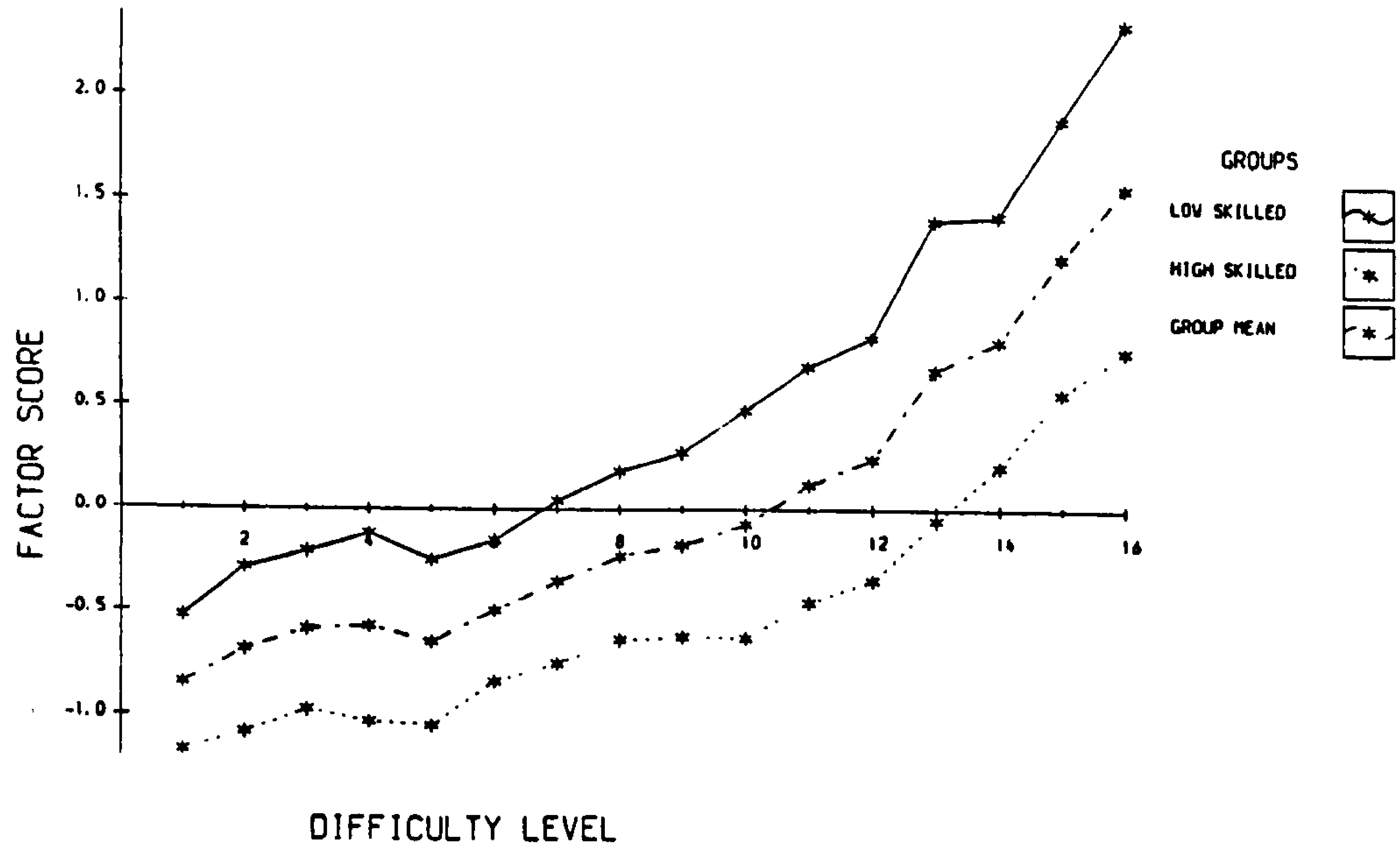
Group X Difficulty interaction : Univariate tests of the Factor 3 scores revealed a significant Group X Difficulty interaction; $F(15,330) = 2.76992$, $p<0.001$ (see Appendix 18, Table 4). Tests of simple main effects on the low skilled group's Factor 3 scores reached significance; $F(15,165) = 39.10828$, $p<0.001$ (see Appendix 18, Table 9), indicating that there were significant differences between the low skilled group's Factor 3 scores across the 16 difficulty levels. These differences were examined using the

Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 19. The trend reflected that of the difficulty main effect, as factor scores tended to increase with increases in difficulty. For example, there were no significant differences between factor scores at levels 1 to 7; the factor score at level 16 was significantly greater than the factor scores at levels 1 to 14; the factor scores at levels 13 to 15 were significantly greater than factor scores at levels 1 to 11; the factor scores at levels 10 to 12 were significantly greater than the factor scores at levels 1 to 6; and the factor scores at levels 8 and 9 were significantly greater than the factor scores at level 1.

Tests of simple main effects on the high skilled group's Factor 3 scores also reached significance; $F(15,165) = 33.49319$, $p<0.001$ (see Appendix 18, Table 9), indicating that there were

DIFFICULTY	LOW SKILLED	HIGH SKILLED
1	-.522	-1.167
2	-.285	-1.079
3	-.202	-.960
4	-.117	-1.026
5	-.245	-1.046
6	-.148	-.836
7	.043	-.749
8	.184	-.635
9	.277	-.619
10	.478	-.624
11	.693	-.452
12	.831	-.345
13	1.402	-.054
14	1.425	.207
15	1.889	.565
16	2.356	.771

Table 14 : Mean Experience Factor 3 Scores



<u>Figure 19 : Experience Factor 3 - Group X Difficulty</u>

significant differences in the high skilled group's Factor 3 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 19. Again, the trend was for factor scores to increase with increases in difficulty; however, the rate of increase was rather slower than for the low skilled group. For example, the factor scores at levels 15 and 16 were significantly greater than the factor scores at levels 1 to 13; the factor scores at levels 13 and 14 were significantly greater than the factor scores at levels 1 to 10; the factor scores at levels 11 and 12 were significantly greater than the factor scores at levels 1 to 5; and the factor scores at levels 8 to 10 were significantly greater than the factor score at level

1. There were no significant differences between factor scores at levels 1 to 7.

Factor 4

Group effect : As the MANOVA did not reveal a significant main effect for Group, $p>0.297$, univariate tests of the Factor 4 scores were not justified.

Difficulty effect : Univariate tests of the Factor 4 scores revealed a significant main effect for Difficulty; $F(15,330) = 11.56195$, $p<0.001$ (see Appendix 18, Table 5), which indicated that there were significant differences between the Factor 4 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 20. The factor score at level 7 was significantly greater than factor scores at levels 1 to 3, and 13 to 16; the factor scores at levels 4 to 6, and9 to 16 were significantly greater than the factor scores at levels 1 and 2; and the factor scores at levels 2 and 3 were significantly greater than the factor score at level 1.

Group X Difficulty interaction : Univariate tests of the Factor 4 scores revealed a significant Group X Difficulty interaction; $F(15,330) = 4.66575$, $p<0.001$ (see Appendix 18, Table 5). Tests of simple main effects on the low skilled group's Factor 4 scores reached significance; $F(15,165) = 11.53832$, $p<0.001$ (see Appendix 18, Table 10), which indicated that there were significant differences in the low skilled group's Factor 4 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 20. There were no significant differences between factor scores at levels 3 to 16; the factor scores at levels 3 to 16 were significantly greater than the factor scores at levels 1 and 2; and the factor score at level 2 was significantly greater than the factor score at level 1.

DIFFICULTY	LOW SKILLED	HIGH SKILLED
1	-2.108	-.452
2	-.917	-.458
3	-.314	-.201
4	.145	.054
5	.165	.292
6	.244	.465
7	.228	1.050
8	.048	.903
9	-.281	.798
10	-.211	.688
11	-.204	.362
12	-.127	.437
13	-.201	.142
14	.015	-.102
15	.193	-.367
16	.101	-.388

Table 15 : Mean Experience Factor 4 Scores

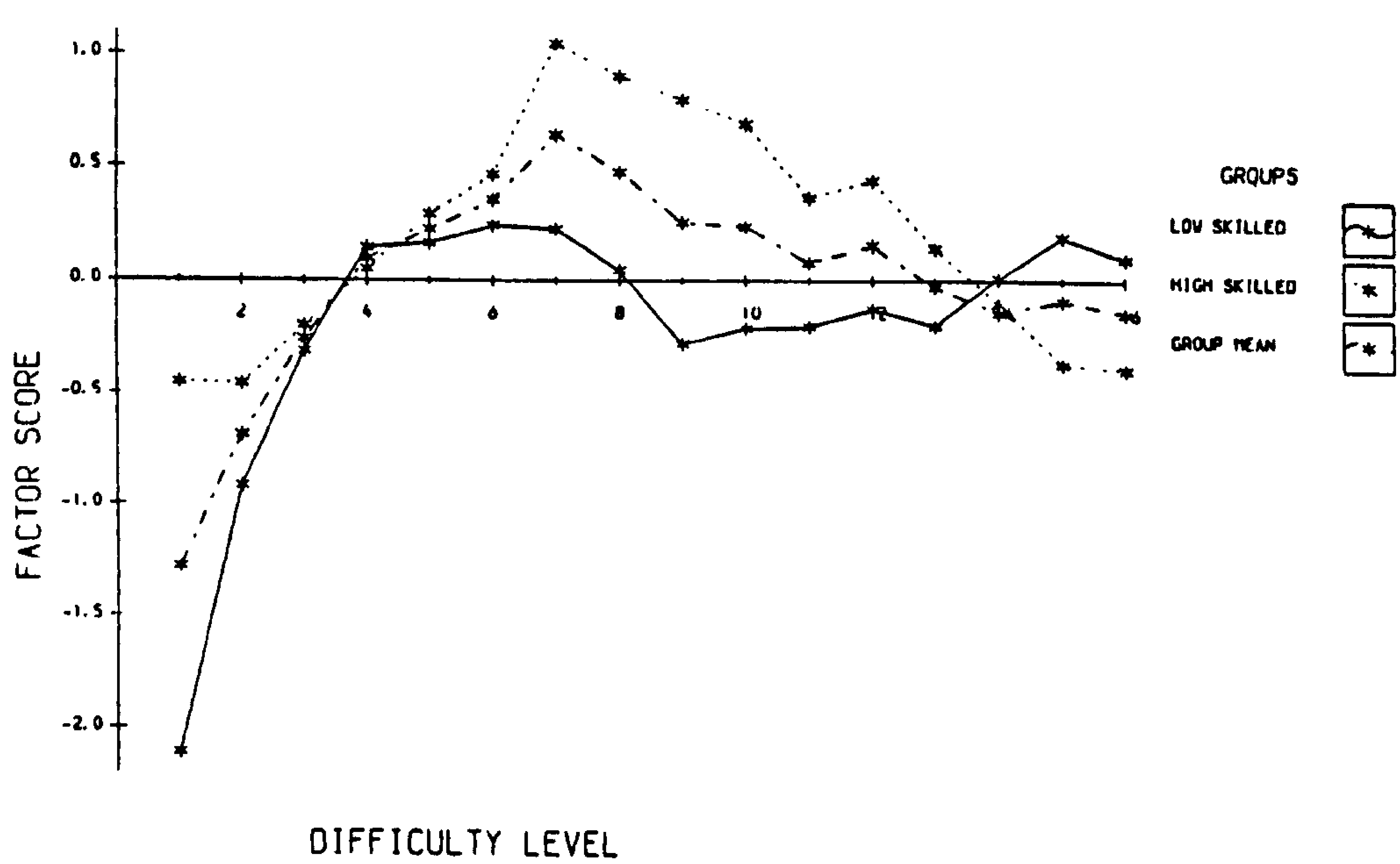


Figure 20 : Experience Factor 4 - Group X Difficulty

Tests of simple main effects on the high skilled group's Factor 4 scores also reached significance; $F(15,165) = 5.77122$, $p<0.001$ (see Appendix 18, Table 10), which suggests that there were significant differences in the high skilled group's Factor 4 scores across the 16 difficulty levels. These differences were also examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 20. The factor scores at levels 7 and 8 were significantly greater than the factor scores at levels 1 to 3, and 14 to 16; and the factor scores at levels 9 and 10 were significantly greater than the factor scores at levels 1, 2, 15 and 16. There were no significant differences between factor scores at levels 4 to 13.

Factor 5

Group effect : As the MANOVA did not reveal a significant main effect for Group, $p>0.297$, univariate tests of the Factor 5 scores were not justified.

Difficulty effect : Univariate tests of the Factor 5 scores revealed a significant main effect for Difficulty; $F(15,330) = 2.31650$, $p<0.005$ (see Appendix 18, Table 6), which indicated that there were significant differences between the factor 5 scores across the 16 difficulty levels. These differences were examined using the Newman Keuls procedure (see Appendix 19), and should be studied with reference to Figure 21. However, the only significant difference between these rather erratic factor scores was that the factor score at level 6 was significantly greater than the factor scores at levels 1 and 2.

Group X Difficulty interaction : Univariate tests of the Factor 5 scores did not reveal a significant Group X Difficulty interaction; F(15,330) = 1.06824, p>0.384 (see Appendix 18, Table 6). As the interaction did not reach significance, tests of simple main effects were not performed. It should be concluded that differences between the low and high skilled group's Factor 5 scores did not vary across the 16 difficulty levels.

DIFFICULTY	LOW SKILLED	HIGH SKILLED
1	-.200	-.154
2	-.223	-.209
3	.077	-.231
4	.307	-.209
5	.217	-.028
6	.387	.045
7	.246	.025
8	.150	-.008
9	.135	-.060
10	.243	-.037
11	-.037	-.049
12	.053	-.029
13	.076	-.045
14	-.186	-.117
15	.152	-.124
16	-.056	-.109

Table 16 : Mean Experience Factor 5 scores

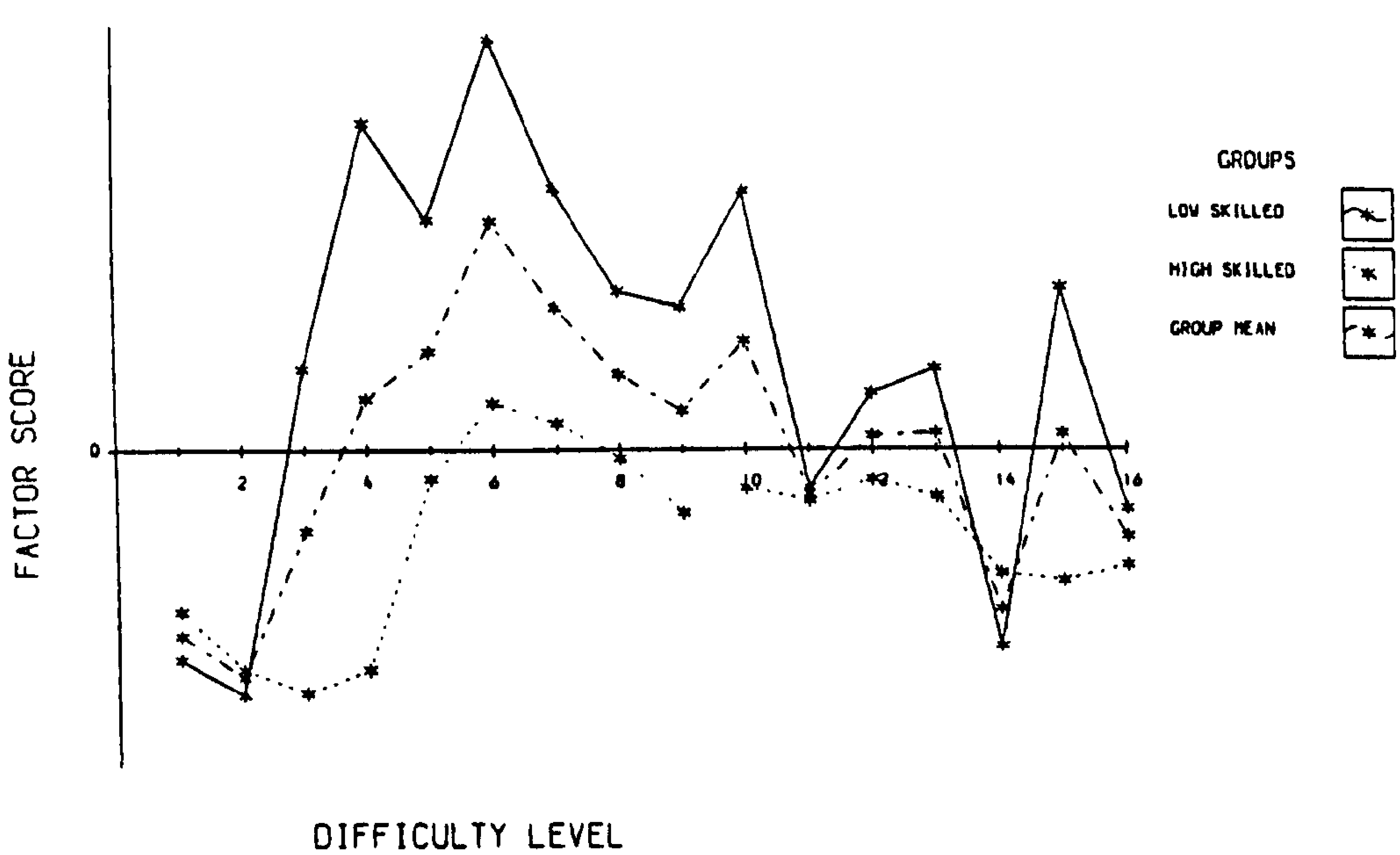


Figure 21 : Experience Factor 5 - Group X Difficulty

Discussion Of Experience Factors

The results from the MANOVA indicated that there were significant differences as a result of the Difficulty manipulations ($p<0.001$), and intergroup differences suggested by the significant interaction ($p<0.001$). The non-significance of the Group main effect ($p<0.297$) suggested that, overall, the two groups did not differ in their peak experience. This supports the contention made earlier, that experiences are relative to personal norms and not level of ability, and should be measured as such (Massimini et al, 1987). As in the analysis, the results will be discussed factor by factor.

Factor 1, which was tentatively labelled a general peak experience/flow factor produced very similar results to the ESM intensity of flow factor. Indeed, the results were virtually identical. The main effect for Difficulty ($p<0.001$) showed that peak experiences increased from levels 1 to 8, decreased from levels 8 to 16, and were greatest from levels 4 to 9 (see Figure 17). This effect was examined in more detail with the tests of simple main effects performed upon the significant Group X Difficulty interaction ($p<0.001$).

As this factor was considered to represent general flow/peak experience, the hypotheses for the behaviour of the factor scores of these two groups reflected the predictions of the flow (Csikszentmihalyi, 1975) and peak experience (Privette, 1983) theories. If Factor 1 is a true reflection of general peak experience and flow states, then it is not suprising to find the results supporting the hypothesis made earlier. The low skilled group's Experience Factor 1 scores are extremely similar to the

ESM Factor 1 scores (see Figures 14 and 17). The peak experience was not significantly different for this group over levels 1 to 8. However, the greatest peak experience occurred at levels 4 to 6 (which was significantly greater than the peak experience at levels 9 to 16). The absence of significant differences over these early difficulty levels could perhaps best be attributed to a high degree of intrinsic interest in the task as subjects had only just begun to perform the activity (as suggested in the discussion of ESM Factor 1). Peak experience then showed the trend of decreasing as difficulty increased. In terms of the skill/challenge ratio, it would appear that the peak/flow experience was again facilitated at the earlier levels of difficulty where skill and challenge were matched. The experience subsequently lessened, presumably when challenge began to significantly exceed skill.

As hypothesised, the factor scores of the high skilled group showed that their peak/flow experience intensified from levels 1 to 8 (see Figure 17), at which point the experience was greatest (as with the ESM Factor 1). As difficulty increased from levels 8 to 16, the experience lessened to the same extent as it had increased during the early difficulty levels. The 'peak' of this peak experience factor therefore came around levels 6 to 9, which has already been identified earlier in the discussion of ESM factors as the point at which skill and challenge appear to be matched for this group, and the point at which the affective states should be strongest and most positive. As with the ESM factors, no direct intergroup comparisons were possible for any of the Experience factors because the interaction was examined with tests of simple main effects for the reasons discussed earlier.

Factor 2 was labelled as letting the performance happen, and is probably best understood as subjects having no preconceptions about the task or how they might perform the skill. It would seem to be diametrically opposed to a later factor, functional goal drive, but this will be discussed in due course.

The main effect for Difficulty ($p<0.001$) showed that letting it happen, or spontaneity, decreased as difficulty increased (see Figure 18). The most significant finding was that the ability to `let it happen' was significantly greater at difficulty level 1 than at any other level. This would seem to suggest that subjects became more familiar with the task and it's demands following the first performance, and consequently became more constrained to respond as the task required. In addition, the more challenging the task became, the less subjects were able to let their performance happen. These differences will be discussed in more detail in the study of the simple main effects.

The low skilled group's ability to `let it happen' decreased as the challenge increased ($p<0.001$) in the same way as the main effect (see Figure 18). In particular, the ability to let it happen was significantly greater at difficulty level 1 (their first contact with the task) than at any other level. This may well be interpreted as the ultimate experience of this factor, as subjects would have no preconceptions about how to perform, or what to expect, having only seen a demonstration of the task. Their subsequent familiarity combined with the increasing difficulty of the task seems to repress this factor. The results of the low skilled group would therefore seem to reflect the hypotheses made about the behaviour of Factor 2.

The tests of simple main effects on the high skilled group's Factor 3 scores appeared to be quite consistent across difficulty (see Figure 18). This group seem to be able to let the experience happen significantly better at the lower and higher levels of challenge, while their preconceptions about the task seem to be greatest around levels 6 to 12. It would therefore appear that the high skilled group's ability to let it happen is repressed when they confront challenges which match their skills, and that it is more evident when the challenge of the task is either less or greater than the skill level of the performer. Again, this would reflect the original prior involvement hypothesis for this group's factor scores. The high skilled group had spent considerably more time on the task, and would have developed preconceived ideas about the task, it's challenges, and how to perform. They may therefore have learned to set goals concerning their performance from previous experience, which would rather contradict the nature of this factor.

Factor 3 was labelled as relative task demand and intensity of involvement. It was suggested that the factor scores of both groups should reflect the increasing task demands and intensity of involvement with the increasing difficulty of the task. Consequently, it was argued that Factor 3 scores should reflect subjects' perceptions of the challenge discussed earlier. The main effect for Difficulty ($p<0.001$) showed that intensity of involvement increased with challenge (see Figure 19), particularly following the first five difficulty levels. This trend was examined in more detail in the tests of simple main effects for each group.

The tests of simple main effects showed similar trends for both the low skilled ($p<0.001$) and the high skilled ($p<0.001$) groups, the effect being an almost linear trend between level of challenge and task demand/intensity (see Figure 19). Both low skilled and high skilled subjects reported an increase in intensity of involvement as difficulty increased. However, as might be expected, the high skilled group reported a slower rate of increase in intensity than the low skilled group. It is perhaps worth noting that the scores shown in Figure 19 bear some similarity to the perception of perceived challenge scores considered in an earlier analysis (see Figure 10). This is perhaps not suprising as task demand/intensity and challenge are essentially the same. In other words, this finding would seem to confirm the task demand and intensity label associated with Factor 3. Figure 19 also shows that the low skilled group regard the task demands and intensity as being greater than the high skilled group (although no between group follow up tests were performed for the reasons stated earlier). This, of course, is exactly as one would predict if Factor 3 is concerned with task demands and intensity.

Following the lead of Privette (1986), Factor 4 was tentatively labelled functional goal drive, and appears to be primarily concerned with goal directed behaviour. It was hypothesised that the previous involvement of the two groups on the task would play a major role in determining the factor scores on this dimension. It was also hypothesised that as the high skilled group had more experience on the task, their behaviour should be more goal directed than the low skilled group (although it was possible that the low skilled group would develop more goal directed behaviour as they became more familiar with the task.

The main effect for Difficulty ($p<0.001$) showed that functional goal drive stabilised following the first two difficulty levels (see Figure 20). This effect was examined in further detail in the tests of simple main effects on the significant Group X Difficulty interaction ($p<0.001$).

Tests of simple main effects on the low skilled group showed that their goal drive was significantly lower at difficulty levels 1 and 2 than at any other levels, with no significant differences in goal drive from levels 3 to 16 (see Figure 22). This finding is perhaps a reflection of these subjects developing goal directed behaviour as they become more familiar with the requirements of the task. As no significant differences appeared from level 3 onwards, level 3 would appear to be the point at which some kind of `functional goal drive' was established for this group. Tests of simple main effects on the high skilled group showed that goal drive increased from levels 1 to 7, followed by a decrease from levels 7 to 16 (see Figure 20). Goal drive at level 7 was significantly greater than at levels 1 to 3, and 14 to 16, so that level 7 appeared to be the point at which functional goal drive was greatest for this group. It would seem likely that the high skilled group's functional goal drive was related to their perception of the goal, reflecting Hardy and Nelson's (1988) notion that goals should be worthwhile and attainable. It was greatest where the goal was perceived to be both worthwhile and realistic (probably when the skill/challenge ratio was closest to one). However, when these conditions were not met, functional goal drive decreased; ie, where the skill/challenge ratio was considered to be imbalanced (skill > challenge at levels 1 to 3, and challenge > skill at levels 14 to 16). These situations demonstrate the inadequacies of setting goals which are either too easy or unnattainable (thereby supporting the work of Erez and Zidon, 1984).

Finally, as mentioned earlier, this factor seems to be somewhat opposed to Factor 2 (let it happen), as the practice and prior related movement required by Factor 4 is directly in conflict with the spontaneity, new actions/thoughts, and free from restriction nature of Factor 2. This can be confirmed by closer examination of the changes in the factor scores of the two factors. At the moments where goal drive was high for the high skilled group, the `let it happen' dimension was low, and where goal drive was low for the low skilled group, the `let it happen' dimension was high. It might be that these two factors work antagonistically; spontaneous behaviour (which would seem to be necessary for flow to occur) is not goal directed, whilst goal directed behaviour is practised and planned and does not seem co-exist with flow. However, the orthogonality of the factor extractions which are produced by principle components factoring suggests that it may make more sense to try and identify some experience variable which may influence Factors 2 and 4, in order to decide whether or not these factors are really diametrically opposed. The fact that the high skilled group, for example, scored high on one factor and low on the other may be a reflection of the mediocrity of their skill (a point raised earlier). Genuinely high skilled performers (for example, world champions in sport) appear to be able to have strongly goal-directed behaviour coupled with relaxed concentration which allows their performance to happen (see, for example, Gallwey, 1974; Ravizza, 1977).

Factor 5 was hypothesised to be concerned with subjects' perceptions of the nature of the event, and what triggered it. One would perhaps expect these variables to be consistent for all subjects as the situation was an experimental task for which everyone had volunteered, and because the nature of the task was constant (although level of challenge was varied). The significant main effect for Difficulty ($p<0.005$) showed the only significant difference in the perception of the nature of the event and it's trigger to be at level 6 which was significantly greater than levels 1 and 2 (see Figure 21). In other words, subjects perceived the event to be more external/outer at this point. The Group X Difficulty interaction was not significant ($p<0.386$), which demonstrated that there were no significant between groups differences and would also seem to clearly confirm the hypothesis about the non-changing nature and trigger of the task.

Summary And General Discussion Of Experiment Two

As mentioned elsewhere in the discussions of the findings of this experiment, the concept of flow, based upon notions from the intrinsic motivation literature, has important implications for mental and physical well-being and the quality of life. It would seem that the flow theory encapsulates several theories of intrinsic motivation; for example, the underlying desire to seek some degree of optimal incongruity or challenge in the environment (as in the incongruity theories of the likes of Hunt, 1965), and the need to feel competent and self-determining (Deci, 1975) which may be a result of dealing competently with the incongruity sought in the environment. The ability to seek such optimal incongruity, feel competent and self-determining, and to experience flow would all appear to be the result of intrinsically motivating and intrinsically motivated situations.

It has also been emphasised throughout the review of flow literature that the flow experience is a desirable state, although no controlled study or direct evidence (barring Csikszentmihalyi's (1975) anecdotal observations), has been offered to substantiate this idea. For the first time, a controlled investigation of the flow model and it's predictions was undertaken to identify the underlying factors of flow and experience and their behaviour in relation to the skill/challenge ratio. However, perhaps more importantly, this study has shown how flow exists from a theoretical standpoint by providing some evidence to substantiate the predictions of the model. In short, the flow theory exists.

It is also important to comment on the few developments which have so far taken place in flow theory and their relevance to this study. The initial writings on flow theory considered that the experience of flow was absolute, and intensity of the flow experience dependent therefore upon the ability to match a highdegree of challenge with a high level of ability. Consequently, only highly skilled individuals had access to deep flow or macroflow experiences. However, the later work of Massimini et al (1987) considered a simple qualification to this model; namely that flow is present when challenge and skill are relatively high in terms of being above an individual's mean level of functioning. In addition, this level of functioning may be different for each individual and for each situation. This allows a fuller range of experience in relation to relative experiences, both above and below the norm. In this manner, one can then consider both micro and macroflow in the experience of any individual, together with functioning at levels below the norm where challenges encountered and skills used are less than those generally in evidence.

This observation also draws an important parallel with peak performance research as it suggests that macroflow is only present in above optimal behaviour, indicating that the flow experience and peak performance may share more similarities than at first suggested in Chapter 4. In addition, Massimini et al (1987) also considered several degrees of imbalance between challenge and skill, and the hypothesised changes in affective states which occur relative to the skill/challenge ratio. Such affective states are clearly more specific and descriptive than simply challenge > skill or skill > challenge. The later developments in the flow theory which allow flow to be considered relative to individual norms was an important theoretical and methodological step which should prove an important consideration in subsequent flow studies. In practical terms therefore, the flow model can be regarded as a concept which encompasses the whole spectrum of possible experience for each individual across a full range of events and situations.

As such, these findings would appear to present some type of watershed, in that the flow theory has been outlined, tested, and considered to be theoretically sound. It is therefore important at this point to not only reflect on the findings of the study so far, but to consider the implications of this study, and what may come next.

It has already been mentioned that the flow model makes it possible to consider an entire range of experiences from the most negative to the most positive. It would perhaps seem logical to pursue this line of enquiry and ask why there should be variations in the experiences of individuals, and where and why these might occur. In other words, undertake a study of flow and non-flow experiences, and present some suggestions of why and how these occur.

CHAPTER 7

FLOW AND PERSONALITY

Introduction

In defining areas for future research following his initial investigations into the concept of flow, Csikszentmihalyi (1975) commented that:

> "personality differences probably result in differential responsiveness to flow activities. It could be perhaps useful to categorise personality in terms of the situations in which one experiences flow. The person who functions fully when playing chess is quite different from one who does so while dancing, or the one who experiences flow in composing music or rock climbing. A `flow profile' might become a dynamic way to describe people for the purposes of finding the best match between their potential and the demands in the environment."

The ESM makes it possible to describe the entire spectrum of experiential states under normal conditions of everyday life (see, for example, Larson, Csikszentmihalyi and Graef, 1980; Larson and Csikszentmihalyi, 1983; Csikszentmihalyi and Larson, 1984). Also from this point of view of personality, the range and diversity of activities across which people experience flow (established by the ESM) is quite crucial - that being what personality is. Indeed, in addition to autotelic activities, Csikszentmihalyi (1975) has considered the conceptually abstract `autotelic personality'; a person who is able to enjoy what he/she is doing regardless of whether he/she will get rewards for it. He suggests that some people can enjoy the least autotelic of activities, whereas others need external incentives even to do things which are rife with intrinsic rewards. It is reasonable to assume then, that there is an autotelic personality variable which is orthogonal to the autotelic structure of the activity. Unfortunately, no data is presented to suggest what such a personality trait may look like. The only real empirical evidence that bridges activities and people is the autotelic experience itself; an autotelic activity usually provides autotelic experiences, and an autotelic person is one who tends to have such experiences. However, it would be wrong to assume that even the most enjoyable of activities will be experienced as autotelic at any given time, or that a person who is usually intrinsically motivated will enjoy a given experience.

Csikszentmihalyi and Graef (1975) attempted to examine how various kinds of microflow patterns were related to other cognitive and personality characteristics. Using a sample of 20 subjects, a number of measures were obtained (the ESM technique had not been developed at that stage), including scores on a mood adjective checklist. It was expected that if choice of flow activity was a stable personality trait, the percentage of time spent involved in various flow activities would relate meaningfully to self-descriptive items. Correlations between the two sets of variables revealed a complex of interactions between flow patterns and more general personality traits. People who experienced microflow socially (talking, parties, shopping), consistently described themselves by more negative traits (sad, resentful, constrained, unworthy, out of control). Those relying on kinesthetic activities (walking, running, games), chose more positive terms to describe their moods (happy, satisfied, free, relaxed, strong, in control). This is possibly because the people reporting predominantly kinesthetic activities were more autonomous in getting enjoyable experiences. Social flow requires other persons, and is possibly externalised by subjects who may attribute moods to be the cause of others. Such an explanation is in line with White (1959) and de Charms (1968), who considered that the major determinant of intrinsic motivation was whether a person felt that he/she has originated an act, or had been forced to do it by external conditions. In the first case, the person should presumably enjoy the activity, but in the latter, experience it as drudgery. Finally, the frequency of creative activities (working, playing musical instruments, doing art work), also had a strong positive association with self-perception of moods. Those involved more in this type of flow described their mood as exciting, trusting, fast, creative and satisfied. The trend of these results again confirms that the way one organises one's experiences is an important trait, and that the suggestion of identifying `flow profiles' may be a useful manner in which to categorise people.

It is probably worthwhile to note some observations from a follow up experiment by Csikszentmihalyi (1975) in which the same subjects were instructed to try and eliminate microflow activities from their behaviour. Subject's self-reported moods were observed to deteriorate significantly. More particularly, they reported feeling more tired, as well as less healthy and relaxed. They also judged themselves more negatively, feeling less creative and reasonable. Spontaneous creative performances decreased, and daily activities became chores accompanied by a loss of concentration and depression. Subjects reported experiences similar in many respects to the disruption found in people who have suffered acute psychotic breakdowns (Payne and Hewlett, 1960; McGhee and Chapman, 1961). It suggests some type of relationship between flow deprivation and thought disturbances, which may result in hospitalisation.

Consequently, by reversing these symptoms, we might infer that the function of microflow experiences is to keep a person alert and relaxed, with a positive self-perception and feelings of spontaneous creativity. The ability to do things which are not absolutely necessary to survival induces a feeling of effectance, or the motive to master and deal with challenges in the environment (White, 1959), and of being in control of one's actions (de Charms, 1968). In addition, this behaviour may regulate the amount of stimulation available by supplying novelty in an otherwise barren environment, or reducing input when stimulation is excessive (Berlyne, 1960).

In terms of the flow model, some everyday interactions may result in macroflow activities, while others may be at a barely perceptible level involving minimal skills (for example, daydreaming, conversation). Yet, as mentioned earlier, these apparently trivial activities appear to have an important role in the psychic economy. Without them, a person loses the balanced state of interaction, and is no longer coping as an active agent in control of his/her own experience. This is most strikingly reported in acute cases of schizophrenia (Freedman, 1974).

The possibility of severe effects caused by flow deprivation suggests a realm for investigation. If results could be upheld with larger and more diverse samples, they could indicate that some people may suffer from mental disorders if they are unable to structure environmental or personal conditions in order to achieve optimal experience. Indeed, acts which were previously seen as useless and insignificant could assume an important role in mental health, especially if they moderate overinclusion, which is present in many psychopathologies.

Bi-directional Effects Of Attention And Mood

Evidence exists for the reciprocal effects of attention and mood/experience. The effect of mood on attention and perceptual processes is better established than the other direction of influence. According to a review by Blumenthal (1977), our experiences (emotions, feelings, attitudes, values) can affect the course of cognition, structuring of thoughts and formations of perceptions. There are obvious factors within individuals that cause them to attend to one event instead of another. One is motives or needs. People who are hungry, thirsty or sexually aroused are likely to pay attention to events in the environment which will satisfy these needs. Another internal factor is preparatory set - a person's readiness to respond to one kind of sensory input, but not to other kinds. For instance, a husband who is expecting an important telephone call may hear the telephone ring in the night whilst his wife may not. A third internal factor is interest. For example, a person who is interested in football is likely to hear (or pay attention to) the words "football results" whilst paying little attention to the rest of a news programme. These internal factors provide a certain amount of consistency in the events to which we pay attention. They therefore give our experience, or perception of the world some direction and stability. Without them, what is selected to be at the focus of attention would be at the mercy of whatever environmental factors happened to be present at any given time.

Formal investigation of the effect of internal events on perception began with the work of Bruner and Postman (1947), and McGinnies (1949). Subsequent investigations focussed on the defensive features of perception and became known as the `new look' (Erdelyi, 1974).

However, an increasing number of studies have been conceptualised in terms of the other direction of the relationship (attentional effects on mood). Good attentional performance has been linked to a variety of experiences and personality traits; for example, reports of sustained, absorbed concentration (Tellegen and Atkinson, 1974); hypnotic susceptibility (Davidson and Goleman, 1978); meditation (Davidson, Goleman and Schwartz, 1976); reports of intrinsic enjoyment or a preference for intrinsic rewards (Csikszentmihalyi, 1977, 1978). In addition, poor attentional performance has been linked with distractability and boredom, which in turn is linked to increased psychopathology.

As we are ultimately concerned with quality of experience, this chapter will acknowledge the reciprocal effects of mood and attention, but will emphasise the effect of attention on mood and experience, together with it's varied role from improving the quality of life to the diagnosis and treatment of mental disorders.

Mood And Personality Correlates Of Good Attentional Performance

Hamilton (1981) has presented an `attention determines experience' line of reasoning, which suggests that individual differences in attention are important in regulating the continuum of experiences ranging from interest to boredom. The the crux of this argument is illustrated in Figure 22. More specifically, she suggests that good performance on measures of attention is associated with absorbing interest and intrinsic enjoyment (in effect a state of flow), whereas poor performance correlates with boredom and psychopathology. The implications for an attentional model of interest-boredom, which could be used for diagnosis, education and treatment aimed at the regulation of our experience, are apparent.

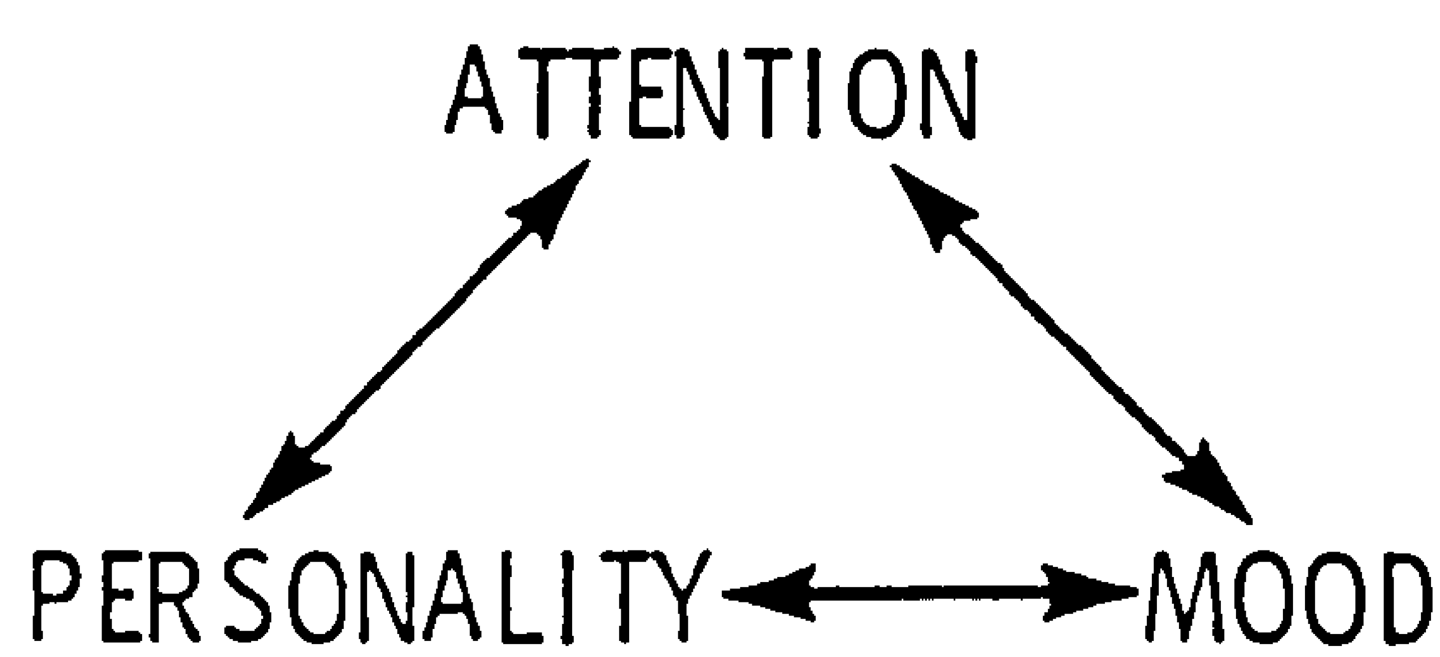


Figure 22 : Interrelationship Of Attention, Personality (Motivation), And Mood

Absorption is a relatively stable personality trait (Tellegen and Atkinson, 1974) which reflects self-reports of intense experiences characterised by total and sustained attention. Absorption has been shown by Davidson, Schwartz and Rothman (1976) to correlate with increased EEG specificity (a biological index of good attention regulation efficiency). Absorption scores are also consistently correlated with hyponotic susceptibility, which is thought to be mediated by attentional control (Engstrom, 1976; Karlin, 1979).

Hypnosis, together with placebos and many drugs, seems to reduce the experience of pain primarily by changing the criterion for reporting pain rather than by affecting sensitivity in detecting the stimulus (Davidson and Goleman, 1978; Clark, 1974). However, individual differences in pain tolerance have been related to (i) habitual attention regulation assessed by average evoked response augmentation/reduction (Buchsbaum, 1976; Silverman, 1964), and (ii) successful focussing of attention away from the source of the painful stimulus (Melzack and Wall, 1970).

Davidson, Goleman and Schwartz (1976) showed that people who meditate have higher absorption scores than those who do not. Meditation techniques require sustained attention to internal or external stimuli (Hassett, 1978), and are associated with the experience of relaxation (Goleman, 1971; Schwartz, Davidson and Goleman, 1978), deeply felt positive moods (Stace, 1960), and a sense of novelty. Meditators are also better able to concentrate (as defined by fewer signalled thought intrusions) than non-meditators (Spanos et al, 1979; Van Nuys, 1973). Several studies have demonstrated that meditators score high on hypnotic susceptibility (Walrath and Hamilton, 1975; Van Nuys, 1973) and low on indices of psychopathology (Smith, 1975), although these findings were not confirmed by Spanos et al (1979). However, perhaps the strongest evidence comes from studies where experimental manipulation of attention by meditation training led to more positive moods. Using meditation as a cognitive-behavioural technique to train attention was shown by gains in selective attention (as measured by tests of field articulation) by Linden (1973) and Pelletier (1974). Meditation was also accompanied by decreased stress reactivity in work by Smith (1975) and by Goleman and Schwartz (1976). Finally, Schwartz, Davidson and Goleman (1978) presented evidence which showed that subjects practising physical exercise reported relatively less somatic anxiety and more cognitive anxiety than subjects practising meditation (a technique believed to be associated with cognitive relaxation - Davidson and Schwartz, 1976).

Early interview studies by Csikszentmihalyi (1975) associated intrinsic enjoyment (flow) with periods of total interest, involvement and absorbed attention. Although reports of intrinsic enjoyment have not been correlated with scores on Tellgen's Absorption Scale, both experiences are characterised almost identically in terms of intense interest and involvement. Reports of high intrinsic enjoyment are therefore hypothesised to reflect a person's success at attentional regulation across a variety of situations, so as to experience absorbed interest rather than boredom or other negative moods.

Mood And Personality Correlates Of Poor Attentional Performance

In a similar fashion, mood and personality correlates of poor attentional performance could be considered. It is possible to draw links between poor attentional performance (mind-wandering and distractability) and reports of boredom and psychopathology. Examples in the research literature suggest that negative moods seem to accompany (i) a lack of felt control over one's thoughts, perceptions or attention, as reported in schizophrenia (Neale and Cromwell, 1970), and (ii) the inability to direct attention to discover meaning and relevance and therefore avoid the characteristics of depression and suicide (Voth and Cancro, 1972). It is not suprising that the study of attention and personality may provide a worthwhile approach to the study of, for example, schizophrenia (McGhie, 1970), hyperactivity (Porges, 1976) and depression (Nelson and Craighead, 1977). The prominence of attention as an explanatory construct in schizophrenia and hyperactivity would also suggest that it would be worth taking a closer look at the concomitant role of boredom in psychopathology.

In general, high amounts of daydreaming are correlated with reports of distractability, mind-wandering (Huba, Segal and Singer, 1977) and monotony (Smith, 1955). Individuals who are prone to daydreaming have been shown to score more poorly than low-daydreamers on tests of both attention (Leviton and Schulman, 1976) and vigilance (Antrobus et al, 1967). However, the content of daydreams may reflect or elicit either absorbing interest, or boredom and anxiety. For example, depressed people report being bored with their daydreams (Traynor, 1974), although daydreaming results in better moods when it pertains to the task one is engaged in (Csikszentmihalyi and Graef, 1978). Csikszentmihalyi and Graef (1978) reported that secretaries whose daydreaming elaborated on something intrinsic to the task, such as the type of people who wrote the letters they were filing, tended to report better moods than ones who reported daydreams about totally unrelated, extrinsic activities.

Besides a decrement in performance and mood, there is an increased risk of accidents with mind-wandering in certain jobs; for example, factory workers responding to monotonous tasks by shifting attention away from the task. As suggested previously, an alternative strategy would be to engage one's attention in the qualities of what one is doing, elaborating on the rhythmical qualities of the machinery for example. Csikszentmihalyi's (1975) work therefore suggests that intrinsic enjoyment could be affected and increased by restructuring the way one attends to the information provided by the activity, rather than merely shifting attention to secondary or compensatory sources of stimulation.

In summary, therefore, daydreaming is valuable as an attention regulator when it can be controlled with low felt effort, the content is positive, and it takes advantage of the qualities intrinsic to the ongoing flow of internal/external information.

Attentional dysfunction is thought to be a central feature of schizophrenia (Wachtell, 1967; Neale and Cromwell, 1970; Silverman, 1974; Wynne et al, 1976). A cognitive attention regulation defect in schizophrenia appears to be `stimulus overinclusion', or the inability to screen out irrelevant information. Stimulus overinclusion is significantly correlated with trait measures of anxiety and feelings of external control with normal volunteers, in addition to depressed and alienated subjects (Harrow et al, 1972). Kayton and Koh (1975) have shown that schizophrenics have significantly lower recall of pleasant words than normal subjects, but the same recall of unpleasant words. This finding is in line with an attentional regulation bias which could give rise to their characteristic lack of pleasure - anhedonia (Grinker, 1975; Harrow et al, 1977).

Cognitive-behavioural studies of depressed adults show characteristic distortions in their patterns of thought. Several therapies for anxiety and depression are thought to change the direction of attention from an internal to a more external orientation (Lazarus et al, 1970; Meichenbaum, 1976).

Ultimately, the question which arises from this research is, does an attention regulation deficit precede the onset of psychopathological symptoms and diagnoses ? Vulnerability studies are one approach to studying the role of attention in psychopathology (for example, Spring and Zubin, 1978). It has been found that non-patient, non-symptomatic relatives of schizophrenics (who are, nonetheless, statistically at risk) score more poorly on continuous performance vigilance tasks than controls (Herman et al, 1977). This finding suggests that primary attentional deficits may place one at risk for the later development of symptoms.

High boredom susceptibility scores from Zuckerman's Sensation Seeking subscale (1975) were associated with relatively high levels of habituation and a need for novel stimulation (Zuckerman, 1975). Attempts to avoid boredom amongst high sensation seekers may take the form of sociopathy (Quay, 1975), drug abuse (Carrol, 1975; Klinger, 1977), and reckless behaviour. In addition, high sensation seeking was associated with high average evoked responses, similar to those of patients with bipolar affective illness and with elevated MMPI `mania' scores (Buchsbaum et al, 1978). As Zuckerman and Neeb (1979) have inferred, high sensation seeking, in combination with other factors, may well be associated with vulnerability to certain types of psychopathology.

Conclusions

This examination of Hamilton's (1981) `attention determines experience' explanation of moods has shown how individual differences in susceptibility to absorbing interest and vulnerability to boredom might be a result of day to day interactions. It may be that some people appear to face fewer constraints than do others in maintaining optimal moods over a wide range of external information environments. Random sampling methods have already been successfully used to describe the direction of attention and quality of experience in work and classroom situations (Cameron and Giuntoli, 1972; Csikszentmihalyi et al, 1977; Csikszentmihalyi, 1978), and would seem to provide an obvious means of performing such a mapping exercise. Only by such systematic assessment or profiling can we begin to develop an integrated approach to attention training and therapy aimed at self-regulation. The mapping of successful and unsuccessful augmentation-reduction patterns across a variety of situations, would possibly allow the prediction of specific constraints on a person's attention regulation capacity; although to attempt such a mapping exercise is beyond the scope of this study. Identifying primary defects versus secondary symptoms, therapies might be developed to deal with vulnerable profiles. These profiles could also be used to identify people who were `at risk' in specific environments. Special therapy or training might then be developed to help them become less at risk.

Selective self-regulation of one's experience develops through the active control of attention. Attentional habits have been trained by educational techniques ranging from sports training (Nideffer, 1976), to meditation (Pelletier, 1974), imagery and other exercises (Meichenbaum, 1976; Singer, 1974). The theoretical implications of such attentional training are that we should be better able to maintain a sense of freshness, interest and excitement through more of ordinary life instead of so often feeling alienated, empty and bored. However, although the influence of attentional training upon affective states (and flow) would appear to be an obvious line of research, it is not the issue at hand in this study. We are not concerned with the measurement of attentional efficiency or augmentation-reduction in attentional regulation, only flow. At this stage, these and the previous comments should be interpreted only as possible implications of the line of thought which suggests that attention determines mood. Having said this, one possible explanation of how attention regulation might influence flow and mental health is that it may determine the extent to which people experience flow. In this case, it might be more worthwhile to examine the general nature of the relationship between personality, flow and mental well-being.

CHAPTER 8

PERSONALITY AND HEALTH

Introduction

A number of investigators have attempted to show a correlation between life stress and the onset of illness, or between certain personality traits and illness. While some have worked with specific disease entities such as coronary heart disease, hypertension, cancer and asthma, others have studied general susceptibility to any illness. Some believe that life stresses are always undesirable events, while others regard stress as any event that requires an adjustment of some sort. Hence, when some people adjust well to an event, they are seen as dealing with the stress, while conversely, those who do not adjust might be viewed as not being able to cope with the stressor. Some investigators feel that psychological factors, in association with environmental factors, play an etiological role in illness since they lower host resistance and allow predispositions to specific disease processes to manifest themselves. Others feel that psychological factors are involved only in the development of disease once it has been contracted.

Psychological Vulnerability And Illness

Workers in psychosomatic medicine have described various personality types in psychosomatic disorders. The hypothesis has been that certain personality traits make a person more vulnerable to certain diseases; that is, a person might be classified as having `psychological vulnerability' to these diseases. In addition, considering the previous chapter's implications that flow may play a role in the development of personality, then it follows that the experience of flow may also play a part in the prevention of psychological and physical illness, and consequently in the improvement of the quality of life.

(i) Personality Traits

Luborsky, Docherty and Penick (1973) reviewed 53 studies (both retrospective and based on immediate observation) of onset conditions for psychosomatic symptoms. The same main types of psychological antecedents were reported in both types of studies, except that frustration was found more often in immediate observation studies, and separation in retrospective studies. The psychological antecedents reported, in order of frequency were, resentment (hostility), frustration (rejection), depression (hopelessness), anxiety, and helplessness. Unfortunately, as most studies were retrospective (an issue which will be considered in more detail later), the effect of the disease on personality and the influence of personality upon disease cannot be separated, so that it is difficult to imply causality in the association between the two.

Canter et al (1972) used the hypochondriasa, morale loss and ego strength scales from the Minnesota Multiphasic Personality Inventory (MMPI), with the total score on the Cornell Medical Index, to assess psychological vulnerability. Individuals scoring above the median on any three of these four tests were considered psychologically vulnerable; nonvulnerability being equated with scores below the median on any three of the four scales. 23% of the vulnerable as opposed to 7% of the nonvulnerable subjects had a hypersensitive reaction to a number of skin tests (highly significant). Using the same vulnerability measures, Canter

(1972) reported on changes in mood associated with a febrile illness. He found that the psychologically vulnerable group had a greater total number of fever hours, and that the onset of mood change (decreased positive mood to increased negative mood, measured by 2 self-report adjective checklists per day) occurred at least six hours before the onset of fever in 24 out of 34 cases. The maximum temperature was also higher (although not significantly so) for the vulnerable group. In Canter's view, the study suggested that mood changes were sensitive barometers to changes in the biological state, and that the psychologically vulnerable person is also biologically vulnerable.

(ii) Dependent Personalities

The dependent personality has often been considered a personality type susceptible to disease. Jacobs et al (1966, 1967) divided a sample of college volunteers into an asthma/hay fever allergy group, a normal group, and a respiratory/dermatological complaints group. A battery of tests was administered to yield information concerning maternal domination, paternal rejection, exaggerated dependency, and neurotic emotional liability. A combination of the results from these tests resulted in a `psychological index' score; higher scores indicating greater dependency. A measure for biological predisposition towards illness consisted of an eosinophil count on histamine challenge and skin test procedures. 93% of the allergy subjects, compared with 33% of the nonallergy subjects in the other two groups, reacted to the skin tests or to the histamine challenge. Patterns of maternal domination or parental weakness were found to be present in 78% of allergy subjects, compared to 50% of nonallergy subjects ($p<.05$). In addition, 75% of the allergy cases had both biological and psychological predispositions (as explained earlier) present, while 75% of nonallergy subjects did not have both factors concurrently present.

These authors believed that the `summation' hypothesis best explained allergic disorders; that is, both biological and psychological factors together may cause more allergy than either factor on it's own. This interpretation was based on the finding that adding the biological index scores and the psychological index scores, gave scores which differentiated the allergy group from both other groups.

(iii) Maladaptive Coping

The techniques discussed above have also been used to study respiratory illnesses in college students by Jacobs and associates (Jacobs et al, 1969, 1970, 1971; Spilken and Jacobs, 1971). Students treated for upper respiratory illness and asthma had significantly more disappointments, failures, unresolved role crises, social isolation, and life crises than did controls. It was argued by Jacobs and associates that the development of upper respiratory illness was associated with "unresolved distressing life change, maladaptive coping mechanisms, and unpleasant affect". Jacobs and associates considered that the maladaptive coping mechanisms would make people more likely to consult a physician for symptoms that other people might ignore. In the early studies, only people who went to a dispensary were studied, whilst in later studies, subjects were sought out who had respiratory illness but had not consulted a physician because it was realised that people who did not seek medical care for such symptoms would be different from those who did. Jacobs and associates also found that the subjects seeking treatment for upper respiratory illness and asthma had angry-defiant coping styles in relation to controls. In addition, habitual and excessive defiance was associated with an increased incidence of failure and disappointment. It was concluded that people with maladaptive coping mechanisms will experience more life crises and failures, and will respond to them with symptoms which are more overtly neurotic than the symptoms that they manifest at times of lesser life stress.

(iv) Psychiatric Disorder And Somatic Illness

Other investigators have attempted to show a relationship between psychiatric disorders and somatic disorders. Sainsbury (1960) found that patients with psychosomatic disorders scored higher on neuroticism as measured by the Maudsley personality Inventory. Weiss (1969) reported a significant correlation of .63 between somatic symptoms and psychiatric symptoms as measured by the Cornell Medical Index. Hinkle and Wolff (1957) and Roessler and Greenfield (1961) examined individual health records and found that somatic illness was significantly more common in psychiatric patients than normal patients. Krietman, Pearce and Ryle (1966) also studied this relationship, but could not confirm the findings. Although positive relationships were found between psychosomatic, minor organic and symptomatic complaints, it was felt that the findings were a result of lower thresholds of complaint. In fact, Krietman et al found a negative relationship between psychiatric and major organic illness.

Eastwood and Trevelyan (1972b) approached the problem in a different way. They obtained a random selection of patients, and determined psychiatric illness by questionnaire and interview. The psychiatric sample had significantly more major somatic disorders in comparison with the control group ($p<.05$). In minor illnesses, significance was only achieved for males; 73% of the psychiatric group having one or more minor illness compared to 46% of the male controls. Many of the major somatic illnesses were unknown to the subject's physicians, and probably to the patients themselves, prior to the screening as part of the study. In general, these illnesses produced few symptoms or caused little concern to the patients. Thus, it cannot be said that the psychiatric group was reacting to a conscious knowledge of somatic illness (although knowledge of somatic illness was not assessed), thereby contributing to psychological indices. Eastwood and Trevelyan also recognised that a positive correlation does not necessarily imply a causal relationship, only a statistical one, an issue which will be considered further in due course.

A subsequent study (Eastwood and Trevelyan, 1972a) used the same methods to study the relationship between psychiatric disorder and a large number of psychosomatic disorders. More such disorders were found in the psychiatric group than in the control group. In particular, coronary heart disease and hypertension were more frequent in the psychiatric group. Eastwood and Trevelyan (1971) also compared psychiatric and control groups for the presence of ischemic heart disease, finding a statistically significant excess of ischemic heart disease among the psychiatric group compared to the control group (30% versus 11% for males, and 23% versus 12% for females).

Quantitative Measures Of Life Events

A series of studies have used measures of life change and life events to examine the relationship between life events and illness. Holmes and Rahe (1967) developed the Schedule of Recent Experience (SRE), a list of 43 life events which had been found to be important to most people. These ranged from minor violations of the law to the death of a spouse. Since different events might well require a different amount of adjustment, the authors also developed the Social Readjustment Rating Scale. This scale gives different weightings to each life event, with the weights being derived from rankings of the events by the general population according to the amount of adjustment which was perceived to be required for each event. A life change index was obtained by multiplying the weight for each event by it's frequency in the time period under study. Using this technique, the results of numerous studies by Gunderson and Rahe (1974) allowed a series of general conclusions: (i) clusters of life changes preceded the onset of reported illness; increased life change scores over the years preceding the study repeatedly showed a positive, significant correlation with incidence of illness during the study period, (ii) a small proportion of men had most of the illness episodes in the studies, (iii) 80% of the illness episodes were minor, (iv) more illness episodes occurred during stressful periods (for example, during combat on a navy ship), (v) a higher incidence of illness was observed in men performing physically demanding or hazardous tasks, and (vi) demographic variables affected the reported incidence of illness (higher incidence in younger men, blacks, unmarried men, men with lesser education and greater job dissatisfaction). Unfortunately, the major shortcoming of these studies is the lack of documentation regarding illness, illness data being obtained from both self-report and medical records.

Thurlow (1971) studied the medical records of industrial employees, and reported that the perception of the life situation as measured by the SRE and the standard deviation score (a measure of the amount of variablity which the environment was viewed to have) bore a strong relationship to illness experience. Aaksten (1974) developed a questionnaire similar to the SRE, and found correlations between psychosocial stresses and health disturbances. He interpreted the stresses as failures to realise `existential' goals. Marx, Garrity and Bowers (1975) used a College Schedule of Recent Experience in conjunction with a health questionnaire to report an association between high levels of life change and reported illness.

Some workers have concentrated on specific types of life change. For example, Hooper and associates (1972) measured the effect of house change on illness, mental health and satisfaction. They reported a greater incidence of illness in housing areas containing more mobile families than less mobile families. Berkman (1969) studied spouseless motherhood and it's possible effect on illness. Compared to married mothers, spouseless mothers reported significantly more illness and had lower morale, more psychological predisposition to stress, and lower ego strength.

The studies discussed so far have attempted to account for the notion that life events can cause a decrease in general host resistance to all illness and make a person more vulnerable to pathophysiological processes. Whilst numerous studies have reported similar results, conclusive evidence for such a notion is still lacking.

Summary And Conclusions

The reasons why much of this work reported must be regarded as unsatisfactory are, firstly, that many of the studies were retrospective. It is doubtful whether the memory of past events can be uncontaminated by present day or previous illness, and vague hypotheses in the minds of those afflicted. In any case, memories of past events are notoriously unreliable, particularly when these are of a strongly emotional nature (Nisbett and Wilson, 1976). Only prospective studies can give acceptable evidence on the importance of stress.

The second reason is the confusion which exists in much of the literature surrounding the concept of stress, Eysenck (1987) suggests that stress is what is imposed upon the material in question by the outer world, whilst strain is the reaction of that material to the stress. In psychological terms, the loss of a wife is a stress; the psychological, hormonal, physiological and other consequences are the strain. We might therefore reconsider stress as 'stressors'. The importance of this distinction lies in the fact that what may appear to be identical stressors may set up quite different strains, depending on the individual. For example, as Eysenck (1987) points out, the loss of a wife may be a devastating blow to a young husband who loves his wife, while it may be a relief to the husband whose wife has been ill for many years. It may also be a joyous occasion for a philandering husband who inherits his wife's money. Studies which only look at events without examining the individual's reaction, can produce data which are quite valueless because they leave out of account these important variables.

Schroeder and Costa (1984) have given voice to such doubts in a very critical review of the traditional literature:

> "There is good reason to suspect that the link between environmental stress and illness has been exaggerated in both the public mind and the psychological literature. Individuals are eager to find explanations for events that occurred to them, and they may sieze upon the stress hypothesis to account for what would otherwise have to be considered ill fortune. Unfortunately, many resarchers have come to suppose that illness is closely linked to life stress, encouraged by retrospective self-report studies, which have often shown sizeable associations between recalled stress and recalled illness. It could be argued that memory, perception and response tendencies figure so prominently in these studies that these factors alone could account for the findings."

Maddi, Bartone and Puccetti (1987) have put forward a reasonable reply to this argument yet there is no doubt that many of the published studies are subject to Schroeder and Costa's criticisms, and that reliance should be placed only on prospective studies showing that they recognise the distinction between stress and strain, as well as the importance of personality variables.

Evidence of the main hypotheses linking personality with cancer has been reviewed by Eysenck (1987), which extends the notion of a `disease prone personality' (Friedman and Booth-Kewles, 1987). That is, personality types and behaviour patterns which are likely to result in health disorders. The Eysenckian disease prone typologies will be discussed later, and bear considerable resemblance to Type A and B behaviour patterns which have received considerable attention in the literature, and which will be discussed in the next chapter. A survey by Temoshok (in press) also arrives at conclusions similar to those reported by Eysenck. These lines of enquiry are now pursued in an examination of recent developments in the research literature.

CHAPTER 9

RECENT ADVANCES IN PERSONALITY AND HEALTH
(i) TYPE A BEHAVIOUR REVIEW AND CONTROVERSY

Introduction To Personality Patterns And Stress Disorders

Friedman and Rosenman (1974), and Glass (1977) identified the following qualities and behaviours which they hypothesised to characterise two different personality types; Type A and Type B. Type A persons are thought of as hard driving and competitive, living under constant pressure largely of their own making. Much of the time they may function as alert, competent, efficient people who get things done. However, under stressful conditions which they cannot control, they are likely to become hostile, impatient, anxious and disorganised.

In contrast, Type B persons are easy-going, noncompetitive, placid, and able to weather stress more calmly. Type As are usually distinguished from Type Bs by responses to personality questionnaires or by their behaviour during interviews, although the questionnaire method of assessment has been strongly criticised by Ivancevich and Matteson (1988). Friedman and Rosenman (1978) also observed that when placed in situations with prolonged stress that they cannot control, Type As often tend to give up. They demonstrate a type of `helplessness' and become less effective and less responsive than Type Bs; that is to say, after their initial struggle to control the situation has failed, they cease to cope.

Glass (1977) suggested that a possible explanation for the link between personality type and disease lies in the chemical substances released by the autonomic nervous system as a response to stress. There is evidence that CHD patients react to stress with delayed and protracted responses rather than an immediate response with prompt recovery, and also that they have different blood chemistry responses (Glass, 1977). All this suggests that programmes to help CHD patients cope more constructively with stress might be helpful. However, before pursuing this line of thought, the experimental literature concerning Type A behaviour will be considered in more detail.

The Type A behaviour pattern is depicted as consisting of impatient or hurried behaviour, a strong orientation towards work responsibilities and task completion, and intense competitive behaviour in situations which involve evaluation (Ivancevich and Matteson, 1988). Following early attempts to modify the entire Type A behaviour pattern (for example, Kemple, 1945; Meninger and Meninger, 1936; Osler, 1910), there is now a growing acceptance of the proposition that a total change is not necessary (Barefoot et al, 1983). The Type A person is now being presented as possessing many desirable characteristics and healthy behaviours that are worth reinforcing (Friedman, Thorensen, Gill et al, 1987; Roskies, 1978; Roskies, Kearney et al, 1979). For example, the Type A behaviour pattern appears to possess some positive value in terms of meeting work responsibilities and task completion. On the other hand, individuals manifesting the Type A behaviour pattern seem to have a significant risk of developing and prematurely dying from CHD when compared to their Type B counterparts (Roskies, 1983, 1987). Organisational decision makers are increasing the intensity of their search for solutions to productivity problems, but have typically not examined the Type A behaviour pattern and disease, and what can be done to reduce the destructive features of the Type A behaviour pattern. These three issues will now be considered.

Type A Behaviour And Illness

Considering the link between CHD and Type A behaviour, Cooper et al (1981) concluded that "Type A behaviour is associated with an increased risk of clinically apparant CHD in employed, middle aged US citizens. The risk is greater than that imposed by age, elevated systolic pressure, and smoking, and appears to be of the same order of magnitude as the relative risk with the latter of these factors". The view that heart patients are distinctive for their impatient, hyperalert and aggressive behaviour has been made repeatedly throughout the history of (health) psychology (Kemple, 1945; Menninger and Menninger, 1936; Osler, 1910).

Friedman and Rosenman (1959) also reported that the majority of their CHD patients showed a set of behaviour patterns and emotions that could be labelled as Type A. Type A behaviour was confirmed as an `action-emotion' complex, with persons being work-orientated, concerned with deadlines, attempting to achieve more and more in less and less time, competitive and impatient. These characteristics are encouraged and rewarded in many western societies, yet the potential costs in terms of increased risk of contracting CHD and other diseases or health problems are serious indeed.

The Framingham Heart Study examined the coronary risk of Type A behaviour in men and women in white and blue collar jobs. All subjects were free from CHD at the beginning of the study. However, Type A behaviour (measured by the Framingham Type A scale) was shown to be an independent predictor of CHD in 45 to 64 year old men and women (Haynes et al, 1980).

Two studies by the Western Collaborative Group revealed similar findings. Rosenman et al's (1975) prospective study of 3154 CHD-free men over 8.5 years showed that those identified as Type A by interview had a risk ratio of two-to-two (which is a confusing description) for development of CHD compared to Type Bs. These findings were confirmed in the Belgian-French pooling project (1984) which used the Bortner rating scale (Bortner, 1969) to assess Type A behaviour. The quarter of the sample scoring lowest on the Bortner (ie, least Type A) had an annual incidence of CHD of 4.5 per 1000, compared to an annual incidence of 9.2 per 1000 for the quarter of the sample with highest Type A score.

A major study which failed to confirm these findings about the risk of Type A in CHD was the Multiple Risk Factor Intervention Trial (MRFIT) study (Shekelle et al, 1985). The data indicated that Type A was unrelated to the 7 year incidence of CHD. This relationship held regardless of whether Type A behaviour was assessed by interview or the Jenkins Activity Scale (Jenkins et al, 1965).

These few examples from the research literature clearly show that whilst there are some supportive studies which indicate Type A behaviour as a coronary risk factor, there are other contradictory studies which question the measurement, design or conclusions reached by these studies. In addition, there is also research which questions the examination of Type A in global terms (Ivancevich and Matteson, 1988). Instead, it suggests that greater specificity, and the use of (for example) anger-hostility measures would be more valuable in examining meaningful predictors of CHD (eg, Barefoot et al, 1983). That is to say, a stronger emphasis should be placed upon identifying those specific components of Type A behaviour which are potentially damaging to health. Although the anger/hostility dimension has been identified here as the major culprit, Matthews and Haynes (1986) conclude that greater specificity would be of more value in examining meaningful predictors of CHD. In order to draw conclusions from this seemingly unclear evidence, much more must be learned about how Type As respond biochemically and physiologically to different work environments. In addition, gaps must also be filled in the theoretical, applied and empirical Type A literature.

Physiological Reactivity Of Type As

The identification and understanding of the biological mechanisms linking Type A behaviour to disease outcomes is important for both scientific and intervention reasons (Roskies, 1987). Scientifically, the establishment of a causal relationship between Type A behaviour and disease requires the identification of biochemical and physiological relationships. These can then serve as indicators to evaluate whether a particular intervention is effective or not. Numerous laboratory studies have reported that in response to challenge, high demands and loss of control, Type As demonstrate greater elevation in blood pressure, heart rate, and cortisol, epinephrine and norepinephrine secretion than do Type Bs (Dembroski et al, 1978; Glass et al, 1980; Williams et al, 1982; Lambert et al, 1987). A series of elevations in blood pressure and heart rate are thought to damage the inner layer of the coronary arteries, thereby contributing to atherosclerosis and subsequent CHD. If the stress response of Type As in laboratory settings is typical of their responses to work environments, family situations and so on, then it seems plausible that Type As would suffer premature CHD at a higher rate than Type Bs.

Ganster (1986) conducted a review of the organisational literature examining studies of Type As and their physiological responses in organisational settings. Ten empirically based studies emerged which indicated a significant moderating effect of Type A behaviour on the relationship between job stressors and physiological and psychological outcomes. The design, measurement and validity of the studies are worth noting. For example, eight different measures were used to assess Type A behaviour. In addition, with the exception of one study by Hurrell (1985), subjective self-report observations were used in all the other studies. Finally, the only studies which used an objective measure of stress did not assess physiological outcomes. We should also note that a limited number of situations and work occupations were covered by the available studies, so that the results may not be generalisable. The Hurrell (1985) study surveyed groups of postal workers performing machine paced sorting jobs and non-paced sorting tasks. Hurrell justifiably hypothesised that because of a loss of control, Type As would indicate more negative psychological reactions to the machine paced tasks than Type Bs. Type A behaviour was assessed using the Thurstone measure of Type A behaviour. However, the results showed no significant differences in psychological reaction between Type A and Type B postal workers. This suggests questions such as, are postal workers different from other types of people examined ? Is machine pacing a powerful enough stimulus to evoke hyper-responsivity in Type As ? and was the Thurstone questionnaire measure of Type A behaviour as used by Hurrell reliable and valid for this sample ?

The 'Hot Reaction' Notion

Some researchers have proposed that Type A should not be the only construct examined in the assessment of hyper-responsivity to stressors. One factor which has been considered to be important has been labelled 'hot reacting'. Eliot and Breo (1984) described 'hot reactors' as people who respond to stressful situations with extreme cardiovascular reactions. It seems reasonable to hypothesise that such people would be at greater risk of developing stress related CHD because they cause excessive wear and tear on arteries and organs by expending enormous amounts of energy. Basically, they overwork their cardiovascular systems. Whether 'hot reactors' are at greater risk for the development of CHD remains to be determined.

The originators of this concept suggest that it is not the same as the Type A behaviour pattern. Hot reacting is an extreme cardiovascular response to stressful tasks, while Type A behaviour is an 'action-emotion' complex involving impatience, hostility and aggression. Hot reacting is determined by the measurement of cardiovascular responses to the mental and physical tasks that constitute daily life experience. Type A behaviour is identified by observing verbal and physical reactions during an interview, or analysing self-perception via paper and pencil tasks. Some Type As may also be hot reactors, but there are also some Type Bs who are hot reactors. At this early point in the development of the hot reaction concept, it is reasonable to label hot reacting as a potentially independent risk factor that may help improve understanding of over responsivity to stress.

A Theoretical Model For Type A Research

In order to focus, deepen and integrate understanding of the Type A behaviour pattern, a theoretical framework is required. As indicated earlier, much of the research has addressed middle class, middle aged, white males in a limited number of situations. Whether Type A/CHD predictions and associations can be made with other populations such as women, ethnic and cultural groups is now beginning to be considered (Price, 1982; Sorensen et al, 1987).

A theoretical model would also draw attention to another critical concern: How does a person acquire Type A behaviour ? If there is going to be progress to prevent the development of the potentially destructive role of Type A, it will be necessary to identify it's early stages and also the environmental and personal factors which encourage the evolution and development of those aspects of Type A behaviour which may be damaging.

Figure 23 presents a model of Type A behaviour (Ivancevich and Matteson, 1988) which calls attention to social and cultural antecedents, objective and subjective environmental stressors, physiological, psychological and organisational consequences, and disease outcomes. The model also suggests a number of potential causal links highlighting how Type A behaviour might lead to disease outcomes such as CHD. The model uses many of the same principles and pathways that have been previously identified by other theorists and researchers (de Frank and Ivancevich, 1986; Ivancevich and Matteson, 1986; Ivancevich, Matteson and Preston, 1986; Smith and Anderson, 1986).

To date, the majority of the research in this area has focussed on the 3A and 8 (physiological-CHD) linkages (Ganster, 1986). It is assumed that perceptive and subjective stressors such as role conflict, work overload, red tape beaureaucracy cause physiological problems. This might manifest itself in elevated blood pressure, anxiety and irritability, which in turn are expected to have an impact on insomnia, CHD and ulcers as well as contributing to poor quality of life and performance decrements.

The linkage shown in 1 suggests that to understand Type A behaviour thoroughly, it is necessary to examine cultural and social antecedents. An industrialised society's workforce possesses beliefs, attitudes and experiences which indicate that Type A behaviour is required for social approval and material rewards. Competitiveness, job involvement, meeting performance and time deadlines are requirements to receive rewards such as promotion, pay increases and recognition. A person's success is therefore largely determined by placing primary value on tangible achievements. These values are then perpetuated by families, schools and the media.

Institutions in society such as unions, governments and religious groups are proposed to have an influence on the development of Type A behaviour as represented in pathways 2 and 4. These forces may be perceived (subjective) or real in terms of objective standards (ie, meeting deadlines).

The causal process in 6 and 7 emphasises the moderating effect of Type A on the relationship between stressors and responses. This pathway illustrates that Type As show hyper-responsivity to stressors. However, the research reviewed in this section suggests that this hyper-responsivity has been identified primarily in laboratory settings.

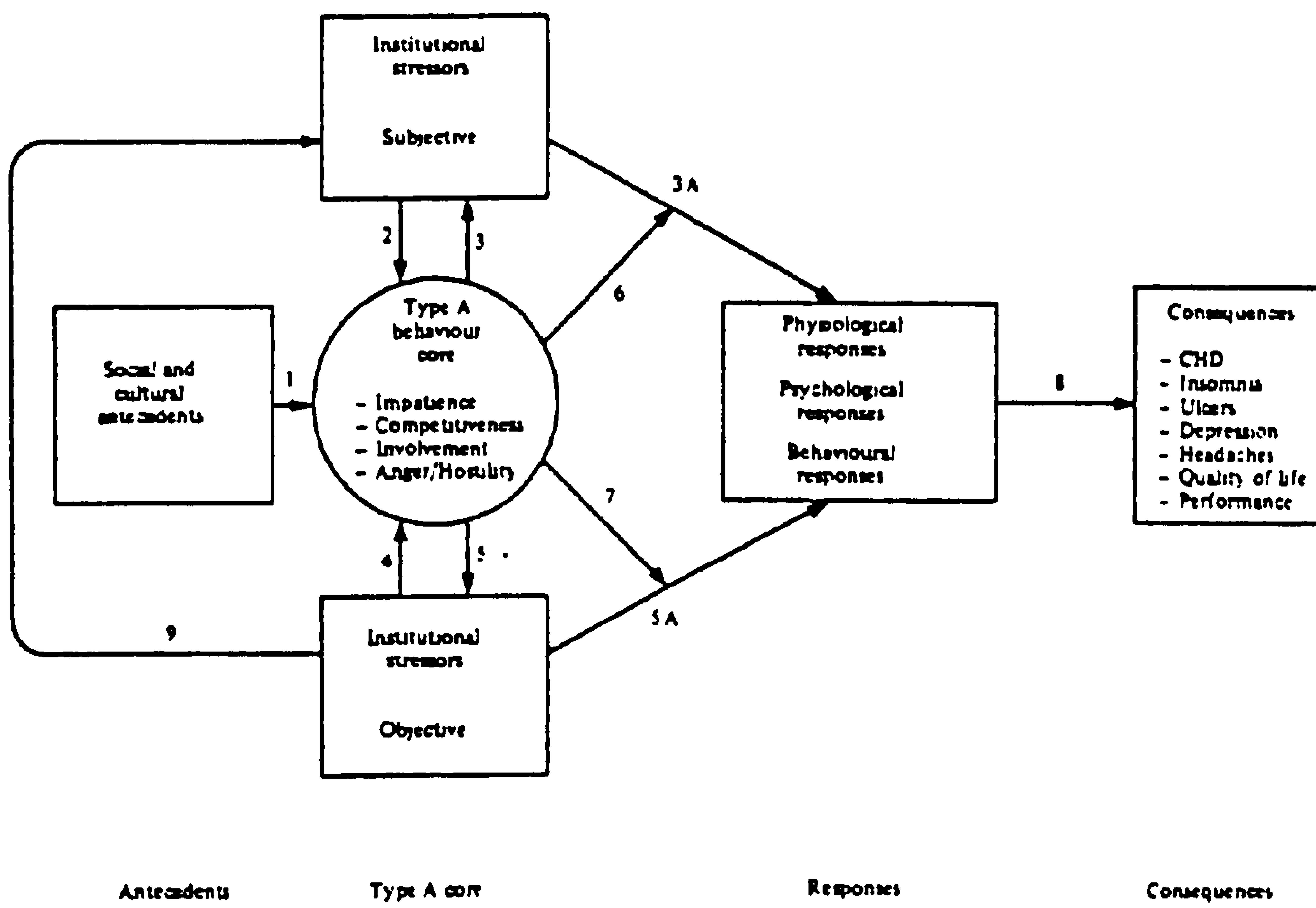


Figure 23 : Integration Model Of Type A Behaviour And Stress: Antecedents, Responses And Consequences (from Ivancevich and Matteson, 1988)

The pathway displayed in 9 suggests that objective institutional stressors can directly affect a person's perceptions of events, other people, or situations. A person's perceptions of stimuli are, in essence, reality to that individual. Despite the objectivity of situations and events, the overriding influence is an individual's assessment of the situation.

The final two variables displayed in the consequences box are intended to reflect positive influences. As suggested earlier, high energy levels, mental alertness, emotional expressiveness and competitiveness, all of which are Type A traits, may result in improved performance and an enhanced quality of life. Examinations of the consequences of Type A behaviour should not focus solely on negative or unhealthy consequences, but should also search for healthy consequences. These ideas will be considered in more detail in the following section.

Type A Behaviour And Performance

One might realistically predict differences in job performance between Type As and Type Bs based on the evidence from laboratory experiments, and because of the striving tendencies of Type A behaviour. For example, in laboratory settings, Type As have been shown to outperform Type Bs on simple tasks (Burnam et al, 1975) and also set more difficult initial task completion goals (Snow, 1978). It has also been shown that Type As are better task performers than Type Bs in situations where persistance or endurance are required (Glass, 1977; Matthews and Brunson, 1979). Thus, in terms of quality of performance, Type As are higher performers. Type As have also been shown to outperform Type Bs on tasks which require slow and careful responses (Gastorf et al, 1980; Glass et al, 1974).

The findings from field research on Type A and performance are equivocal. Jamal (1985) obtained results indicating that Type Bs were rated higher on quality of performance and had fewer psychosomatic complaints than Type As. There was no difference in quantity of performance or promotions received during the past five years. It was also noted that supervisors rated Type As effort exerted in the job as higher than Type Bs.

A field study by Matteson et al (1984) examined the relationship of Type A behaviour to the performance and satisfaction of sales personnel. Type A sales agents did not significantly outperform Type B sales agents on any of the three objective performance measures (policy amount, premium income, total number of policies sold). However, Type As reported significantly more stress and expressed more health complaints than Type Bs. There was no significant difference in terms of job satisfaction between Type As and Type Bs.

In a field study by Ivancevich et al (1983), Type As reported significantly higher stress levels and ambitiousness than Type Bs, although there were no significant differences between Type As and Type Bs in terms of health status or goal based performance.

In contrast to these studies, other researchers have found that Type As outperformed Type Bs. Matthews et al (1980) used the Jenkins Activity Survey (Jenkins et al, 1971) to assess Type A behaviour. This Type A measure was directly related to the quantity of research performance in the social psychologist sample (as measured by the number of citations in the Social Science Citation Index). Assuming that citations in the SSCI are a measure of performance, which may be questionable, it therefore appears that the social psychologists classified as Type A were more productive than their Type B counterparts. Although this study generally supports the notion that Type As outperform Type Bs, it should be noted that the sample only included males, and only considered one aspect of a variety of possible performance measures (for example, grant preparation, textbook writing, classroom teaching could all have been considered).

The results of a study by Taylor et al (1984) showed a direct and significant relationship between Type A behaviour and both quantity and quality performance indicators of productivity. This study again used faculty members, but included males and females. It examined productivity in 8 categories (representing quality of performance) as well as number of citations (quantity of performance). The results provided support for the hypothesis that Type A individuals tend to perform better at work when compared to Type B individuals, both with respect to quality and quantity of performance.

These five field studies suggest that there is no clear pattern to the Type A/performance relationship. Whether or not consistent differences in job performances exist between Type As and Type Bs has not been examined across a diverse enough selection of occupations and settings to reach a satisfactory conclusion. In some situations, Type A behaviour appears to be associated with superior performance, yet in other situations, there is apparently no difference between Type A and Type B performance. However, there is still a general consensus held by organisational decision makers that Type As are better performers, probably based on the opinion that Type A behaviour is believed to contribute to completing job requirements on time, in the amounts required and at an acceptable level.

These studies also highlight two other concerns, namely the methodologies by which Type A behaviour is, or should be assessed, and whether clarifying or modifying the subcomponents of Type A behaviour is possible or beneficial. It would seem that some type of multivariate assessment of personality would be most desirable. What is certain is that investigation of the causal pathways illustrated in Figure 25 requires reliable and valid measures of the crucial Type A subcomponents. Additional work to examine responses on self-report scales and their relationship with observable behaviour is also required. Until objective evaluations of Type A assessment techniques indicate a concordance at around the 90% level, the established Jenkins Activity Survey, and the Friedman and Rosenman Structured Interview (Friedman, Rosenman and Buyers, 1964) must continue to be used.

Intervention Strategies And Design Considerations For Type A Experiments

The data on Type A behaviour and it's role in health risk are complex and often contradictory. Many Type As will not have premature CHD problems or any other health problems. The fact that many Type As are successful in organisational advancement and achievements is an obvious reason why Type As may resist any attempt to modify or change their behaviour pattern.

The objective of improving the coping style of Type As is to improve the person's awareness and skills in controlling perceptions and responses. The Type A needs to be made aware that personal upset, explosive loss of control and perception of every situation as a major crisis may be costly in health terms. It is therefore sensible to encourage Type As to consider an alternative style that is healthier and more gratifying.

Specific approaches to making healthy Type As even healthier are varied. Suinn and associates (Suinn, 1974, 1975, 1978; Suinn and Bloom, 1978) recommend the use of two treatment procedures: Anxiety Management Training (AMT), and Visuo Motor Behaviour Rehearsal (VMBR). In an organisational setting, AMT would involve training Type As to identify physical cues of arousal to stress, and then teaching them to use relaxation techniques to reduce their response to stress. VMBR is a covert rehearsal procedure designed to assist people to use alternative behaviours (instead of Type A behaviours) in those situations which habitually elicit Type A responses. This procedure has much in common with Meichenbaum's (1976) stress innoculation training. Suinn believes that Type A behaviour is best treated with intense stress management training rather than long term psychotherapy.

Roskies and associates (Roskies, 1978; Roskies et al, 1979) used two different methods for modifying Type A behaviour. One consisted of weekly group sessions of psychoanalytically orientated therapy, and the other, a behaviourally orientated training programme for anxiety and tension reduction to be practised daily. The psychoanalytical programme focused on diminishing the need of Type A individuals to control and master the environment. The behavioural approach used instruction for relaxation of muscles, followed by breathing exercises and cue-related relaxation in response to stressful situations. Results were evaluated by assessing levels of anxiety, psychological symptoms, life satisfactions, blood pressure and serum cholesterol. The behaviour therapy group produced better results with regard to these measures (for example, significantly greater life satisfaction, less anxiety) at a six month follow up point in comparison to the psychoanalytic and control groups.

As a result of this and other research, Roskies (1987) recommended a cognitive-behavioural therapy programme for Type A individuals. The objectives of this programme were, increased awareness within the individual of psychological, behavioural, emotional and cognitive responsivity; acquisition of numerous new coping strategies and skills; and ability to evaluate the effect of different coping strategies and skills upon mental and physical well-being.

Roskies et al (1986) empirically tested and developed the programme as part of the Montreal Type A Intervention Project. Subjects were assigned to one of three groups: aerobic exercise, weight training, and cognitive-behavioural stress management. The latter was designed to teach participants to perceive and respond to stressors in a more differentiated manner, increasing the number of coping strategies used (eg, stress innoculation, muscle relaxation) and the flexibility with which they were used. The project results based on healthy Type A managers concluded that the cognitive-behavioural approach can significantly reduce behavioural reactivity, but this programme, as well as the other two, had little or only trivial effects on physiological reactivity. Unfortunately, no evidence was produced to indicate whether, or to what extent, subjects had acquired the taught behavioural management skills.

The available research evidence gathered from several studies points to a number of relevant considerations and issues surrounding the modification of Type A behaviour. The first issue is to determine the facets of Type A behaviour that are most dangerous to health. Suitable subjects would include those who feel stressed, believe they are losing control, and are unhappy about their work situations. Secondly, instead of attempting to totally change a Type A to a Type B, it would seem more reasonable to attempt to change the intensity of those Type A behaviours which have been identified as damaging. The obvious candidate, which has been identified earlier, is the anger/hostility dimension. Perhaps a comparative intervention project such as that proposed and tested by Roskies (1987) using healthy Type As could be designed to address a specific facet such as anger/hostility.

There is no current universally accepted methodology for evaluating the success of modifications of the `global' Type A factor or, more significantly considering the previous comments, any of it's subcomponents. However, the most informative design would presumably include behavioural activity measurements, biochemical measures, neuroendocrine measures, cardiovascular, and psychological measures of anxiety and tension.

CHAPTER 10

RECENT ADVANCES IN PERSONALITY AND HEALTH
(ii) INFLUENCE OF PSYCHOSOCIAL AND PERSONALITY FACTORS

Psychosocial Factors

Recently, Eysenck and his associates have initiated a volume of research which has examined the interaction of psychosocial factors such as stress and coping styles of behaviour in the causation of cancer and CHD.

Of primary concern was the role of cigarette smoking in the genesis of cancer, CHD and other disorders, and the fact that it appears to be neither a necessary nor a sufficient cause. For example, as regards lung cancer which has probably been linked most closely with cigarette smoking, only one in ten heavy smokers dies of lung cancer; hence smoking cannot be a sufficient singular cause. Conversely, one out of every ten people who do die of lung cancer is a non-smoker; hence smoking cannot be a necessary cause. Cigarettes smoking is therefore unlikely to be a cause of lung cancer or any other disorder by itself, but rather is more likely to be one of a set of causal determinants. In any case, this illustrates the point that a statistical association, however strong, does not necessarily imply a causal determination. Furthermore, there are severe difficulties in demonstrating such causal links (Eysenck, 1985b).

An alternative theory to that which makes carcinogenic substances responsible for cancer, is one which makes psychosocial factors (stress, personality) responsible. Stress in particular has received much attention, as shown in reviews by Fox (1983) and Dobson (1982). Recent research has also focussed upon the relationship between stress, behaviour and the immune system (for example, Borysenko and Borysenko, 1982). The causal hypothesis in this work has been that stress (particularly uncontrollable stress) leads to helplessness (as defined by Seligman, 1975) and a supression of the immune system. Hodapp and Weyer (1982) add the point that neither objective environmental variables nor personality characteristics alone cause stress. Rather, it is thought that a particular individual's evaluation of his environment is decisive in causing stress. Weyer and Hodapp's investigations have resulted in a causal model which links various stress factors with extraversion and neuroticism.

Eysenck (1985) has emphasised a distinction between `stress' and `strain' which had previously resulted in some confusion in the literature. In Eysenck's terminology, stress is the objective situation which impinges upon the individual, whilst strain is the reaction produced in the individual by the externally imposed stress. Also important is the specific nature of stressor and the personality of the individual, something which has been neglected in the literature. For example, one indication of the importance of the type of stress concerns the difference between acute and chronic stress. Acute stress apparently increases the liklihood of the development of carcinomas, whereas chronic stress may have an arresting effect (Sklar and Anisman, 1981).

Personality Factors

Traditionally, two major sets of personality traits have been linked with cancer. The loss-depression syndrome (LeShan, 1959) and it's relationship to cancer have formed the basis of much research (Eysenck, 1985b). It attributes the incidence of cancer to the loss of significant objects in the life of a person, such as career disappointments, loss of self-esteem, or the death of a loved person. This conception is very close to

Seligman's (1975) concept of learned helplessness. Failure to cope with the stress arousing situation links it with the uncontrollable nature of cancer-producing stress in animal experiments. It suggests the possibility that teaching the use of coping mechanisms through cognitive behaviour therapy may help to prevent this particular cause of disease (Eysenck, 1987a, 1987b).

The second of the personality related syndromes in cancer is one emphasising lack of emotional reaction, or it's supression. It is postulated that the onset and development of malignant tumors may be associated with the excessive use of repressive and denying mechanisms (Bahnson and Bahnson, 1964) or a general inhibition of emotional reactions (Kissen and Eysenck, 1962).

These two traditional theories have received a certain amount of anecdotal support, whilst in recent years, several empirical studies have gone some way toward providing support to these theories (reviewed by Eysenck, 1985a). One major criticism of much of the published work is that the studies were carried out on patients already suffering from cancer. Prospective studies are obviously desirable, and are likely to be much more informative than studies carried out on patients already ill. There is also the problem that even though there may be a correlation between cancer and personality, the long developmental period of sub-clinical carcinomas makes it possible that it is the cancer which causes changes in personality, rather than personality being instrumental in causing the cancer.

Cancer is not the only major disease which has been linked with personality. As indicated in the previous chapter, CHD is another. Since the early work of Peete (1955), interest has mainly focused on the so-called Type A-Type B behaviour patterns discussed earlier (Friedman and Rosenman, 1974; Jenkins, 1978; Price, 1982). Eysenck and Fuller (1983) have shown that the concept of Type A behaviour is related to extraversion and neuroticism, and that it is strongly determined by genetic factors.

The theory linking personality with cancer can usefully be extended to cover duration of life after diagnosis. That is, the ability of the organism and it's immune system to combat the disease. There is some evidence for the existence of such a relationship. Greer et al (1979, 1985) found in a 10 year follow up study that women with breast cancer who were rated as having a fighting spirit had better outcomes than women rated as stoic or helpless. Rogentine et al (1979) reported significantly greater relapse in melanoma patients showing a passive or stoic response style. Visintainer and Casey (1984) demonstrated a similar association between passivity and disease outcome in melanoma patients as did Dervogatis et al (1979), and Jensen (1984) with breast cancer patients.

Animal studies have given further support to the hypothesis that `learned helplessness' is associated with cancer. For example, Shavit et al (1984), and Greenberg et al (1984) suggested the existence of a causal relationship between acute behavioural helplessness in mice and rats, supression of lymphocyte functioning, and faster tumor growth.

If these criticisms are disregarded, the failures to replicate findings (due possibly to the use of different tests and questionnaires) and the problems caused by the many different paradigms used, it may be possible to conclude cautiously that there is some evidence for the relationship between stress and cancer. It may well be that there is a cancer prone personality characterised by reactions of hopelessness-helplessness and the inhibition of emotional expression. Similarly, there may also be a CHD prone personality, in many ways the obverse of the cancer prone personality, and characterised by strong feelings of anxiety, hostility and aggression.

Clearly, it would be desirable if these tentative hypotheses could be supported by a prospective study using a sufficiently large sample so as to be convincing. Three such studies are available in the work of Grossarth-Maticek and his colleagues. These studies have also led to a causal theory (Eysenck, 1987) which will be discussed in due course.

Eysenck's Stress, Personality And Illness Typologies

The questionnaire used in the Grossarth-Maticek studies contained questions relating to several personality complexes, including those considered relevant to cancer and CHD. Thus, one group of questions related to adverse life events leading to long lasting hopelessness-helplessness. Another group related to adverse life events leading to anger and hostility. Still another set related to rationality, the obverse of neuroticism-anxiety and hopelessness-helplessness. This questionnaire system of typology does not claim universal validity, but is specifically geared to the prediction of cancer and cardiovascular disease in people who experience certain types of stress and react in certain ways to this stress. As a consequence, it is specifically the occurrence of this stress, and the reaction of different types to the stress which are important. The stress which forms the basis of the system arises from the individual's failure to relate positively to an emotionally important object, be it a person, professional success, or a particular aspect of living. Unfortunately, details regarding the psychometric properties of the measurement device were not reported. In addition, no concurrent validity or reliability information was given. Although the authors have designed the questionnaire for a specific research area, some criticism should be directed at the failure to provide evidence concerning the development and validity of the questionnaire for the studies.

Four personality types were identified by Grossarth-Maticek, Eysenck and Vetter (1987), namely a cancer prone type (Type 1), a CHD prone type (Type 2), an unstable type (Type 3), and a healthy autonomous type (Type 4). A detailed description of the four types is given in Grossarth-Maticek et al (1987) from which the following outlines of each type are taken. Again, some criticism must be made in that the precise basis of classification of each type was not given. Grossarth-Maticek et al (1987) successfully attempt to give greater detail about the nature of the disease prone types than has been the case in previous accounts (eg, Eysenck, 1987 a and b; Grossarth-Maticek, 1986), yet fail to enlarge on the initial identification of each of the groupings. Typical case histories for each type are also discussed by the authors, which are omitted here for the sake of brevity.

Type 1: Understimulation - Persons of this type show a tendency to regard an emotionally valued object as the most important condition for their well-being and happiness. The stress of withdrawing this object is experienced as an emotionally traumatic event. Type 1 individuals fail to distance themselves from the object and remain dependent upon it. Individuals of this type therefore do not successfully reach the object, remaining isolated from it. Great strain is produced by their inability to reach or achieve their object, which results in the individual showing a lack of autonomy, characterised by feelings of hopelessness and helplessness.

Type 2: Overarousal - Persons of this type show a tendency to regard a valued object as the most important cause of their distress and unhappiness. Rejection by the object or failure to reach it is experienced as emotional trauma, yet persons of this type fail to disengage from it, and become more helplessly dependent on it. Thus, persons of this type remain in constant contact with negatively valued and emotionally disturbing people, or fail to distance themselves from dependence on disturbing objects. Where persons of Type 1 seek nearness to the object of their desires and experience failure as helplessness and hopelessness, Type 2 persons fail to disengage from the object, and experience a reaction of anger, arousal and aggression.

Type 3: Ambivalence - Persons of this type show a tendency to shift from the typical reaction of Type 1 to that of Type 2 and back again. This type therefore regard an emotionally valued object alternatively as the most important condition for their well-being, and as the main cause for unhappiness. In these individuals there is an alternation between feelings of helplessness-hopelessness and feelings of anger-arousal.

Type 4: Personal autonomy - The reactions of types 1, 2 and 3 persons indicate a dependence on some highly valued object, and their reactions are characterised by contradictions between expected and actual consequences. Persons of Type 4 regard their own autonomy, and the autonomy of people with whom they wish to be in contact as the most important condition for well-being and happiness. This enables Type 4 persons to realistically experience the approach or avoidance behaviour of the object, and enables them to accept the autonomy of the object. Persons of Type 1 and 2 depend on important objects but cannot remain autonomous in their absence. It is this lack of autonomy which constitutes the stress/strain which, according to the hypothesis, leads to cancer or CHD. Persons of Type 4 are able to deal with this situation by virtue of their autonomy preserving ability, and consequently avoid the stress reaction.

Failure in relation to emotionally highly valued objects is experienced by persons of Type 1 or 2 as unavoidable. However, persons of Type 4 possess the ability to cope rationally with the situation and hence the reaction is avoidable. Given that unavoidable stress is closely related with disease, whereas avoidable stress is not (Sklar and Anisman, 1981), it is clear that Type 4 persons should be less likely to suffer from cancer and CHD than Types 1 and 2. Type 3 persons may also be protected to some extent by changing their reaction to the stressful situation from Type 1 behaviour to that typical of Type 2, and back. In this way, persons of Type 3 avoid, to some extent, the build up of behaviour patterns related to cancer or CHD respectively.

The actual allocation of cases to one of the four types was done using a long questionnaire or a short questionnaire. The long questionnaire allowed subjects to be allocated to one or other of the four types. The short questionnaire could be used in the normative sense as it also gives rise to scores, but in both cases, subjects were allocated to one of the four types according to their highest score. The long questionnaire was used for self ratings, and the short scale for interviewer and relative's ratings. However, the final allocation of a subject to one of the four types was done on the basis of scores on the long questionnaire (which is reproduced in Appendix 14). The long and short forms were administered to subjects in three separate samples, discussed in detail in the next section, giving Cramer coefficients between the self-report and interviewer rating scales of .68 (Yugoslavia sample), .62 (Heidelberg representative sample), and .58 (Heidelberg stressed sample) respectively.

Relation Of Four Type Personality To Other Typologies

As the system of typology used in the Grossarth-Maticek/Eysenck studies is specifically geared to the prediction of cancer and cardiovascular disease, it is of interest to consider whether it is related to other typologies developed in English speaking countries. A recent survey by Temoshok (in press) suggests close links. There are similarities between Type A personality and the Type 2 classification, at least as long as we consider the negative apects of Type A. Type B corresponds to Type 4 within reasonable approximation. Temoshok has also suggested, on the basis of her own work, and of a review of research on cancer-psychosocial factor associations, that there existed a 'Type C', different and contrasting with Type A and characteristic of a cancer prone personality. This Type C corresponds quite closely to the Type 1 classification, although Type C is derived from a study of patients already diagnosed as suffering from cancer, while Type 1 is derived from studies where the personality of healthy individuals was assessed and preceded establishment and cause of death. Thus, Type 1 or Type C is related not only to proneness to cancer, but also to the development of cancer. These similarities emerging from widely differing research paradigms, different measurement techniques, and different countries, must be regarded as encouraging for the recognition of psychosocial and personality factors as causal aspects in cancer.

The Type 3 classification seems relatively unattached to disease, and is difficult to relate to more orthodox descriptions of personality. However, terms such as `psychopath' and `personality disorder' spring to mind when examining descriptions of Type 3 individuals. In a more recent unpublished study by Grossarth-Matticek et al, a close relation was reported between Type 3 individuals and sexual behaviour linked with AIDS (large numbers of partners, refusal to use condoms, homosexuality or bisexuality).

Of 16 homosexual probands, 13 were of Type 3, and of 58 bisexual probands, 53 belonged to that type. Equally pronounced was the relative refusal of persons of this type to use condoms, and also the greater promiscuity of Type 3 probands. It seems possible therefore, that Type 3 is related to AIDS and other sexually transmitted diseases, although direct proof of this is still lacking. In addition, it is obvious that in this case, the connection between conduct and disease is much more direct than in the case of cancer or cardiovascular disease.

Prospective Studies On Stress, Personality And Health Disorders

Three prospective studies employing different samples in different countries were carried out in order to collect data on the relationship between the personality types previously described, and the incidence of cancer and CHD.

(i) Yugoslavia Study

The first study took place in Yugoslavia, with a sample of 1353 subjects recruited by selecting the oldest person in every second household in a small Yugoslavian town. Psychosocial data were collected with other medical information. Ten years after initiating the study, a physician assessed the occurrence of different diseases in the sample and also recorded diagnoses from death certificates. This design was considered superior to that used in most of the studies already reported, and avoids most of the criticisms made of work of this nature made by Morrison and Paffanbarger (1981).

The most crucial figures from the Yugoslav study are those which show that of Type 1, 46.2% died from cancer but only 5.6% from CHD. Of Type 2, 8.3% died from cancer, and 29.2% from CHD. Negligible numbers of Types 3 and 4 died of either disease, while those of Type 4 showed a 90.7% survival rate, compared with 56.7% of Type 3, 28.3% of Type 2, and 23.8% of Type 1. These figures are shown in Table 17.

	LIVING	CANCER	CHD	OTHER	TOTAL
TYPE 1	72=23.8%	140=46.2%	25=8.3%	66=21.8%	303
TYPE 2	96=28.3%	19=5.6%	99=29.2%	125=36.9%	339
TYPE 3	123=56.7%	4=1.8%	20=9.2%	70=32.3%	217
TYPE 4	437=90.7%	3=0.6%	8=1.7%	34=7.1%	482
IMPOSSIBLE TO ALLOCATE TO TYPE	6	0	4	4	12
TOTAL	734=54.2%	166=12.3%	156=11.5%	297=27.0%	1353

Table 17 : Deaths from various diseases by personality type in the Yugoslav sample

Schmidt (1984) has carried out large scale factor analytic and correlational studies of the results of the Yugoslav study, and discovered that the resultant factors coincided to a large extent with the a priori scales constructed by Grossarth-Maticek, most of which had reasonably high reliabilities ranging from .79 to .95 . The major scales from the factor analysis were rational-antiemotional behaviour; anger-excitement; harmonisation; hopelessness-helplessness; hypochondriasis; anxiety.

The correlation between helplessness-hopelessness and cancer was .59, and the correlation between cancer and rationality-antiemotionality was .51 . These two correlations confirm very clearly the general hypothesis of the cancer prone personality which has emerged in more testable forms in recent years. A third factor named `harmonisation' (a tendency to shun quarrels and to try to bring about harmony among and with people) also correlated quite highly with the occurrence of cancer to the extent of .49 . Hypochondriasis showed a negative correlation with cancer to the extent of -.39, whilst other factors had much lower correlations and are therefore not included.

		LUNG CANCER DEATHS	OTHER DEATHS	TOTAL
NON-SMOKERS	TYPE 1	1	118	119
	OTHERS	0	550	550
SMOKERS	TYPE 1	31	153	184
	OTHERS	6	482	488

Table 18 : Interaction Of Smoking And Personality Type In The Yugoslavia Sample For Lung Cancer And Other Deaths, Separately For Smokers And Non-Smokers

We should also consider the importance of smoking for the personality type-cancer relationship. Table 18 shows the number of cancer deaths, other deaths and total deaths in the Yugoslav sample, for smokers and non-smokers of Type 1, compared with individuals of the other 3 types. Among non-smokers, there was only one death of lung cancer. For smokers, there were 36 deaths, 31 of which were of Type 1 individuals. These results give rise to an association between Type 1 individuals and lung cancer ($p<.001$). It is clear then, that Type 1 individuals are cancer prone independently of smoking, when compared to individuals of Types 2, 3 and 4.

The synergistic interaction between smoking and typology is also clearly demonstrated here, and will also be demonstrated in the report of a later study. The only group which has a high proportion of deaths from lung cancer is that of smokers of Type 1. Clearly, smoking seems to present a much greater danger to the health of Type 1 individuals than to the health of other types.

This study supports the cross sectional studies discussed earlier and suggests that psychosocial factors, such as stress and personality, may be of considerable value in the prediction of cancer and CHD. In addition, the data further suggest that smoking is statistically less important as a predictor than is personality, but that smoking and personality form a synergistic relationship.

(ii) Heidelberg Normal Sample

Data was also collected from two samples in Heidelberg between the years of 1972 and 1982. The first of the two samples was a random sample, with certain age and sex control specified, but otherwise with subjects selected on a random basis. The sample consisted of 1026 persons, (although there were some losses in this sample reducing the sample to 872), 54% of which were male, and 90% of which were between the ages of 40 and 60. This sample is thus considerably younger than the Yugoslav sample, and was therefore expected to contain fewer deaths at follow up.

	LIVING	CANCER	CHD	OTHER	TOTAL
TYPE 1	78=71.6%	19=17.4%	2=1.8%	10=9.2%	109
TYPE 2	109=64.1%	10=5.9%	23=13.5%	28=16.5%	170
TYPE 3	185=98.4%	0	1=0.5%	2=1.1%	188
TYPE 4	387=99.0%	0	1=0.3%	3=0.8%	391
IMPOSSIBLE TO ALLOCATE TO TYPE	14	0	0	0	14
TOTAL	773=88.6%	29=3.3%	27=3.1%	43=4.9%	872

Table 19 : Deaths From Various Diseases By Type Of Personality In The Heidelberg Normal Sample

Results for this group are shown in Table 19. The survival rate for this sample was, as expected, much higher than the Yugoslav one. The crucial figures are again those showing that of Type 1, 17.4% died of cancer and 1.8% of CHD. Of Type 2, 5.9% died of cancer and 13.5% of CHD. Once again, individuals of Type 4 showed the highest survival rate followed by those of Type 3. In this sample, there were almost as many persons of Type 4 as there were of Types 1, 2 and 3 together. This might suggest that the behaviour associated with disease may not manifest itself until later in life, and we could therefore equate younger people with Type 4, or healthier personality types.

(iii) Heidelberg 'Stressed' Sample

The third sample was selected by members of the normal Heidelberg sample, who were asked to nominate friends or relatives whom they considered as 'highly stressed'. 50% of the sample were male, with ages ranging from 42 to 63 in 90% of the sample. In addition, 231 members of this sample were used for an intervention study using behaviour therapy, som acting as controls and others being included in the experimental group. These subjects were extracted from the sample, leaving a total of 1042 persons.

The results from this Heidelberg stressed sample, shown in Table 20, are very similar to those from the Yugoslav study. Of those persons who were of Type 1, 38.4% died of cancer whereas only 2.3% of Type 2 persons did so. Conversely, 27.8% of those of Type 2 died of CHD, but only 7.0% of those of Type 1. Again, Type 4 persons had the lowest death rate followed by those of Type 3.

As expected in this sample, only a small minority of subjects were identified as Type 4.

	LIVING	CANCER	CHD	OTHER	TOTAL
TYPE 1	188=38.4%	188=38.4%	34=7.0%	79=16.2%	489
TYPE 2	148=47.9%	7=2.3%	86=27.8%	68=22.0%	309
TYPE 3	153=92.7%	4=2.4%	0	8=4.8%	165
TYPE 4	71=97.3%	0	0	2=2.7%	73
IMPOSSIBLE TO ALLOCATE TO TYPE	6	0	0	0	6
TOTAL	566=54.3%	199=19.1%	120=11.5%	157=15.1%	1042

Table 20 : Deaths From Various Diseases By Type Of Personality In The Heidelberg Stressed Sample

One further point remains to be made in connection with the primary purpose of establishing a relationship between stress and disease. In a ten year follow up of the two Heidelberg samples, approximately 40% more died in the stressed than in the normal sample. A further follow up of these two samples was recently completed, extending the total period by another three years. The 40% greater number of deaths in the stressed group was maintained in this additional follow up, again demonstrating the importance of stress-strain for disease and mortality. Being prospective, these studies do not suffer from the usual criticisms made of retrospective studies.

As with the Yugoslav sample, the interaction between lung cancer and smoking showed that the Type 1 group appeared to be particularly at risk for lung cancer from smoking than the other types (see Table 21).

		LUNG CANCER DEATHS	OTHER DEATHS	TOTAL
NON-SMOKERS	TYPE 1	9	227	236
	OTHER	3	297	300
SMOKERS	TYPE 1	37	216	253
	OTHER	0	247	247

Table 21 : Interaction Of Smoking And Personality Type In The Heidelberg Stressed Sample For Lung Cancer And Other Diseases, Separately For Smokers And Non-Smokers

Summary

We might conclude that psychosocial factors, and in particular personality type, are important variables mediating death from cancer and CHD. These personality variables also seem to be more influential than other factors such as smoking. In addition, personality and physical factors appear to interact in a synergistic fashion. These conclusions suggest that theorising of the type "smoking causes cancer" is oversimplistic and unscientific in terms of suggesting a causal link.

Intevention Studies : Prevention And Prophylaxis

The theory underlying the series of studies reported here suggests that personality (organised and regular patterns of behaviour characteristic of a person) is a causal factor in the genesis of cancer. However, all the evidence presented so far deals with correlations, and the postulation of a causal relationship may still be doubtful. Thus, the possibility cannot be gainsaid that cancer may produce changes in personality, and that the long developmental period of cancers prior to their being diagnosed may have been effective in mediating this relationship. The only way in which a causal, as opposed to a correlational relationship may be indicated is by an intervention study. That is, the use of an experimental treatment to change one of the supposedly causal, independent variables, followed by measurement of the effect of this manipulation upon the dependent variable.

A study of this kind was performed using a subsample of the Heidelberg stressed sample. Subjects from this group were randomly divided into a control and a therapy group. The cognitive behaviour therapy used was essentially based on the hypothesis that a relationship existed between personality and cancer. The aim of the therapy then was to change the behaviour of the person from that characteristic of Type 1 to that characteristic of Type 4. In other words, socially acceptable expressions of emotions were encouraged, and the person was taught coping behaviours appropriate to his/her particular experience of stress-strain. Therapy was individual, and attempted to teach coping behaviours appropriate to the individual's particular situation. Although this is as much information as Eysenck gives in reporting this experiment, it is important to emphasise and critically examine it's vagueness. Clearly, some evidence regarding the efficacy of the treatment in modifying Type 1 personality to Type 4 should be presented. Some ethical consideration should also be presented as regards selection of Type 1 subjects for treatment. The basis on which this selection was made is not clear. In addition, although the aim was clear, details of the type of therapy were not given; for example, the type of skills which the subjects were taught, and the period of time for which the thearpy lasted. Evidence of the extent to which these skills were acquired, and of subsequent changes in personality are also conspicuous by their absence. The results of the study, shown in Table 22, therefore represent only final living/death figures as a result of the treatments.

	LIVING	CANCER DEATHS	OTHER DEATHS	TOTAL
CONTROL GROUPS	19	17	14	50
THERAPY GROUPS	45	0	5	50

Table 22 : Deaths In Therapy And Control Groups In Heidelberg Stressed Subsample

The results indicate that of those in the control group (50 subjects), 19 were still living, while 45 (of 50 subjects) in the therapy group were still living. In the control group, 17 died of cancer, compared with none in the therapy group. Eysenck (1987) reports that, as far as cause of death is concerned, these data are still preliminary, and that a careful rechecking is currently underway to certify the correct diagnoses. However, there can be no doubt from the figures that these cancer prone probands (all of Type 1) died predominantly of cancer; that those who received therapy survived much more than those who did not receive therapy; and that the number of deaths in the control group was much higher than would have been expected in a non-stressed sample. This makes the absence of information regarding the details of the therapy given all the more frustrating.

Two further intervention studies have been carried out and reported in the literature (Eysenck, 1987a, 1987b; Grossarth-Maticek, 1986; Grossarth-Maticek et al, 1986). In these studies, 91 cancer prone (from the Heidelberg stressed sample) and 82 coronary prone (from the Heidelberg normal sample) were selected, and in each case divided on a random basis into an experimental and control group. The experimental group received a 'special type' of cognitive behaviour therapy which attempted to change the behaviour of the individuals involved in a direction away from that characteristic of the cancer prone or coronary prone person. What exactly the 'special type' of behaviour thearpy consisted of is open to interpretation, as no details were given as to how this therapy was different from any other behaviour therapy treatments. The criticisms made earlier about the absence of details regarding the precise nature and duration of treatments also applies here. The authors suggested that the treatments were largely successful. In a ten year follow up, it was found that significantly fewer of the experimental group,

RISK: CANCER	ALIVE	OTHER DEATHS	CANCER DEATHS	TOTAL
CONTROL GROUP	25	9	12	46
THERAPY GROUP	40	5	0	45
TOTAL	65	14	12	91

RISK: INFARCT/STROKE	ALIVE	OTHER DEATHS	CHD DEATHS	TOTAL
CONTROL GROUP	20	5	14	39
THERAPY GROUP	34	6	3	43
TOTAL	54	11	17	82

Table 23 : Effect Of Prophylactic Behaviour Therapy On Cancer Prone And CHD Prone Probands

compared with the control group, died of cancer or CHD respectively (see Table 23). This would seem to suggest that the relationship between personality and cancer is not only statistical, but has a causal basis.

Similar to these prophylactic studies is one in which the authors examined the influence of behaviour therapy on the duration of survival in cancer patients (Grossarth-Maticek, 1987). One hundred women suffering from terminal cancer of the breast were divided into four groups of 25 each. One group received neither chemotherapy nor behaviour therapy, while another received both. A third group received only chemotherapy, and a fourth received only behaviour therapy. It would appear that this selection was done on a random basis, although it is difficult to believe that such an experimental design would pass any ethical committee. Table 24 shows the results.

		CHEMOTHERAPY		
		NO	YES	TOTALS
BEHAVIOUR THERAPY	NO	mean=11.28 n=25	mean=14.08 n=25	mean=12.68
	YES	mean=14.92 n=25	mean=22.40 n=25	mean=18.66
		mean=13.10	mean=18.24	GRAND MEAN=15.67

<u>Table 24 : Survival In Months Of Groups Of Women With Cancer Of The Breast As A Function Of Type Of Treatment</u>

In terms of length of survival, the group receiving no therapy did worst, and the group receiving both therapies did best. The groups receiving only one type of therapy showed roughly equal survival lengths, greater than the no therapy group although less than the combined therapies.

There is clearly a synergistic effect. The mean survival time of all patients was 15.7 months, with total survival time varying from 6 to 38 months. In comparison with subjects who received no therapy, chemotherapy alone increased survival by 2.8 months, while behaviour therapy alone increased survival by 3.64 months. It is not stated whether there were main effects for either of these treatments. If the two treatments were additive, one would expect a survival time of 11.28 (no therapy) + 2.8 (chemotherapy) + 3.64 (behaviour therapy) = 17.2 months for the group with both treatments. However, the mean survival time of the combined therapy group was 22.4 months, exceeding the additive value by 4.68 months ($p<.005$). This suggests a positive interaction between chemotherapy and behaviour therapy, and that they operate synergistically.

Finally, in addition to the ethical considerations remarked upon earlier, a number of questions should be raised about the findings from the intervention studies, in order to provide a critical examination as opposed to a simple report of the findings. In particular, none of the intervention studies reported here are replicable on the basis of the information given. Indeed, one cannot help but think that when considering the fact that not one subject survived longer than three years in the breast cancer study (even following treatment), and that a quarter of the subjects received no treatment, then other variables might be involved. The basis on which subjects were allocated to treatments and non-treatment in the breast cancer study was not given, but it would seem likely that the selection was non-random. If this is the case, then the basis of selection should also be considered as an influential variable. For example, did the 25 `no treatment' subjects not want treatment, or were not able to afford treatment. The zero survival rate would also suggest that subjects selected for this study were in the latter stages of the disease with only a poor chance of survival at any cost.

Finally, some critical comment might be levelled at the methods used to define and assess personality types. More specifically, this criticism should be directed at the absence of multivariate techniques in the assessment of personality, namely the combined use of questionnaire and clinical techniques. Should existing techniques of personality assessment be inadequate, the question arises of what is actually being measured. It might therefore be of more use to consider what exactly is meant by 'personality' and then how it could be assessed therough questionnaire and clinical techniques. This becomes more obvious when considering the intervention studies of Eysenck and his associates reported earlier. For example, personality has traditionally been regarded as being of a relatively enduring nature, demonstrating a resistance to change. If this should be the case, then the effect of the behaviour therapy treatments of Eysenck and associates may not have significantly altered personality so much as, for example, mood. In addition, the criticism of the lack of detail of the type of therapy given to subjects in the intervention study becomes more relevant. For example, behaviour therapy may examine and affect behavioural manifestations of personality, whilst cognitive behaviour therapy may alter mood. Substantial changes in personality (ie, enduring traits) in response to relatively short term therapy might therefore not be possible, rather all that might be possible is a change in the emotional tone which affects a person's outlook, namely mood.

A Causal Theory Of Personality And Illness

In spite of the above criticisms, these data are important, both from the practical and theoretical point of view. Theoretically, they suggest that the relationship between personality, and cancer and CHD could well be a causal one. Evidence of such causality would require a general theory from which the relationship could be deduced, as well as proof for the links in the theory which connect personality with disease. An attempt to present such a framework will be discussed shortly.

From a practical point of view, the data suggest that prophylactic intervention is possible and indeed, strongly indicated in the case of Type 1 individuals. They suggest that cancer can be avoided, or at least postponed, by the use of cognitive behaviour therapy. This is an important conclusion, particularly because of the relatively poor evidence often cited in an attempt to show that giving up smoking enables subjects to avoid or postpone cancer.

The theory in question (Eysenck, 1986) essentially maintains that certain hormones and peptides influence both personality and the immune system, thus producing the observed correlation between personality and cancer. The endocrine system in turn, can be influenced by external stress-strain, and by changes in personality-behaviour, such as that produced by changes from Type 1 to Type 4 behaviour.

As an example of the complex interaction between peptides and hormones, we may consider cortisol. Cortisol is known to be related to both depressive feelings of hopelessness-helplessness, and to immunosupression. There is evidence to show that when stressors lead to strain reactions, there is a decline in activity of natural killer cells (for example, Levy et al, 1985; Levy et al, 1987). Thus, it seems possible that people who are genetically predisposed to react to stress and strain with feelings of depression and helplessness-hopelessness increase their cortisol level and thereby produce immunosupression, lowering natural killer cell activity. In this way, strain and cancer might be related along a perfectly intelligible chain of reactions.

A fuller account of this theory is to be found in Eysenck (1986), but it should be noted that cortisol here only represents a very complex and interacting chain of peptides and hormones, including among others, ACTH and the endogenous opiates. It is not within the scope of this study to examine the theory in more detail. It is only mentioned to demonstrate that a relationship between personality and cancer is at least theoretically plausible.

Direct evidence that cognitive behaviour therapy can not only affect morbidity, but can also affect cortisol levels, is given by Rodin (1984, 1986). She gave such therapy to one group of elderly females and no treatment to control groups. The studies were successful in showing that the therapy group did much better in terms of both survival and reduced cortisol levels.

It should be noted however, that much of the work on the personality, stress-strain, disease interaction, and the theory outlined above is based on the initial investigations reported here, and should therefore be utilised as a basis for future research and modification.

Statement Of The Problem And Hypotheses

The purpose of the second part of this study was to examine the association between personality characteristics which lead to disease and the flow theory, in terms of the facilitation of physical and mental health.

Experiment Three

Having employed a formal examination of the flow theory to establish a basis for understanding the factors which underlie the flow experience, it was proposed to use this information in examining how often people experience flow, and across how wide a variety of situations this could occur. Using the ESM technique, it should be possible to identifysubjects who experience flow often and across a wide range of activities (ie, wide flow profiles), and those who experience flow less often and across a narrow range of activities (ie, narrow flow profiles).

It was therefore hypothesisedthat if it was possible to identify such groups of people, then these people should also demonstrate crucial individual differences in both the ability to cope with stressful situations, and also in terms of personality variables.This latter hypotesis was based upon the notion that if people are able to enter the flowchannel across a variety of situations, then they must have some type of flexible strategy for changing their perceptions of events so as to make them flow events. Consequently, individual differences which may be demonstrated in the experience of flow may also manifest themselves in personality differences, and also in vulnerability to stress related health disorders (cf Eysenck, 1987).

It was therefore hypothesised that it would be possible to show howthw experience of flow was related to personality and proneness to health disorders. More specifically, those identified as autonomous by the Eysenck personality assessment method should also show wider flow profiles, and in turn, be able to cope more effectively with naturally occurring stressful events. Conversely, it was expected that people identified as 'at risk' in Eysenckian terms, would demonstrate less intense flow and a poorer ability to cope in stressful situations. At this point, no causal links between ability to experience flow, ability to deal with stressful events, and personality are made.

CHAPTER 11

AN EXAMINATION OF THE IMPLICATIONS OF THE FLOW MODEL FOR HEALTH AND STRESS

EXPERIMENT THREE

Experiment Three was designed to examine the relationship between the variety of situations in which people experience flow and their ability to cope with a naturally occurring stressful event. It was hypothesised that subjects with a wide `flow profile' would be better able to deal with the naturally occurring stressful event (by perceiving it more positively). It was also hypothesised that subjects with a wide `flow profile' would be better equipped to cope with a wide variety of naturally occurring stressful events, so that they would therefore have a healthier personality profile in terms of vulnerability to stress related diseases.

Methodology

Subjects : Consisted of a stratified random sample of 80 subjects - 40 undergraduate students from the population of Physical Education students at U.C.N.W.Bangor about to undertake their end of year degree examinations (a naturally occurring stressful event), and 40 randomly selected adults.

Questionnaires : The questionnaire used to obtain self-reports of both random and specific experiences was the Experience Sampling Method questionnaire (Larson and Csikszentmihalyi, 1983), details of which have been given elsewhere in this thesis. This was used in preference to Privette's (1984) Experience Questionnaire because it was designed specifically for use as an instrument to collect random data. Privette's Experience Questionnaire is primarily designed to collect retrospective data on not only flow, but other experiential phenomena, and is also much longer, therefore taking considerably more time to complete.

The devices used to assess `coping' were the revised

Worry-Emotionality Inventory (Morris, Davis and Hutchings, 1981), which is designed to assess test anxiety (see Appendix 22), together with each subject's examination performance score expressed as a proportion of their coursework percentage, and an attentional effort cost score obtained through anagram solution times using the methodology of Sothmann, Hart, Horn and Gustafson (1988) (see Appendix 23). The final questionnaire used to classify subjects according to vulnerability to disease was Grossarth-Maticek et al's (1987) questionnaire which was described earlier (see Appendix 24).

Experimental procedure : The design of the experiment involved three phases. Initially, all 80 subjects received eight copies of the ESM self-report form to be completed during (if at all possible) or immediately following specific activities considered to represent particular balances and imbalances of challenge and skill. Subjects were required to complete a self-report form on two separate occasions for each type of activity specified. These were :

1. During or following something you are very good at;
2. During or following something you find very difficult;
3. During or following an unstimulating or mundane work activity;
4. During or following a recreation or leisure activity;

Subject instructions are included in Appendix 20.

On completion of this part of the study, subjects were given a booklet containing 30 copies of the ESM self-report form to be completed at random times over a five consecutive day period (six self-reports per day). Because it was not possible to replicate previous ESM studies which utilised paging devices to signal subjects when it was time to complete a form, the times for each subject to complete the forms were specified in advance. In addition to the obvious disadvantages, this method did have one advantage in that it gave subjects a record of completion times if for any reason they had to complete a form retrospectively. This was not the case with the paging method if, for example, a subject left his/her paging device at home. Because of the unavailability of paging devices, subjects were explicitly requested not to base their behaviour upon questionnaire completion times. Although random paging clearly controls this problem, it was hoped that subjects would not modify their behaviour because of the impending completion of any ESM forms.

In order to achieve as many random yet reliable self-reports as possible, the sampling was based over a five day period (Monday to Friday) with six times specified per day, between the hours of 9am and 9pm. This meant completing one self-report form for every two hour period: 9am-11am, 11am-1pm, etc. These times and hours were chosen so as not to place unreasonable time constraints upon subjects, notably during their free time at weekends. The precise random timings are given in Appendix 20. Finally, it was hoped that a full range of activities would be achieved by the use of the additional eight structured situations.

The study therefore obtained 38 self-reports per subject in order to assess the extent to which subjects experienced flow as part of their everyday lives. This can be compared with total numbers of 30 (Csikszentmihalyi, Larson and Prescott, 1977), 43 (Csikszentmihalyi and Graef, 1980), 44 (Csikszentmihalyi and Figurski, 1982) and 30 (Larson and Csikszentmihalyi, 1978) reports per subject used in previous ESM studies, although as mentioned elsewhere, these studies did not attempt to construct flow profiles from the ESM data.

For the next part of the study, it was considered that the end of year degree examinations provided an ideal opportunity to test the `coping hypothesis' with the student subsample. Each subject's first examination of the year was selected, as it was considered that this would probably provide the most stressful event.

Approximately thirty minutes before their first examination was about to start, subjects were taken into a quiet room, and given the Worry-Emotionality Inventory to complete (see Appendix 22). They were asked to return to the room immediately after the examination had finished.

The post examination data collection was based on anagram solution times which were then used to assess attentional cost in terms of the effort required by the the previous task (ie, the examination). The methodology of Sothmann et al (1988) was altered slightly to enable the relatively large number of subjects to be group tested. The subjects were presented with a set of three anagrams, each of five letters which, when placed in the correct order would spell an English noun. Each anagram was presented one at a time on an overhead projector. All anagrams were soluble, with only one possible solution to each anagram. A clock with a sweep second hand was placed at the front of the room. Subjects were presented with the anagram and given a time limit of 100 seconds to find the solution. They were instructed not to write anything down until they thought they had the solution (ie, they were not allowed to juggle the letters on paper). Once they had an answer, they immediately noted down the time elapsed, and then the solution which was checked by one of two arbitrators. If, for any reason their solution was incorrect, they continued until they reached the correct solution, or 100 seconds of time on the task had elapsed (ie, the time at which they restarted was noted and an appropriate period of time was added on at the end of the 100 seconds). A break of 20 seconds was used between each pair of anagrams.

Only one set of three anagrams was used, firstly to eliminate further time restraints on subjects, and secondly because significant effects in the Sothmann et al (1988) study were found only for the first set of three anagrams from the nine anagrams presented (three blocks of three). The full subject instructions for this phase are shown in Appendix 22.

The three anagrams used were:

D M L O E (MODEL)

G S R U A (SUGAR)

C B N A O (BACON)

A pattern was involved in all three anagrams which formed part of the solution, in which the first letter of the anagram was the third letter of the solution, the second letter of the anagram was the first letter of the solution, the third letter of the anagram was the fifth letter of the solution, the fourth letter of the anagram was the second letter of the solution, and the fifth letter of the anagram was the fourth letter in the solution. For example:

Anagram	D M L O E	=	M O D E L	Solution
	3 1 5 2 4		1 2 3 4 5	

To examine the `health' part of the hypothesis, each subject completed Grossarth-Maticek et al's (1987) personality and proneness to stress related illness questionnaire following completion of all other data collection. Subjects were then allocated to one of the four types on the basis of their highest score (ie, positive responses).

Results And Analysis

(i) The ESM Data

In order to calculate factor scores, each subject's response matrix to the 30 random and 8 specific self-report forms (a total of 26 items X 38 self-report forms) was multiplied by the factor score coefficient matrix obtained from the Experiment Two ESM factor analysis. the programme used for this manipulation is contained in Appendix 21. The programme incorporates the 26x3 factor score coefficient matrix, and allows the 38x26 raw score matrix (ESM responses) to be input. The subsequent matrix algebra resulted in a 38x3 matrix, giving factor scores on each of the 3 ESM factors (intensity of flow, coping, motivation) for each occasion on which the self-report form was completed. Each subject therefore submitted data which was transformed into 3 factor scores for each self-report form, resulting in 40 factor score matrices. These figures are not reproduced here for the sake of brevity. The factor scores were then handled as follows.

Factor 1 (intensity of flow experience) was used in its raw state. Subject's scores on this factor were simply added together to give an indication of the total intensity of flow experiences for each subject, with larger scores indicating a greater intensity of flow experiences. Factor 1 was treated differently to Factors 2 and 3. With Factor 1, as scores increase they are regarded as getting better since they represent a progression from microflow towards macroflow (see Figure 11). However, Factors 2 and 3 are conceptualised as cutting through the flow channel (see Figures 12 and 13). Because of this, the following rationale was used to treat the Factor 2 and Factor 3 data.

Taking the experimental population into account, it was considered reasonable to suppose that the 30 self-report forms completed by each subject at random times should consist of half situations in which ability exceeded demands, and half situations in which demand exceeded ability, the basis of this assumption simply being the random nature of the design. Consequently, the mean Factor 2 and Factor 3 scores for the 30 random reports from all the subjects was used to determine new "origins" for Factors 2 and 3. Of course, the assumption that half the random situations represented an ability surplus and half a demand surplus may not hold for all subjects. In particular, for example, one would not expect it to hold for subjects who were suffering from mental disorders. However, in line with the usual randomisation argument, the random nature of the sample selected from a normal population of healthy people should ensure that any such individual biases cancel one another out when the mean of the factor scores for all 30 subjects was computed (for example, a low skilled individual should be countered by a high skilled individual in a random sample). Consequently, these means were taken to represent the new `zero points' for Factors 2 and 3, and subject's Factor 2 and 3 scores were then transformed into the modulus of their deviation about these points, thereby indicating how far from the point of balanced ability and demand each factor score was. Although this manipulation applies a relatively arbitrary method of setting limits, if the theory under question is to be applicable, then it has to be anchored somewhere, otherwise, it is untestable. In this instance the theory was anchored to the sample mean of all the subject's 30 random reports.

The statistical procedure can be summarised as follows: Factor 1 scores were totalled for each subject. This total score then represented the intensity of the flow experience, the higher the score, the more intense the experience. For Factors 2 and 3, the mean score for all the subjects in all the 30 random situations was calculated. Each subject's factor scores were then transformed to the absolute deviation about these points. Each subject's 36 factor scores were then totalled to give scores of how far from the point of ability-difficulty equilibrium each subject was on average; that is to say, how far from the flow channel they 'lived'.

(ii) The Flow/Coping Regression Analysis

Using the 3 ESM factor scores, and the pre- and post-examination questionnaire `coping' data from the 40 subjects in the student sub-sample, a regression analysis was performed with the coping data as the dependent variables, and the flow factors as the independent variables. The correlation matrix from this analysis is shown in Table 25. The values reported in this table indicate only low to moderate relationships (Morehouse and Stull, 1975), so that it is perhaps not worth pursuing these figures any further at this stage.

	FLOW1	FLOW2	FLOW3	WORRY	EMOT	ANAG	PERF
FLOW1	1.000	.178	.136	-.002	.155	-.034	-.045
FLOW2		1.000	.306	-.360	-.224	-.451	.094
FLOW3			1.000	.185	.004	.015	-.045
WORRY				1.000	.475	-.074	-.324
EMOT					1.000	-.190	-.204
ANAG						1.000	.083
PERF							1.000

Table 25 : Flow/Coping Stepwise Regression Anaysis Correlation Matrix

Table 26 summarises the stepwise regression analysis for each of the dependent variables against the flow factor scores.

Dependent variable - WORRY

Variable(s) entered on Step 1...MFLOW2

		ANOVA			
Multiple R	.36000		df	Sum of Sq	Mean Sq
R Square	.12960	Regression	1	90.19851	90.19851
Stand Error	3.9927	Residual	38	605.77649	15.94149

F = 5.65810 Sig of F = .0225

Variable(s) entered on Step 2...MFLOW3

		ANOVA			
Multiple R	.47529		df	Sum of Sq	Mean Sq
R Square	.22590	Regression	2	157.21789	78.60894
Stand Error	3.81589	Residual	37	538.75711	14.56100

F = 5.39859 Sig of F = .0088

Dependent variable - EMOTIONALITY

No variable(s) entered for this block

Dependent variable - ANAGRAM PERFORMANCE

Variable(s) entered on Step 1...MFLOW2

Multiple R	.45072	ANOVA			
R Square	.20315		df	Sum of Sq	Mean Sq
Stand Error	58.37449	Regression	1	33011.915	33011.92
		Residual	38	129488.059	3407.581

F = 9.68779 Sig of F = .0035

Dependent variable - EXAM PERFORMANCE

No variable(s) entered for this block

Table 26 : Flow/Coping Stepwise Regression Analysis Summary

The nature of the stepwise rgression analysis is to terminate once a step is non-significant. These results indicate that neither of the two dependent variables, emotionality and examination performance, had significant predictors amongst the flow factors. Worry was shown to have two significant predictors on flow factor 2, ($p<0.0226$), and flow factor 3, ($p<0.0089$), whilst anagram performance had one significant predictor in flow factor 2 ($p<0.0036$).

Discussion Of Flow And Coping

In interpreting the findings of the stepwise regression analysis, the results will be discussed in terms of the use of the flow factors to predict coping abilities. It would appear that intensity of flow (Factor 1) was not a useful predictor on any of the coping measures. Factor 2, which is concerned with coping in perfommace terms, was, not suprisingly, a significant predictor of both worry and anagram perofrmance. This would therefore seem to be an important factor in considering how people deal with stressful situations. Factor 3, the motivational factor, was a significant predictor of worry, with greater motivation reflecting less worry.

These results might also be studied from the perspective of the coping variables. For example, worry could be significantly predicted by ability to cope and level of motivation, whilst attentional cost might also be predicted from coping ability.

In addition to these explanations of the findings from the stepwise regression analysis, we should also consider the extraneous variables which might have influenced the results, as field studies are often subject to uncontrollable and extraneous variables. For example, the lack of significance in flow factor predictors of examination performance may have been caused by several variables, not the least of which is ability.

Performance on the anagram test simply provided an indirect assessment of attentional effort, which may have also been contaminated by any number of variables between the time subjects finished their examination (it was noted that some chose to leave early and had to wait to be tested) and the testing period. Biochemical assessment of catecholamines through blood or urine sample might be a reasonable recommendation for similar field studies in the future.

State measures of test anxiety were measured by the Worry-Emotionality Inventory, is a very specific situation in which to look at coping skills. Consequently, whilst people may cope well in general, they may cope poorly in this situation because the demand is out of their control. In terms of the flow model, they may be good at getting themselves from a state of boredom into flow (by increasing the demands or reducing their skill level), but not as efficient in getting from anxiety to flow, by reducing the demands (which may not be possible if the demand is regarded as out of their control). Future recommendations might therefore include restricting the situations across which flow profiles are constructed, thereby making them more situationally specific. Alternatively, coping could be assessed across a wider range of situations. This would differ from the Eysenckian view of coping as his studies were about retrospective anxiety and strain rather than prospective anxiety regarding a forthcoming event.

The construction of flow profiles across more specific or wider ranges of situations might counterbalance the possibility that at least some of the subjects with wide flow profiles in this study were simply lucky with the times specified in the random self-report forms. It may be that some do not actually possess flow skills so much as they have been very fortunate in their experiences of life (or at least those they reported). This background may help them to cope with disasters when they occur, but may not help them to stop worrying about them occurring. This would be similar in a way to the finding from the next part of the study which characterises Type 2 subjects as coping at a cost to health.

There may, of course, be aspects of coping which have not been considered; for example, self-efficacy, attribution of performance results, or coping with failure feedback. Indeed, it may be that some of these would better reflect flow experience, although it has to be admitted that a fundamental prediction of the model should be that people who are able to put themselves into flow should experience less anxiety. Perhaps the perceived external locus of control of goal difficulty is too strong in examinations for many subjects to move themselves back into the flow channel.

(iii) The Flow/Personality Analysis

The allocation of subjects to one of the four types of Eysenckian personality classification was done on the basis of each subject's highest score on the four types described by the Grossarth-Maticek et al (1987) questionnaire described earlier. Of the 80 subjects, 60 were allocated to Type 4, 12 were allocated to Type 3, and 8 were allocated to Type 2. No subjects were allocated to the Type 1 personality, a finding which could have important implications for the randomness of the sample, and will be referred to at various points in the report of this study.

A single factor MANOVA of the 3 ESM factor scores by Eysenckian class was performed on the data from all 80 subjects in this sample. However, a minor modification was made to the ESM data for this analysis. The analysis of coping and flow utilised the modulus of flow factors 2 and 3, as the hypotheses were concerned with deviations from the flow channel. In this part of the study, the hypotheses are not so much concerned with relative distance from the flow channel as with which side of the flow channel the subjects were on in order to make comparisons with Eysenck's personality classifications.

The MANOVA revealed a significant 'Eysenck personality' effect; $F(6,231) = 6.34448$, $p<0.001$, indicating that there were significant differences in the flow factor scores as a result of the Eysenckian personality classifications (see Appendix 25, Table 1). Subsequent univariate tests revealed a significant `Eysenck' effect for ESM Factor 1; $F = 14.67$, $p<0.001$ (see Appendix 25, Table 2), suggesting that there were significant differences in the intensity of flow experience between the Eysenckian personality groupings. A significant `Eysenck' effect was revealed for Factor 2; $F = 7.63$, $p<0.002$ (see Appendix 25, Table 2), suggesting that there were significant differences in coping performance between the Eysenck personality groupings. Finally, a significant `Eysenck' effect was also revealed for Factor 3; $F = 6.34$, $p<0.004$ (see Appendix 25, Table 2), suggesting that there were significant differences in motivation associated with the challenge of the task between the Eysenckian groupings.

Newman Keuls follow up tests were performed on the group scores for each ESM factor (see Appendix 26). Factor 1 follow up tests indicated that both Types 2 and Type 4 reported a greater intensity of flow experiences than Type 3 subjects (see Table 27). However, Types 2 and 4 were not significantly different from each other.

EYSENCK CLASS	FACTOR 1	N OBS
2	36.106	8
3	22.757	12
4	36.254	60

Table 27 : Factor 1 Scores (Intensity Of Flow Experience) And Eysenck Typologies

Newman Keuls follow up tests on the Factor 2 scores similarly revealed that Types 2 and 4 coped significantly better than Type 3 subjects (see Table 28). Again, Types 2 and 4 were not significantly different from each other.

EYSENCK CLASS	FACTOR 2	N OBS
2	-.108	8
3	-10.757	12
4	.8188	60

Table 28 : Factor 2 Scores (Coping In Terms Of Performance) And Eysenck Typologies

The Factor 3 follow up tests indicated that Type 3 had significantly lower motivation than Type 4s. Type 2s were marginally less motivated than Type 4s, but there was no significant difference between Types 2 and 3 (see Table 29).

EYSENCK CLASS	FACTOR 3	N OBS
2	-6.794	8
3	-10.46	12
4	2.996	60

Table 29 : Factor 3 Scores (Motivation Associated With Challenge) And Eysenck Typologies

Discussion Of Flow And Personality

In interpreting the results from the flow and personality analysis, two sets of causal explanations will be considered. Firstly, each of the Eysenckian typologies will be discussed in terms of the possible influence of the three flow factors upon them. Secondly, each of the ESM factors will be discussed in terms of the significant differences and similarities which could be caused by the Eysenckian personality variable. In other words, the discussion will consider the relationship between personality and flow in terms of the two possible causal perspectives (flow --> personality, and personality --> flow).

(i) Flow --> Personality

Considering the Type 1 classification first, the problem immediately arises that no subjects were classified as Type 1. This might suggest that the sample used was not representative. Furthermore, as the analysis of ESM factor scores was based on the assumption that the sample was random, this casts doubt over the whole experimental design. The sample was not selected following Eysenckian personality/illness prone classification, but classified following random selection. To justify the randomness of the sample, it would be necessary to establish what percentage of the whole population is cancer prone, and then decide whether or not this sample is representative of the population. We might also question the appropriateness of Eysenck's classification of individuals as cancer prone, and raise criticisms of his definition of cancer prone probands. Alternatively, it might be worthwhile to justify the randomness of the present sample by suggesting that if the sample was selected to include examples of each personality/disease type, then the sample could well be biased and unrepresentative of the population. However, the most plausible explanation of the absence of Type 1s from the sample is that Type 1 behaviour is age related (see the results of Grossarth-maticek et al's Heidelberg and Yugoslavian studies presented in Tables 17 and 19). This would have considerable bearing on the issue because of the age range of the present sample. For example, the 40 student subjects may not display Type 1 characteristics because of their age. To a lesser extent, the additional 40 subjects may not have `developed' Type 1 behaviour for the same reason. Unfortunately, data regarding age was not collected from the subjects. The absence of Type 1s seems most likely therefore to reflect an absence of `older' people in the sample.

Considering Type 2s next, the subjects classified in this group experienced intense flow, thought they coped well in terms of performance, but had a negative regard for the demands of whatever tasks they were involved with. In Eysenckian terms, such a negative regard for their environment may lead to anger and aggression as a result of their efforts to cope successfully, but at a cost to health, which is along similar lines to the Ivancevich and Matteson (1988) line of thought regarding Type A behaviour. These people were unmotivated by the demands in their environment, and it may be that they regard the environment as the cause of their distress (which is typical of Eysenck's - 1987 - Type 2 classification) - this is in spite of still being able to deal with the demands. What seems most likely is that Type 2s appear to exhibit the negative characteristics of Type A behaviour with which Type 2 is compared, in terms of their aggressive and hostile behaviour (for example, compare Eysenck, 1987; and Ivancevich and Matteson, 1988).

The Type 3 subjects in this study seem to conform with the description given earlier by Grossarth-Maticek et al (1987). In terms of the factors identified earlier, these people's experience of flow was less intense, they had a negative response to challenge, and also coped poorly with such challenge. They appear to have had poor control over their environment, and their response to the environment. Where results from the Type 2 subjects suggested that they were able to cope, albeit at a cost to health, the Type 3 subjects in this study coped poorly. This poor coping and generally negative response to challenge seems to reflect a shift towards hopelessness/helplessness at least some of the time, and it may well be that as such individuals get older, some of them will eventually become fully fledged Type 1s. It is also worth noting that this linking between coping, motivation and helplessness is very similar to the learned helplessness and attributional ideas forwarded by Forsterling (1980, 1985).

Finally, the Type 4 subjects also seem to correspond with the predictions of the Eysenckian typology. They experienced flow more intensely, coped positively with their performance, and had a positive motivational response to challenge. This indicates a positive view of themselves and their environment, and reflects a strong degree of personal control (Hamilton, 1981). To achieve this personal autonomy, they may, for example, regulate themselves, or cognitively restructure the task/environment to experience flow (for example, Lazarus, 1976). In terms of Selye (1979), they may be able to change a threatening, stressful situation into a more useful situation by perceiving the stressor differently (such that potential distress becomes eustress). This personality characteristic appears to be absent in the disease prone typologies presented by Eysenck and colleagues (1987).

(ii) Personality --> Flow

If Factor 1, which indicates the intensity of the flow experience, is considered first, it appears that individuals of Types 2 and 4 experienced significantly more intense flow than persons of Type 3. There were no significant differences in intensity of flow experience between Types 2 and 4. It could be hypothesised that Type 4 individuals might experience more intense flow as a result of their autonomous personality characteristics (Grossarth-Maticek et al, 1987). Regardless of whether the intensity of flow influences personality or vice versa, this finding at least suggests that healthy and desirable personality characteristics are related to the experience of flow.

In attempting to explain the lack of significant differences between Types 2 and 4, it might be enlightening to turn to a comparison of Types 2 and 4 with Type 3 individuals. Persons of Type 3 were shown to experience significantly less intense flow than Types 2 and 4, perhaps demonstrating more of the understimulation typical of Type 1 which would no doubt result in less intense flow. Alternatively, one might argue a clearer case for the absence of sgnificant differences between Types 2 and 4 if one considers that the intensity of the flow experience is a result of the Type 2 `overaroused' behaviour characteristic (Grossarth-Maticek et al, 1987). As Type 2 has been compared with Type A behaviour (Temoshok, in press) which is typified as hard driving and competitive, intensity of experience would seem to be a not unreasonable result of such behaviour, ie, their flow intensity is the result of generally intense and overaroused behaviour.

Factor 2 (coping in terms of performance) showed similar results to Factor 1; Types 2 and 4 were not significantly different in coping, although both coped significantly better than persons of Type 3. This factor was measured differently from Factor 1, being based around the whole sample mean, so it may be concluded that the mean Type 3 factor score is indicative of coping less well in terms of their performance when compared with Type 2 and 4 individuals.

The results suggest that Type 2 subjects have become so wrapped up in behavioural activity and trying to achieve their goals (a characteristic of these types) that they are unable to perceive of coping in anything but behavioural terms (which in any case, is all that Factor 2 measures), and do not recognise the potential cost of their intense and overaroused behaviour. Type A behaviour has been shown to involve the setting of difficult task completion goals (Snow, 1978), and persistent and enduring behaviour to complete tasks (Glass, 1977), which would seem to confirm this viewpoint. In summary then, the Type 2 individuals may cope behaviourally, but the result of their coping behaviour may be negative in health terms.

The lack of coping indicated by the Type 3 factor score could be due to the constant switch from overaroused to understimulated behaviour. However, it seems more likely that the influence of the Type 1 behaviour (hopelessness/helplessness) is instrumental in shaping coping ability, or more precisely, a lack of coping responses. The recent finding that Type 3 seems to be related to the more orthodox personality characteristics of psychopathy and personality disorder (Grossarth-Maticek and colleagues, unpublished), would also seem to support this point of view. The notion that psychopaths may also be unable to cope in terms of performance is an interesting one which will not be considered further in the context of this study.

Finally, Factor 3 showed that in terms of factor scores, there was no significant difference in motivation associated with the challenge between Types 2 and 3, although Type 3's showed significantly less motivation than Type 4's. Type 2's also had marginally less motivation than Type 4's (approx $p<.06$). As Factor 3 refers to the motivational response to task demands, it can be observed that individuals representing Type 4 showed a more positive response to the demands of the task than individuals of Types 2 and 3. In addition, Type 2 and 4 people reported factor scores which represent not only a significantly better response to task demands, but also a positive response.

Again, considering the possibility that emotional and motivational response to task demand and personality may have a reciprocal relationship, it appears that the healthy personality type is associated with a positive response to task demands, possibly as a result of their positive regard for their own autonomy as being the most important condition for their well-being (Grossarth-Maticek et al, 1987). It was also shown that the disease prone personalities were associated with a less positive response to task demands, and therefore an inability to deal with the stress, which according to the Type A and Eysenckian theories, leads to illness.

Factor 3 provides a clear distinction between the healthy personality type (Type 4) and the two disease prone types (Types 2 and 3). It seems to confirm the suggestion made in the discussion of the previous two factors, that the Type 2 classification might actually contain both positive and negative aspects of healthy behaviour, with Type 2s experiencing intense flow and coping at a cost to health.

In any case, whatever conclusions may eventually be drawn about the Type 2 classification, Factor 3 is concerned with subjects' perceptions of their environment on a continuum from interest to boredom. Furthermore, this perception and the subsequent responses to the environment are a the crucial issue in differentiating between Type 2 and Type 4 personalities. Ultimately, one must conclude that the Type 4s may be able to deal with the complexity of any situation by virtue of their autonomy preserving ability (Eysenck, 1987; Grossarth-Maticek et al, 1987). By adjusting their personal goals, they might regard any amount of demand in a situation as motivational, whilst not being disinterested in situations where the challenge is too easy or too difficult. In terms of the flow model, they should be able to regulate either their personal skills or their perception of the environment in order to enter the flow channel in any activity (in a similar fashion to the example shown in Figure 5). This appears not to be the case for Type 2 and 3 individuals.

If these typologies and their implications are correct, then as predicted by Eysenck (1987), Types 2 and 3 are characterised by a negative view of the environment. Type 2s may regard their environment as demanding and unmotivating, yet they may see themselves as being able to cope despite this by working intensely hard. Conversely, the Type 3 classification is an example of individuals who have have negative regard for task demands, and whose performance focused coping is also poor.

In conclusion, this study has shown a relationship between the flow experience, ability to cope in stressful situations, and stress related personality characterisics. The question which is perhaps most pertinent following the second part of this experiment is whether personality dimensions determine the extent to which people experience flow, or the extent to which flow is experienced regulates personality. This discussion has attempted explanations from both causal perspectives with the result that neither appears to be more convincing than the other. It may therefore be of more use to recommend the consideration of processes by which personality and health interact in a reciprocal or cyclical manner as opposed to a directly causal one, although this will not be dicussed any further here. In this way, life and daily experiences might be seen to effect changes in mood and affect, whilst at the same time, the reactions of individuals to their environment may shape their experiential state.

Methodological And Design Issues

At this point, we should consider some of the methodological and design issues which were raised by this experiment. Firstly, the attribution of personality types to individuals in the sample. As the sample was randomly selected from a population of Physical Education students in one instance, and the general public in the other instance, prior to data collection, there was no pre-selection according to attributions on the personality scale. The resulting distribution showed an absence of Type 1 individuals and an abundance of Type 4 individuals. The randomness of the sample is of the utmost importance, as the analysis of ESM data was based on the assumption that the sample was random. If the sample was unrepresentative, then the design and statistical treatment of data would not be valid. However, as has already been pointed out, the absence of Type 1s does not neccessarily mean that the sample was not random. Obviously, the point of contention here is to establish what exactly is a random sample.

In addition to the absence of Type 1s, there also seemed to be a bias towards Type 4 individuals in the sample. The idea that the Eysenckian personality classifications might be influenced by age has already been considered. As half of the sample was taken from the population of undergraduate Physical Education students at U.C.N.W. Bangor, it might well be hypothesised that these subjects would demonstrate healthy personality characteristics (high self esteem, personal efficacy, locus of control, etc). We might also consider the implications of sport and exercise in the prevention of stress related illness via personality. Again, this issue will be discussed in detail later.

Although the abundance of Type 4s and relative absence of disease prone typologies may be due to the fact that the disease prone personalities do not develop until mid or old age (Ivancevich, Matteson, and Preston, 1982) it may simply be the case that most people are healthy, and that the present findings should not be treated with such suspicion. Indeed, a recent study by Hardy, Parfitt and Baker (1989) also found relatively few Type 1s in a sample of 75 police officers (mean age 35 years). Although the non student sample was generally older, age was not considered in selection of the sample, or recorded from the subjects. This might be considered in future research, although pre-selection according to personality type would almost certainly constitute a sampling bias.

Some comment should also be made about the effectiveness of the signalling method used in the present study because it differed from that which has been used in previous ESM research. Providing subjects with a record of times gave some indication in advance, which could be referred to at any time, particularly in the case of them missing a time. By doing so, it was hoped to eliminate the possibility of subjects forgetting paging devices or ignoring signals. With this method, subjects at least had a time to which they could refer should they have to complete a report retrospectively. Although retrospective reports were criticised earlier in this work, such reports were considered preferable to losing a report altogether. It was also considered that subjects would comply with the request to not base their behaviour on the report completion times because it would be very impractical to do otherwise with so many self-report forms to complete.

Summary And General Discussion Of Experiment Three

Experiment Three of this study used an original method of constructing `flow profiles' to assess the extent to which, as well as the range of situations across which, subjects experienced flow and intrinsic rewards in everyday life. Utilising data considered to reflect subjects' ability to cope effectively with stressful events and their vulnerability to health disorders (through the interaction of psychological and psychosocial factors), the results demonstrated the positive nature of the flow experience in everyday life. In particular, encouraging results were forwarded to support the notion of a relationship between flow and desirable personality characteristics, and their subsequent interactive role in the psychology of health.

This would seem to be an appropriate point to emphasise that this relationship would appear to be a cyclical one. Convincing and logical evidence was offered regarding both possible directions of causality with the result that the notion of a cyclical theory, whilst not making a specific statement, satisfactorally encompasses the theories behind both directions of causality. What is clear is that personality factors play an important role in the determination of behaviour and flow experiences, as attempts by Eysenck (1987) to modify personality have suggested. Likewise the experience of flow and intrinsic rewards via positive (and negative) life events as suggested in Chapter 8, is likely to be realised in terms of individual differences in personality; for example, changes in personality following significant negative life events such as the death of a partner, although generally speaking, there is little research evidence regarding the effect of experience upon personality.

The overriding inference from this study and it's examination of the interaction of personality factors and well-being is that there is a clear relationship between the two. Although this relationship is essentially reciprocal, there is too much evidence to ignore regarding the vulnerability of certain types of behaviour and personality to health disorders; for example, the Type A behaviour pattern (Ivancevich and Matteson, 1988) and those identified by Eysenck's (1987) classification as Types 1 and 2. The more desirable characteristics of less vulnerable behaviour (Type B and Type 4) can be summarised by the fact that both emphasise personal control and personal autonomy. In the words of Deci (1975), competence and self-determination play an important role in the personality characteristics of healthy individuals, and it may therefore be that healthy individuals are also able to perceive intrinsic rewards in the environment or in their behaviour. This would seem to be confirmed by refering to the high levels of coping and motivation shown by Type 4s in this study.

Vulnerable types (Type A and Type 1 and 2) show a lack of autonomy through a dependence on other valued persons or objectives. The failure to disengage from these goals (which may be labelled stressors) results in strain which subsequently manifests itself in disease (Eysenck, 1987). This indicates a second distinction between the healthy and vulnerable personality types; ie, the ability to cope successfully with stressors (cf. Eysenck's Type 4 with Types 1 and 2).

Finally, some further comment should be made regarding the influence of age upon the Eysenck proneness to disease classification. The abundance of Type 4s in this study and absence of Type 1s has already been discussed in terms of the vaidity of the random nature of the sample. Unfortunately, with only one other study with which to compare (Hardy, Baker and Parfitt, 1989), this issue is one upon which only tentative hypotheses might be made. Although age has been mentioned as one possible influence, other factors which might be considered to contribute to the manifestation of disease prone behaviour later in life may be negative life events (death of relatives), personal responsibilities (marriage, children, mortgage), a perceived lack of control, and attributions to an external locus of causality. Nevertheless, Hardy, Baker and Parfitt (1989) did report that only a very small percentage of their sample (mean age 35 years) had an Eysenckian classification of Type 1.

Research Implications

It would seem apparent form the research literature and particularly the evidence presented in this study, that the flow concept and theory may be able to contribute significantly to research in personality and health disorders. Perhaps the most immediate issue arising from this study is the question of whether people can be taught to experience flow, and if so how might this be attempted. It is probably appropriate at this point to formulate some speculative suggestions regarding this question and indicate the possible directions for future research where the question might be addressed.

Ultimately, the concern is with the issue of physical and mental well-being. As critically reviewed in Chapter 10, some tentative evidence has appeared from the work of Eysenck (1987) to suggest that changes in personality through behaviour therapy may result in the arrest or prevention of the onset of health disorders. Clearly then, the field of behaviour therapy may give some clues as to how to attempt to utilise this knowledge towards the development of a healthy personality and the enhancement of the flow experience. This will be the first issue for discussion. The second issue that will be discussed is that of exercise and health psychology, and some of the evidence which indicates the value of exercise and physical activity on health and well-being. This is particularly appropriate when considering the predominantly `healthy' Physical Education student subsample used in this study, and also because it illustrates the wide variety of applications of the flow model from humanistic and mainstream psychology to sport psychology and rehabilitation.

(i) Behaviour Therapy

As Graef et al (1983) have suggested, some people seem to be able to maximise their sense of competence or involvement across a wide range of typical daily activities. In flow terms, these people may be described as having a wide flow profile and exhibiting both healthy personality characteristics, and having the ability to deal competently with stressful situations. This might be a result of a person's perception of themselves as (un)able to deal with the situation or their perception of the event as (un)threatening. Again, in flow terms, such an interpretation emphasises the role of perceived skill or challenge. Following the lead of Eysenck, we might therefore look at the role of behaviour therapy in helping to encourage people to deal positively with stressors and enhance the flow experience.

Selye (1981) has suggested that psychosmatic derangements often depend not so much on the the apparent pathogen and stressor as the way people react to it. Therapy might therefore be concerned with a person's perceptions of either themselves or the environment. Some general ways of dealing with stress might include removing unneccessary stressors from our lives (a simple yet drastic measure), not allowing events to become stressors (by changing perceptions of the environment), developing a proficiency in dealing with conditions regarded as undesirable (the development of personal perception skills), and seeking relaxation or diversion from the demands. The finding of Eysenck (1987) that disease prone behaviour can be altered via behaviour therapy has obvious implications here, as Eysenck's disease prone personality typologies are concerned with reaction to stressors. In the words of Selye (1981) the goal should be to strike a balance between the equally destructive forces of hypostress (boredom) and hyperstress (excess demands), thereby creating as much eustress (good stress) as possible, whilst minimising distress (bad stress). Additional suggestions and strategies regarding therapy for dealing with stress and anxiety are discussed by Suinn and Deffenbacher (1981). However, more importantly, these authors emphasise the importance of self-control in therapy (cf. Eysenck's Type 4 personality which is concerned with personal autonomy), and cite the trend to introduce self-regulation as a therapeutic goal (for example, Mahoney and Arkhoff, 1976). In this light, individuals might learn to to monitor the internal and external environments, develop coping skills, and then use them automatically in dealing with stressors.

In addition, Forsterling (1980) has contended that causal attributions have an important function in clinical problems, and therefore that cognitive behaviour modification should be concerned with identifying and changing patients' causal attributions. Causal attributions play a major role in the descriptions of Eysenck's four personality types, particularly in the Type 1 and 2 disease prone personalities. Theoretical and empirical advances in the application of attribution models to motivational psychology have been followed by attempts to use these principles to initiate behaviour change, as shown in the work of, for example, Maier and Seligman (1976), Bandura (1981, 1982). For a fuller review and description of attributional retraining, see Forsterling (1985), suffice to say that the contribution of attibutional retraining to a variety of psychological problems may be significant in the ling term study of mental well-being and health.

To conclude this brief section, there would appear to be a variety of cognitive and behavioural intervention methods which might contribute to the response to the environment, and the subsequent affective states. These methods might therefore be one way in which to teach people to effectively perceive intrinsic rewards across a range of daily activities, through altering themselves or their perceptions of the environment. In this way it may be possible to also encourage the flow experience with it's positive contribution to health.

(ii) Exercise Psychology

The notion that physical exercise has beneficial effects, not only upon physical health but also upon mental health, personality, and mood is age old. For example, Plato has pointed out that:

> "Avoid exercising either mind or body without the other , and thus preserve an equal and healthy balance between them. Anyone engaged in mathematics or any other strenuous intellectual pursuit should also exercise his body and take part in physical training."

In more modern terms, numerous studies (see Morgan, 1981, for a detailed review) have indicated that a variety of psychological changes may accompany physical activity. These changes may be either transitory psychological states (mood-related variables) or more stable and enduring traits (such as personality and self-esteem changes). In his review of literature in this area, Morgan (1981) has suggested that one of the few consistent findings in the sport psychology literature is that desirable alterations in health related moods accompany physical exercise. This consistency is important from the point of view of external validity and replicability, as several methods have been used to address the same question with similar findings in each instance. The mood and exercise relationship has been viewed from such diverse perspectives as psychometric (Morgan, 1981), psychobiologic (Ismail and Young, 1977) and clinical (Griest, Klein, Eischens, Faris, Gurman and Morgan, 1978), thus indicating that the relationship has broad implications for mental health and preventative medicine. This significance is further enhanced by the prevalence of mental disorders in current society and the distinct advantages that controlled exercise might offer as a therapeutic adjunct or alternative; for example, cost and side effects.

Several factors of a psychological and physiological nature have been implicated as mediators in exercise related mood shifts. These include anxiety, tension, depression, self-concept, endorphins and catecholamines. A series of experimental studies (for example, Barhke and Morgan, 1981; Weinberg, 1979) have consistently shown decreased state anxiety following vigorous exercise both in individuals scoring in the normal range on objective anxiety tests and in those who are clinically anxious. Unfortunately, this evidence relates only to to state anxiety (ie, a transient response) and not trait anxiety (ie, a permanent response). Acute physical exercise has typically not lowered trait anxiety, which is perhaps not suprising due to the relatively enduring nature of psychological traits (Morgan, 1977). As an anxiety intervention, exercise appears to be at least as effective as other therapeutic forms, including rest, relaxation or meditation (Barhke and Morgan 1978).

The state of the art for the exercise/depression relationship is similar to that outlined here for the exercise/anxiety relationship. Reductions in depression symptoms have been associated with exercise (Askikal and McKinney, 1975), although causal mediators of the relationship have not been identified. Moreover, changes in depression observed with exercise have been comparable to those resulting from more traditional psychotherapeutic relationships (Morgan, 1977).

For many individuals, global self-esteem appears to be dependent to some extent on physical self-esteem, and there is considerable evidence that self-perceptions of physical ability in sport and exercise settings covary with self-esteem (Sonstroem, 1978). Moreover, physical self-perceptions are related to actual physical fitness (Dishman, 1978). Increases in physical self-esteem after exercise training have also been observed in the absence of significant increases in physical fitness (Morgan, 1981). This is consistent with findings for other mood-related variables in suggesting that altered mood states may be associated with the exercise setting, but are not neccessarily caused by the exercise.

It may therefore be that sport psychologists are in a position to play a greater role in the resaerch of health-related activities, particularly in the light of medical evidence related to inactivity and mortality (Powell, 1978), and findings related to activity and psychological well-being and mental health (Dishman, 1986).

The exercise-mental health issue can be seen from both preventative and curative perspectives. According to Dishman (1986), the increased use of exercise as therapy by mental health professionals can be attributed to six major reasons: an academic interest in sport psychology was shown by physical educators in the 1950's and 1960's; exercise therapy is consistent with the trend towards self help strategies in psychotherapy; the recognition that mortality and morbidity was increasingly related to lifestyle led to investigations of stress coping and lifestyle adjuncts; the proposed links between lifestyle and mental stress prompted developments in areas such as behavioural medicine and health psychology; the low success rates in terms of adherence to more conventional treatments led to people looking elsewhere for help; and the emphasis of the importance of cost-effectiveness in mental disorder prevention should exercise be found effective.

In addition to the evidence presented earlier which indicates the therapeutic effects of exercise on health, Mutrie (1987) has identified two major physiological mechanisms which could explain mental health benefits from exercise. Firstly, evidence supports the use of exercise as a reducer of neuromuscular tension (Dishman, 1985, 1986), and secondly, increases in physical work capacity resulting from exercise may assist in fatigue resistance, mood elevation and self-esteem changes. The possible psychological mechanisms involved in exercise and mental health have proven to be more difficult to isolate. However, they are likely to involve increased perceptions of mastery (Robbins and Joseph, 1985), a sense of committment to something positive (Carmack and Martens, 1979), as well as providing a distraction from the usual activities of the day (Mutrie, 1987).

The exercise and mental health issue remains an intriguing problem, yet there can be no doubt of it's potential contribution, along with the personal skills implicit in behaviour therapy, towards the development of a healthy personality and flow experiences. Not only is exercise an important issue in it's own right, it allows the possibility of collaborative and cross disciplinary research between sport and humanistic psychologists, and those active in psychiatric and rehabilitation work.

A Final Word

This study has attempted to examine the ideas and principles of a theory of humanistic psychology which has it's roots in mainstream psychology, but which is applicable to virtually every other branch of psychological research and practice. Whilst the flow theory and model of intrinsic rewards would not seem to be conceptually demanding, it's implications and possible applications are extremely widespread. It is hoped that this study has shown the flow theory in operation, as well as indicated and examined some of the more immediate questions regarding it's contribution to psychological research.

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APPENDICES

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APPENDIX 1

Task Reaction Questionnaires

1. Lecture
2. Hobby
3. Experiment

TASK REACTION QUESTIONNAIRE : LECTURE

Listed below and on the sheets that follow are a series of statements related to the lecture that you have just attended. Please take your time and respond thoughtfully and honestly to these statements by indicating the extent to which you agree with each. Thank You.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

1. There are several important abilities of mine that were required to work effectively during this lecture.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

2. I like the idea that I had enough freedom and responsibility to understand the lecture the way I wanted.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

3. Because I knew what was expected of me during this lecture, I tried pretty hard to do well.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

4. The challenge posed by this lecture really aroused my interest in it.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

5. I tried hard to avoid looking like a fool in front of anyone by working hard during the lecture.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

6. My feelings during this lecture could best be described by the word 'excitement'.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)------(7)

7. My attempts to figure out the purpose of this experiment led me to work hard in the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

8. At various times I felt like I was really achieving something during this lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

9. In a lecture like this I usually work hard on the long shot that it will pay off in some way.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

10. There is something about understanding this lecture that I find very appealing.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

11. It is important to me that others see me as doing well in this lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

12. The way the lecturer behaved kept my attention centered on the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

13. I enjoyed using what I considered to be a strong natural ability when it comes to this lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

14. The nice feeling associated with working in this lecture was certainly a determinant of how well I did.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

15. I was excited by the prospect that I might do better than the other subjects.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

16. I became really absorbed with the lecture during it.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

17. The lecture gave me an opportunity to learn something new and interesting.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

18. I feel some responsibility to be a conscientious subject and not mess up the experiment.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

19. The freedom I had to work at my own pace led me to work really hard during the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

20. Working in the lecture gave me a good opportunity to demonstrate my skills to others.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

21. The unpredictable qualities of this lecture were quite intriguing.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

22. The lecture gave me the opportunity to develop new skills.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

23. Much of my effort in the lecture was due to the fact that other people were present.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

24. After working in this lecture for a while, I felt like a pretty competent individual.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

25. The anticipation of praise and approval from somebody else was an important factor in keeping me moving in the right direction in the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

26. My talents were effectively utilised in this lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

27. I liked the opportunity I had to decide for myself how I would work in the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

28. I would describe my time in this lecture as a pleasant experience.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

29. You could say that one thing which influenced how hard I worked was the opportunity to see how effective I was compared toother students.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

30. There was plenty of opportunity to exercise my ingenuity and inventiveness during the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

31. I was somewhat concerned about failing in front of anyone in the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

32. After working for a while, I had the feeling that I was really good at understanding this type of lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

33. In order to feel like one of the group, I worked dilligently during the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

34. I felt considerable pride in knowing that I was doing well in the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

35. The lecture could accurately described as fun.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

36. I felt that if I did not do well in the lecture, I might be criticised or 'put down' by someone.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

37. One source of motivation was the opportunity for independent thought and action during the lecture.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

38. The desire to have what I did evaluated in a positive light led me to try harder.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

39. The lecture really held my attention from the very beginning.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

TASK REACTION QUESTIONNAIRE : HOBBY

Listed below and on the pages that follow are a series of statements related to the hobby that you have just completed. Please take your time and respond thoughtfully and honestly to these statements by indicating the extent to which you agree with each. Thank you.

(1)	(2)	(3)	(4)	(5)	(6)	(7)
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

1. There are several important abilities of mine that were required in order to work effectively on this hobby.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

2. I liked the way that I had enough freedom and responsibility to work at my hobby the way I wanted.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

3. Because I knew what others expected of me when pursuing my hobby, I tried pretty hard to do well.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

4. The challenge posed by the hobby really aroused my interest in it.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

5. I tried hard to avoid looking like a fool in front of anyone by working hard at my hobby.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

6. My feeling while pursuing my hobby could best be described by the word 'excitement'.

   (1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

7. My attempts to figure out the purpose of the experiment led me to work hard at my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

8. At various times I felt like I was really achieving something while working on my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

9. In a situation like this, I usually work hard on the long shot that it will pay off in some way.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

10. There is something about doing my hobby that I find very appealing.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

11. It is important to me that others see me as doing well in my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

12. The way that the other people involved behaved kept my attention centered on my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

13. I enjoyed using what I consider to be a strong natural ability when it comes to my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

14. The nice feeling associated with working on my hobby was certainly a determinant of how well I did.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

15. I was excited by the prospect that I might do better than the others in my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

16. I became really absorbed with my hobby during it.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

17. My hobby gave me an opportunity to learn something new and interesting.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

18. I feel some responsibility to be a conscientious subject and not mess up the experiment.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

19. The freedom I had to work at my own pace led me to work really hard on my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

20. Working on my hobby gave me a good opportunity to demonstrate my skills to others.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

21. The unpredictable qualities of my hobby were quite intriguing.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

22. My hobby gave me the opportunity to develop new skills.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

23. Much of my effort on my hobby was due to the fact that other people were present.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

24. After working on my hobby for a while, I felt like a pretty competent individual.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

25. The anticipation of praise and approval from someone was an important factor in keeping me moving in the right direction in my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

26. My talents were effectively utilised in working on my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

27. I liked the opportunity I had to decide for myself how I would perform my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

28. I would describe my time on my hobby as a pleasant experience.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

29. You could say that one thing which influenced how hard I worked was the opportunity to see how effective I was compared to others.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

30. There was plenty of opportunity to exercise my ingenuity and inventiveness on my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

31. I was somewhat concerned about failing in front of anyone.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

32. After working for a while, I had the feeling that I was really good at this type of hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

33. In order to feel like one of the group, I worked dilligently at my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

34. I felt considerable pride in knowing that I was doing well in my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

35. My hobby could accurately be described as fun.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

36. I felt that if I did not do well on my hobby, I might be criticised or 'put down' by someone.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

37. One source of motivation was the opportunity for independent thought and action while working on my hobby.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

38. My desire to have what I did evaluated in a positive light led me to try harder.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

39. My hobby really held my attention from the very beginning.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

TASK REACTION QUESTIONNAIRE : EXPERIMENTAL TASKS

Listed below and on the sheets that follow are a series of statements relating to the task that you have just completed. Please take your time and respond thoughtfully and honestly to these statements by indicating the extent to which you agree with each. Thank you.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

(1)	(2)	(3)	(4)	(5)	(6)	(7)
strongly agree	moderately agree	slightly agree	neither agree nor disagree	slightly disagree	moderately disagree	strongly disagree

1. There are several important abilites of mine that were required in order to work effectively on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

2. I liked the idea that I had enough freedom and responsibility to do the task the way I wanted.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

3. Because I knew what the experimenter expected of me, I tried pretty hard to do well.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

4. The challenge posed by this task really aroused my interest in it.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

5. I tried to avoid looking like a fool in front of anyone by working hard on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

6. My feelings while completing the task could best be described by the word 'excitement'.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

7. My attempts to figure out the purpose of this experiment led me to work hard on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

8. At various times, I felt like I was really achieving something while working on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

9. In a situation like this, I usually work hard on the long shot that it will pay off in some way.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

10. There is something about solving this task that I find very appealing.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

11. It is important to me that others see me as doing well on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

12. The way the experimenter behaved kept my attention centered on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

13. I enjoyed using what I consider to be a strong natural ability when it comes to this task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

14. The nice feeling associated with working with this task certainly was a determinant of how well I did.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

15. I was excited by the prospect that I might do better than the other subjects.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

16. I really became absorbed with the task while working on it.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

17. This task gave me the opportunity to learn something new and interesting.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

18. I feel some responsibility to be a conscientious subject and not mess up the experiment.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

19. The freedom I had to work at my own pace led me to work hard on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

20. Working on the task gave me a good opportunity to demonstrate my skills to others.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

21. The unpredictable qualities of the task were quite intriguing.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

22. The task gave me the opportunity to develop new skills.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

23. Much of my effort on the task was due to the fact that the experimenter was present.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

24. After working on this task for a while, I felt like a pretty competent individual.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

25. The anticipation of praise and approval from anyone else was an important factor in keeping me moving in the right direction on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

26. My talents were effectively utilised in solving the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

27. I liked the opportunity I had to decide for myself how I would solve the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

28. I would describe my time with this task as a pleasant experience.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

29. You could say that one thing which influenced how hard I worked was the opportunity to see how effective I was compared to other subjects.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

30. There was plenty of opportunity to exercise my ingenuity and inventiveness on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

31. I was somewhat concerned about failing in front of anyone.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

32. After working for a while, I had the feeling that I was really good at this type of task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

33. In order to feel like one of the group, I worked dilligently at the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

34. I felt considerable pride in knowing that I was doing well on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

35. The task could accurately be described as fun.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

36. I felt that if I did not do well on the task, I might be criticised or 'put down' by the experimenter.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

37. One source of motivation was the opportunity for independent thought and action while working on the task.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

38. My desire to have what work I did evaluated in a positive light led me to try harder.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

39. The task really held my attention from the very beginning.

(1)-------(2)-------(3)-------(4)-------(5)-------(6)-------(7)

APPENDIX 2

Experiment 1 Balanced Presentation Order

SUBJECT	LECTURE	HOBBY	TASK 1	TASK 2
1	1	2	3	4
2	4	1	2	3
3	3	4	1	2
4	2	3	4	1
5	1	2	3	4
6	4	1	2	3
7	3	4	1	2
8	2	3	4	1
9	1	2	3	4
10	4	1	2	3
11	3	4	1	2
12	2	3	4	1

APPENDIX 3

Experiment 1 Computer Task - Subject Instructions

When you have read and understood the procedure as detailed below, the experimenter will demonstrate how the task is performed. The task is a computer game in which you are required to paint in the grid displayed on the screen by filling in one square at a time. The cursor is directed by you through keyboard control. Any contact with the pursuer which moves randomly about the grid means you lose one life. Each full game consists of three lives. If you manage to complete a grid within one game (ie, you have not lost all 3 lives), the experimenter will increase the difficulty of the task by increasing the speed at which the pursuer moves.

You will be allowed 3 practise trials in which you should familiarise yourself with moving the cursor about the grid, filling in the grids etc. These trials will be followed by a further 6 trials in which you should attempt to complete as many boxes in the grid as possible. Again, if you complete a grid, the difficulty will be increased on the next attempt.

Following these trials, you will be asked to fill in a short questionnaire which concerns your reactions to performing on this game.

Thank you for your participation.

When you have read and understood the procedure as detailed below, the experimenter will demonstrate how the task is performed. The task is a computer game in which you are required to direct the character around the maze by moving the joystick up, down, right and left. The aim of the game is to eat all the dots contained in the maze, whilst being pursued by 4 ghosts coloured red, blue, green and yellow. When you eat one of the flashing blue markers in each corner of the maze, the ghosts turn a light blue colour, and for a short period you are able to eat them for bonus points. After a few seconds they change back to their original colour.

Each game consists of 4 lives. You will be allowed a practise game in which you should familiarise yourself with the controls and gameplay, followed by a further 2 games in which you should attempt to score as many points as possible. If you successfully complete the maze, the dots will reappear for you to continue until you have lost all four lives.

Following this game, you will be asked to complete a short questionnaire which concerns your reactions to performing on this game.

Thank you for your participation.

APPENDIX 4

Experiment 1 Task Reaction Questionnaire Scores

SUBJECT	LECTURE int	LECTURE ext	HOBBY int	HOBBY ext	TASK 1 int	TASK 1 ext	TASK 2 int	TASK 2 ext
1	53	38	143	49	122	39	120	42
2	49	54	134	78	114	67	129	65
3	34	34	147	90	129	63	126	59
4	45	50	121	70	143	62	112	62
5	44	50	146	74	137	67	121	66
6	47	30	135	72	125	66	126	67
7	44	51	143	49	133	68	137	60
8	36	56	145	75	137	39	143	39
9	53	55	147	76	142	56	145	56
10	34	63	131	98	131	95	133	88
11	33	40	153	80	156	76	149	72
12	48	48	155	60	143	61	146	57

APPENDIX 5

Experiment 1 Task Reaction Questionnaire Standard Scores

SUBJECT	LECTURE int	LECTURE ext	HOBBY int	HOBBY ext	TASK 1 int	TASK 1 ext	TASK 2 int	TASK 2 ext
1	35.6	35.1	57.3	42.2	52.2	35.8	51.7	37.7
2	34.6	45.4	55.1	60.9	50.3	53.8	53.9	52.5
3	31.0	32.6	58.2	68.6	53.9	51.2	53.2	48.7
4	33.6	42.9	52.0	55.7	57.3	50.6	49.8	50.6
5	33.4	42.9	58.0	58.3	55.8	53.8	52.0	53.2
6	34.1	30.0	55.3	57.0	52.9	53.2	53.2	53.8
7	33.4	43.5	57.3	42.4	54.8	54.5	55.8	49.3
8	31.5	46.7	57.7	59.0	5.8	35.8	57.3	35.8
9	35.6	46.1	58.2	59.6	57.0	47.6	57.7	46.7
10	31.0	51.2	54.4	73.8	54.4	71.8	54.8	67.3
11	30.7	36.4	60.1	62.2	60.4	59.6	58.7	57.0
12	34.4	41.6	59.7	49.3	57.3	49.9	58.0	47.4

APPENDIX 6

Multivariate And Univariate Tables - Experiment 1 Analysis

SOURCE	SUM OF SQ.	D.F.	MEAN SQ.	F	PROB
BETWEEN	957.000	11			
WITHIN	8632.250	84			
TREAT.	6141.625	7	877.4	27.12	.000
RESID.	2490.625	77	32.35		
TOTAL	9589.625	95			

Table 1 : MANOVA Table For Experiment One

SOURCE	SUM OF SQ.	D.F.	MEAN SQ.	F	PROB
BETWEEN	107.0703	11			
WITHIN	4690.648	36			
TREAT.	4535.094	3	1512.	320.7	.0000
RESID.	155.5547	33	4.714		
TOTAL	4797.719	47			

Table 2 : ANOVA Table For Intrinsic Motivation

SOURCE	SUM OF SQ.	D.F.	MEAN SQ.	F	PROB
BETWEEN	1947.344	11			
WITHIN	2845.555	36			
TREAT.	1609.656	3	536.6	14.33	0.0000
RESID.	1235.898	33	37.45		
TOTAL	4792.898	47			

Table 3 : ANOVA Table For Extrinsic Motivation

APPENDIX 7

Experiment 1 Newman Keuls Follow Up Tests

INTRINSIC MOTIVATION

	56.94 (hobby)	55.20 (game 1)	54.68 (game 2)	33.24 (lecture)	r
56.94 (hobby)	*****	1.74	2.26	23.7	4
55.20 (game 1)		*****	.52	21.96	3
54.68 (game 2)			*****	21.44	2
33.24 (lecture)				*****	

r	=	2	3	4
c.d	=	1.80	2.16	2.38

EXTRINSIC MOTIVATION

	57.40 (hobby)	51.39 (game 1)	50.00 (game 2)	41.20 (lecture)	r
57.40 (hobby)	*****	6.01	7.4	16.2	4
51.39 (game 1)		*****	1.39	10.19	3
50.00 (game 2)			*****	8.8	2
41.20 (lecture)				*****	

r	=	2	3	4
c.d	=	5.08	6.11	6.73

APPENDIX 8

Experiment 2 Structure Of Difficulty Levels

DIFFICULTY LEVEL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
PURSUERS	1	2	3	4	5	6	7	8	9	9	9	9	9	9	9	9
SPEED	1	1	1	1	1	1	1	1	1	2	3	4	5	6	7	8

APPENDIX 9

Experiment 2 Presentation Of Difficulty Levels

SESSION	1	2	3	4	5	6	7	8
DAY	1	3	5	7	9	11	13	15
PAIRING OF DIFFICULTY LEVELS	1 & 9	2 & 10	3 & 11	4 & 12	5 & 13	6 & 14	7 & 15	8 & 16

APPENDIX 10

Experience Sampling Method Self-Report Form

Date__________ Time__________ Time filled out__________

What were you thinking about ? ____________________

____

Where were you ? ____________________

What was the main thing you were doing ?____________________

____

Were you ( ) alone ( ) with friends ( ) with strangers

Why were you doing this particular activity ?
( ) had to
( ) wanted to
( ) nothing else to do

What other things were you doing ? ____________________

____

	(1)...						...(7)
Time was passing	O	o	.	-	.	o	O
	fast			as usual			slow

	not at all	some what	quite	very
	(1)...			...(10)
Did you feel in control of the situation ?	I---I---I---I---I---I---I---I---I---I			
Was it hard to concentrate ?	I---I---I---I---I---I---I---I---I---I			
How self conscious were you ?	I---I---I---I---I---I---I---I---I---I			
How much were you concentrating ?	I---I---I---I---I---I---I---I---I---I			
Were you in control of your actions ?	I---I---I---I---I---I---I---I---I---I			
Do you wish you had been doing something else ?	I---I---I---I---I---I---I---I---I---I			

	not at all (1)	some what	quite	very (10)
I felt satisfied with myself	I---I---I---I---I---I---I---I---I---I			
Was there anything at stake for you in the activity ?	I---I---I---I---I---I---I---I---I---I			

	low (1)	high (10)
Challenges in the activity	I---I---I---I---I---I---I---I---I---I	
Skills in the activity	I---I---I---I---I---I---I---I---I---I	

	very (1)	quite	some	neither	some	quite	very (7)	
alert	O	o	.	-	.	o	O	drowsy
happy	O	o	.	-	.	o	O	sad
irritable	O	o	.	-	.	o	O	cheerful
strong	O	o	.	-	.	o	O	weak
angry	O	o	.	-	.	o	O	friendly
active	O	o	.	-	.	o	O	passive
lonely	O	o	.	-	.	o	O	sociable
detatched	O	o	.	-	.	o	O	involved
relaxed	O	o	.	-	.	o	O	anxious
creative	O	o	.	-	.	o	O	dull
free	O	o	.	-	.	o	O	constrained
excited	O	o	.	-	.	o	O	bored
open	O	o	.	-	.	o	O	closed
confused	O	o	.	-	.	o	O	clear

How much choice did you have in selecting this activity ?	( ) none ( ) a little ( ) some ( ) pretty much ( ) very much

Did you do it for -	family	Y/N
	friends	Y/N
	yourself	Y/N

'

APPENDIX 11

Experience Questionnaire

Circle the number that best describes the importance of each item to the experience you reported.

5 = much importance   4 = some importance   2 = little importance

1 2 3 4 5	1. The event involved action or behaviour
1 2 3 4 5	2. I had prior related movement.
1 2 3 4 5	3. The event was spontaneous or triggered, and not planned or structured.
1 2 3 4 5	4. The event was intense.
1 2 3 4 5	5. A process seemed to `click on'.
1 2 3 4 5	6. The event was practised.
1 2 3 4 5	7. My actions and thoughts were new and not habitual.
1 2 3 4 5	8. The event seemed an emergency.
1 2 3 4 5	9. I had clear focus.
1 2 3 4 5	10. The event involved a personal value.
1 2 3 4 5	11. I was absorbed in what I was doing.
1 2 3 4 5	12. I felt a need to continue until completion.
1 2 3 4 5	13. I was interactive.
1 2 3 4 5	14. I had a strong sense of self.
1 2 3 4 5	15. Actions or thoughts just came out spontaneously.
1 2 3 4 5	16. I felt free from outer restrictions.
1 2 3 4 5	17. My inner process was clear.
1 2 3 4 5	18. I was aware of my own power.
1 2 3 4 5	19. My intentions were strong.
1 2 3 4 5	20. The event was nonmotivated.
1 2 3 4 5	21. I felt all together.
1 2 3 4 5	22. The event involved understanding or expression that was personal.
1 2 3 4 5	23. I had a sense of personal responsibility.

1 2 3 4 5	24. The experience overwhelmed other senses and thoughts.
1 2 3 4 5	25. The experience involved unity or fusion with the environment.
1 2 3 4 5	26. The experience involved loss of self.
1 2 3 4 5	27. The event was playful.
1 2 3 4 5	28. Differences were resolved.
1 2 3 4 5	29. Rules, motivation and goals were built into the situation.
1 2 3 4 5	30. The event was fun.
1 2 3 4 5	31. The event had a spiritual or mystical quality.
1 2 3 4 5	32. The event was perceptual rather than behavioural.
1 2 3 4 5	33. I was receptive and passive.
1 2 3 4 5	34. I enjoyed another person or persons during the event.
1 2 3 4 5	35. I experienced a loss of time and space.
1 2 3 4 5	36. The event was an encounter with a person or something outside myself.
1 2 3 4 5	37. The event had great meaning for me.
1 2 3 4 5	38. Other people influenced the outcome.
1 2 3 4 5	39. The event was brief.
1 2 3 4 5	40. The experience was beyond words.
1 2 3 4 5	41. The experience was its own reward.
1 2 3 4 5	42. I experienced joy and fulfilment.

Check the description which best fits your performance.

	this event	usually in similar events
personal best	( )	( )
high performance	( )	( )
effectiveness	( )	( )
mediocrity	( )	( )
inefficiency	( )	( )
inadequacy	( )	( )
failure	( )	( )

Check the description that best fits your feeling.

	this event	usually in similar events
highest happiness	( )	( )
joy	( )	( )
enjoyment	( )	( )
neutrality	( )	( )
boredom	( )	( )
worry	( )	( )
misery	( )	( )

Before the event were you most involved with :

self	( )
another person	( )
environment	( )

What was the role of other people ?

interfering	( )
not present	( )
present only	( )
contributing	( )
essential	( )

How long was the event ?

minutes ______
hour ______
hours ______
days ______
weeks ______
longer ______

What do you think triggered your experience ?

external event (involving others)	( )
external event (others unimportant)	( )
environment	( )
inner processes	( )
spiritual event	( )

Check one of each pair which best describes the event.

active	( )	( )	passive
inner	( )	( )	outer
private	( )	( )	public
light	( )	( )	serious

Check one of each set which best describes the event.

physical	( )	interpersonal	( )
emotional	( )	natural environment	( )
intellectual	( )	material envirionment	( )
spiritual	( )	alone	( )

How do you characterise your feelings afterwards ?

extremely positive	( )
positive	( )
neutral	( )
negative	( )
extremely negative	( )

How do you characterise the aftereffects ?

turning point	( )
significant	( )
some	( )
little	( )
none	( )

APPENDIX 12

Multivariate, Univariate And Simple Main Effects Tables - Skill/Difficulty Analysis

EFFECT	VALUE	APPROX F	HYPOTH DF	ERROR DF	SIG OF F
GROUP	.39377	16.16529	2.00	21.00	.000
DIFF	.07767	56.76525	30.00	658.00	.000
GROUP X DIFF	.45696	10.51308	30.00	658.00	.000

Table 1 : MANOVA Table For Skill/Challenge Manipulation Analysis

EFFECT	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
GROUP	4.37760	38.28646	4.37760	1.74029	2.51544	.127
DIFF	36.30990	122.79688	2.42066	.37211	6.50520	.000
G X D	16.33073	122.79688	1.08872	.37211	2.92578	.000

Table 2 : ANOVA Table For Perceived Skill

	SS	DF	MS	F	SIG OF F
WITHIN CELLS	67.57	165	.41	1.55	.095
DIFF	9.49	15	.53		

Table 3 : Tests Of Simple Main Effects - Low Skilled Group/Perceived Skill

	SS	DF	MS	F	SIG OF F
WITHIN CELLS	55.23	165	.33		
DIFF	43.15	15	2.88	8.59	.000

Table 4 : Tests Of Simple Main Effects - High Skilled Group/Perceived Skill

EFFECT	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
GROUP	104.16667	71.19792	104.16667	3.23627	32.18727	.000
DIFF	1166.40625	150.6354	77.76042	.45647	170.3513	.000
G X D	100.08333	150.6354	6.67222	.45647	14.617	.000

Table 5 : ANOVA Table For Perceived Challenge

	SS	DF	MS	F	SIG OF F
WITHIN CELLS	75.78	165	.46		
DIFF	336.79	15	22.45	48.49	.000

Table 6 : Tests Of Simple Main Effects - Low Skilled Group/Perceived Challenge

	SS	DF	MS	F	SIG OF F
WITHIN CELLS	74.86	165	.45		
DIFF	929.70	15	61.98	136.61	.000

Table 7 : Tests Of Simple Main Effects - High Skilled Group/Perceived Challenge

APPENDIX 13
Experiment 2 Skill/Challenge Manipulations
- Newman Keuls Follow Up Tests

PERCEIVED SKILL - DIFFICULTY EFFECT

		4	6	7	5	8	2	10	9
		3.958	3.875	3.875	3.833	3.75	3.75	3.708	3.666
4	3.958	***	.083	.083	.125	.208	.208	.25	.292
6	3.875		***	.000	.042	.125	.125	.167	.209
7	3.875			***	.042	.125	.125	.167	.209
5	3.833				***	.083	.083	.125	.167
8	3.75					***	.000	.042	.084
2	3.75						***	.042	.084
10	3.708							***	.042
9	3.666								***
11	3.625								
3	3.625								
1	3.54								
12	3.5								
14	3.25								
13	3.208								
15	3.166								
16	2.791								

r =	2	3	4	5	6	7	8
c.d =	.346	.414	.454	.482	.504	.521	.536

11	3	1	12	14	13	15	16	
3.625	3.625	3.54	3.5	3.25	3.208	3.166	2.791	r
.333	.333	.418	.458	.708	.75	.792	1.167	16
.25	.25	.335	.375	.625	.667	.709	1.084	15
.25	.25	.335	.375	.625	.667	.709	1.084	14
.208	.208	.293	.333	.583	.625	.667	1.042	13
.125	.125	.21	.25	.50	.542	.584	.959	12
.125	.125	.21	.25	.50	.542	.584	.959	11
.083	.083	.168	.208	.458	.50	.542	.917	10
.041	.041	.126	.166	.416	.458	.50	.875	9
***	.000	.085	.125	.375	.417	.459	.834	8
	***	.085	.125	.375	.417	.459	.834	7
		***	.04	.29	.332	.374	.749	6
			***	.25	.292	.334	.709	5
				***	.042	.084	.459	4
					***	.042	.417	3
						***	.375	2

9	10	11	12	13	14	15	16
.549	.559	.567	.577	.585	.592	.600	.606

PERCEIVED CHALLENGE - DIFFICULTY EFFECT

		16 7.291	15 6.916	14 6.292	13 5.708	12 5.5	11 5.166	10 4.708	9 4.458
16	7.291	***	.375	.999	1.583	1.791	2.125	2.583	2.833
15	6.916		***	.614	1.208	1.416	1.75	2.208	2.458
14	6.292			***	.584	.792	1.126	1.584	1.834
13	5.708				***	.208	.542	1	1.25
12	5.5					***	.334	.792	1.042
11	5.166						***	.458	.708
10	4.708							***	.25
9	4.458								***
8	4.208								
7	3.916								
6	3.542								
5	2.958								
4	2.458								
3	2								
2	1.875								
1	1.583								

r =	2	3	4	5	6	7	8
c.d =	.382	.457	.501	.533	.556	.575	.592

8	7	6	5	4	3	2	1	
4.208	3.916	2.542	2.958	2.458	2	1.875	1.583	r
3.083	3.375	3.749	4.333	4.833	5.291	5.416	5.708	16
2.708	3	3.374	3.958	4.458	4.916	5.041	5.333	15
2.084	2.376	2.75	3.334	3.384	4.292	4.417	4.709	14
1.5	1.792	2.166	2.75	3.25	3.708	3.833	4.125	13
1.292	1.584	1.958	2.542	3.042	3.5	3.625	3.917	12
.958	1.25	1.624	2.208	2.708	3.166	3.291	3.583	11
.5	.792	1.166	1.75	2.25	2.708	2.833	2.875	10
.25	.542	.916	1.5	2	2.458	2.583	2.875	9
***	.292	.666	1.25	1.75	2.208	2.333	2.625	8
	***	.374	.958	1.458	1.916	2.041	2.333	7
		***	.584	1.084	1.542	1.667	1.959	6
			***	.5	.958	1.083	1.375	5
				***	.458	.583	.875	4
					***	.125	.417	3
						***	.292	2
							***	

9	10	11	12	13	14	15	16
.606	.617	.627	.638	.646	.654	.662	.669

PERCEIVED SKILL - LOW SKILLED GROUP

		4 3.917	10 3.75	6 3.667	11 3.667	12 3.583	2 3.5	5 3.5	7 3.5
4	3.917	***	.617	.25	.25	.334	.417	.417	.417
10	3.75		***	.083	.083	.167	.25	.25	.25
6	3.667			***	0	.084	.167	.167	.167
11	3.667				***	.084	.167	.167	.167
12	3.583					***	.083	.083	.083
2	3.5						***	0	0
5	3.5							***	0
7	3.5								***
8	3.5								
14	3.417								
3	3.333								
9	3.333								
13	3.333								
15	3.25								
1	3.163								
6	3								

r =	2	3	4	5	6	7	8
c.d =	.512	.612	.672	.714	.746	.771	.794

'

8	14	3	9	13	15	1	16	
3.5	3.417	3.333	3.333	3.333	3.25	3.167	3	r
.417	.5	.584	.584	.584	.667	.75	.917	16
.25	.333	.417	.417	.417	.5	.583	.75	15
.167	.25	.334	.334	.334	.417	.5	.667	14
.167	.25	.334	.334	.334	.417	.5	.667	13
.083	.166	.25	.25	.25	.333	.416	.583	12
0	.083	.167	.167	.167	.25	.333	.5	11
0	.083	.167	.167	.167	.25	.333	.5	10
0	.083	.167	.167	.167	.25	.333	.5	9
***	.083	.167	.167	.167	.25	.333	.5	8
	***	.084	.084	.084	.167	.25	.417	7
		***	0	0	.083	.166	.333	6
			***	0	.083	.166	.333	5
				***	.083	.166	.333	4
					***	.083	.25	3
						***	.163	2
							***	

9	10	11	12	13	14	15	16
.812	.827	.84	.855	.866	.877	.888	.897

PERCEIVED CHALLENGE - LOW SKILLED GROUP

		16 7.583	15 7	14 6.417	13 5.75	12 5.5	11 5.25	10 4.917	9 4.75
16	7.583	***	.583	1.166	1.833	2.083	2.333	2.666	2.833
15	7		***	.583	1.25	1.5	1.75	2.083	2.25
14	6.417			***	.667	.917	1.167	1.5	1.667
13	5.75				***	.25	.5	.833	1
12	5.5					***	.25	.583	.75
11	5.25						***	.333	.5
10	4.917							***	.5
9	4.75								***
8	4.5								
7	4.25								
6	3.917								
5	3.917								
4	3.583								
3	3.417								
2	3.167								
1	3								

r =	2	3	4	5	6	7	8
c.d =	.543	.649	.711	.757	.790	.817	.841

'

8	7	6	5	4	2	3	1	
4.5	4.25	3.917	3.917	3.583	3.417	3.167	3	r
3.083	3.333	3.666	3.666	4	4.166	4.416	4.583	16
2.5	2.75	3.083	3.083	3.417	3.583	3.833	4	15
1.917	2.167	2.5	2.5	2.834	3	3.25	3.417	14
1.25	1.5	1.833	1.833	2.167	2.333	2.583	2.75	13
1	1.25	1.583	1.583	1.917	2.083	2.333	2.5	12
.75	1	1.333	1.333	1.667	1.833	2.083	2.25	11
.417	.667	1	1	1.334	1.5	1.75	1.917	10
.25	.5	.833	.833	1.167	1.333	1.583	1.75	9
***	.25	.583	.583	.917	1.083	1.333	1.5	8
	***	.333	.333	.667	.833	1.083	1.25	7
		***	0	.334	.5	.75	.917	6
			***	.334	.5	.75	.917	5
				***	.166	.416	.583	4
					***	0	.417	3
						***	.167	2
							***	

9	10	11	12	13	14	15	16
.860	.876	.890	.906	.917	.929	.941	.951

PERCEIVED SKILL - HIGH SKILLED GROUP

		7 4.25	5 4.167	6 4.083	2 4	4 4	8 4	9 4	1 3.917
7	4.25	***	.083	.167	.25	.25	.25	.25	.333
5	4.167		***	.084	.167	.167	.167	.167	.25
6	4.083			***	.083	.083	.083	.083	.166
2	4				***	0	0	0	.083
4	4					***	0	0	.083
8	4						***	0	.083
9	4							***	.083
1	3.917								***
3	3.917								
10	3.667								
11	3.583								
12	3.417								
13	3.083								
14	3.083								
15	3.083								
16	2.583								

r =	2	3	4	5	6	7	8
c.d =	.460	.549	.603	.641	.669	.692	.712

3	10	11	12	13	14	15	16	r
3.917	3.667	3.583	3.417	3.083	3.083	3.083	2.583	
.333	.583	.667	.833	1.167	1.167	1.167	1.667	16
.25	.5	.584	.75	1.084	1.084	1.084	1.584	15
.166	.416	.5	.666	1	1	1	1.5	14
.083	.333	.417	.583	.917	.917	.917	1.417	13
.083	.333	.417	.583	.917	.917	.917	1.417	12
.083	.333	.417	.583	.917	.917	.917	1.417	11
.083	.333	.417	.583	.917	.917	.917	1.417	10
0	.25	.334	.5	.834	.834	.834	1.334	9
***	.25	.334	.5	.834	.834	.834	1.334	8
	***	.084	.25	.584	.584	.584	1.084	7
		***	.166	.5	.5	.5	1	6
			***	.334	.334	.334	.834	5
				***	0	0	.5	4
					***	0	.5	3
						***	.5	2
							***	

9	10	11	12	13	14	15	16
.729	.742	.754	.767	.777	.787	.797	.805

PERCEIVED CHALLENGE - HIGH SKILLED GROUP

		16	15	14	13	12	11	10	9
		7	6.833	6.167	5.667	5.5	5.083	4.5	4.167
16	7	***	.167	.833	1.333	1.5	1.917	2.5	2.833
15	6.833		***	.666	1.166	1.333	1.75	2.333	2.666
14	6.167			***	.5	.667	1.084	1.667	2
13	5.667				***	.167	.584	1.167	1.5
12	5.5					***	.417	1	1.333
11	5.083						***	.583	.916
10	4.5							***	.333
9	4.167								***
8	3.917								
7	3.583								
6	3.167								
5	2								
4	1.333								
3	.833								
2	.333								
1	.167								

r =	2	3	4	5	6	7	8
c.d =	.537	.642	.704	.749	.782	.809	.832

8	7	6	5	4	3	2	1	
3.917	3.583	3.167	2	1.333	.833	.333	.167	r
3.083	3.417	3.833	5	5.667	6.167	6.667	6.833	16
2.916	3.25	3.666	4.833	5.5	6	6.5	6.666	15
2.25	2.584	3	4.167	4.834	5.334	5.834	6	14
1.75	2.084	2.5	3.667	4.334	4.834	5.334	5.5	13
1.583	1.917	2.333	3.5	4.167	4.667	5.167	5.333	12
1.166	1.5	1.916	3.083	3.75	4.25	4.75	4.916	11
.583	.917	1.333	2.5	3.167	3.667	4.167	4.333	10
.25	.584	1	2.167	2.834	3.334	3.834	4	9
***	.334	.75	1.917	2.584	3.084	3.584	3.75	8
	***	.416	1.583	2.25	2.75	3.25	3.416	7
		***	1.167	1.834	2.334	2.834	3	6
			***	.667	1.167	1.667	1.833	5
				***	.5	1	1.166	4
					***	.5	.666	3
						***	.166	2
							***	

9	10	11	12	13	14	15	16
.852	.867	.881	.896	.908	.920	.931	.941

APPENDIX 14

ESM Factor Analysis Eigenvalues

FACTOR	EIGENVALUE	% OF VAR	CUM %
1	10.18872	39.2	39.2
2	5.17270	19.9	59.1
3	1.55537	6.0	65.1
4	.96552	3.7	68.8
5	.86600	3.3	72.1
6	.73382	2.8	74.9
7	.61829	2.4	77.3
8	.57912	2.2	79.5
9	.55086	2.1	81.7
10	.42574	2.0	83.7
11	.50214	1.9	85.6
12	.46184	1.8	87.4
13	.42337	1.6	89.0
14	.33801	1.3	90.3
15	.32731	1.3	91.6
16	.30554	1.2	92.7
17	.28971	1.1	93.9
18	.28742	1.1	95.0
19	.24097	.9	95.9
20	.23351	.9	96.8
21	.19336	.7	97.5
22	.18095	.7	98.2
23	.14524	.6	98.8
24	.13479	.5	99.3
25	.09920	.4	99.7
26	.08151	.3	100.0

APPENDIX 15

Multivariate, Univariate And Simple Main Effects Tables - ESM Analysis

EFFECT	VALUE	APPROX F	HYPOTH DF	ERROR DF	SIG OF F
DIFF	.10480	24.63545	45.00	975.19	.000
GROUP	.63624	3.81163	3.00	20.00	.026
GROUP X DIFF	.51933	5.34776	45.00	975.19	.000

Table 1 : MANOVA Table For ESM Effects

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
GROUP	7.53057	60.57439	7.53037	2.75338	2.73495	.112
DIFF	127.79152	75.07203	8.51943	.22749	37.44955	.000
G X D	34.98228	75.07203	2.33215	.22749	10.25162	.000

Table 2 : ANOVA Table For ESM Factor 1 Effects

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
GROUP	4.60198	55.16351	4.60198	2.50743	1.83533	.189
DIFF	110.44570	25.87761	7.36305	.07842	93.89606	.000
G X D	8.06005	25.87761	.53734	.07842	6.8523	.000

Table 3 : ANOVA Table For ESM Factor 2 Effects

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
GROUP	.24704	181.85104	.24704	8.26596	.02989	.864
DIFF	44.99536	135.4264	2.99969	.41038	7.30949	.000
G X D	17.31472	135.4264	1.15431	.41038	2.81277	.000

Table 4 : ANOVA Table For ESM Factor 3 Effects

'

GP	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
LOW	77.27382	25.00965	5.15159	.15157	33.98736	.000
HIGH	85.49998	50.06238	5.7	.30341	18.78656	.000

Table 5 : Tests Of Simple Main Effects : ESM Factor 1

GP	HYPOTH SS	ERROR SS	HYPOTH SS	ERROR MS	F	SIG OF F
LOW	36.46257	17.79561	2.43084	.10785	22.5386	.000
HIGH	82.04319	8.08199	5.46955	.04898	111.66489	.000

Table 6 : Tests Of Simple Main Effects : ESM Factor 2

GP	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
LOW	10.56470	119.92887	.70431	.72684	.96901	.490
HIGH	51.74538	15.49753	3.44969	.09392	36.72838	.000

Table 7 : Tests Of Simple Main Effects : ESM Factor 3

'

APPENDIX 16

Newman Keuls Follow Up Tests
(Experience Sampling Method Factor Scores)

ESM FACTOR 1 - DIFFICULTY EFFECT

		8	6	7	5	9	4	3	2
		.622	.595	.510	.389	.386	.345	.305	.303
8	.622	***	.033	.112	.233	.236	.277	.317	.319
6	.595		***	.085	.206	.209	.25	.29	.292
7	.510			***	.121	.124	.165	.205	.207
5	.389				***	.003	.044	.084	.086
9	.386					***	.041	.081	.083
4	.345						***	.04	.042
3	.305							***	.002
2	.303								***
1	.221								
10	.158								
11	-.066								
12	-.191								
13	-.469								
14	-.759								
15	-1.022								
16	-1.327								

r =	2	3	4	5	6	7	8
c.d =	.269	.321	.352	.374	.391	.404	.416

1	10	11	12	13	14	15	16	
.221	.158	-.066	-.191	-.469	-.759	-1.022	-1.327	r
.655	.785	.903	.967	1.111	1.287	1.479	1.734	16
.655	.785	.903	.967	1.111	1.287	1.479	1.734	15
.598	.728	.846	.91	1.054	1.23	1.422	1.677	14
.538	.668	.786	.85	.994	1.17	1.362	1.617	13
.468	.598	.716	.78	.924	1.1	1.292	1.547	12
.436	.566	.684	.748	.892	1.068	1.26	1.515	11
.227	.357	.475	.539	.683	.859	1.051	1.306	10
.074	.204	.322	.386	.53	.706	.898	1.153	9
***	.13	.248	.312	.456	.632	.824	1.079	8
	***	.118	.182	.326	.502	.694	.949	7
		***	.064	.208	.384	.576	.831	6
			***	.144	.32	.512	.767	5
				***	.176	.368	.623	4
					***	.192	.447	3
						***	.255	2
							***	

9	10	11	12	13	14	15	16
.250	.255	.259	.263	.267	.270	.273	.276

ESM FACTOR 2 - DIFFICULTY EFFECT

		2 .656	3 .656	4 .599	1 .539	5 .469	6 .437	7 .228	8 .075
2	.656	***	.000	.057	.117	.187	.219	.428	.581
3	.656		***	.057	.117	.187	.219	.428	.581
4	.599			***	.06	.13	.162	.371	.524
1	.539				***	.07	.102	.311	.464
5	.469					***	.032	.241	.394
6	.437						***	.209	.362
7	.228							***	.153
8	.075								***
9	.001								
10	-.129								
11	-.247								
12	-.311								
13	-.455								
14	-.631								
15	-.823								
16	-1.078								

r =	2	3	4	5	6	7	8
c.d =	.158	.189	.207	.220	.230	.238	.245

9	10	11	12	13	14	15	16	
.001	-.129	-.247	-.311	-.455	-.631	-.823	-1.708	r
.401	.464	.688	.813	1.091	1.381	1.644	1.949	16
.374	.437	.661	.786	1.064	1.354	1.617	1.922	15
.289	.352	.576	.701	.979	1.269	1.532	1.837	14
.168	.231	.455	.58	.858	1.148	1.411	1.716	13
.165	.228	.452	.577	.855	1.145	1.408	1.713	12
.124	.187	.411	.536	.814	1.104	1.367	1.672	11
.084	.147	.371	.496	.774	1.064	1.327	1.632	10
.082	.145	.369	.494	.772	1.062	1.325	1.63	9
***	.063	.287	.412	.69	.98	1.243	1.548	8
	***	.224	.349	.627	.917	1.18	1.485	7
		***	.125	.403	.693	.956	1.261	6
			***	.278	.568	.831	1.136	5
				***	.29	.553	.858	4
					***	.263	.568	3
						***	.305	2
							***	

9	10	11	12	13	14	15	16
.426	.434	.440	.448	.454	.460	.466	.470

ESM FACTOR 3 - DIFFICULTY EFFECT

		1 .591	2 .451	3 .249	5 .230	7 .226	4 .207	9 .146	6 .140
1	.591	***	.14	.342	.361	.365	.384	.445	.451
2	.451		***	.202	.221	.225	.244	.305	.311
3	.249			***	.019	.023	.042	.103	.109
5	.230				***	.004	.023	.084	.09
7	.226					***	.019	.08	.086
4	.207						***	.061	.067
9	.146							***	.006
6	.140								***
8	.017								
10	-.069								
12	-.094								
11	-.126								
13	-.331								
14	-.414								
15	-.540								
16	-.684								

r =	2	3	4	5	6	7	8
c.d =	.363	.434	.476	.506	.528	.546	.562

8	10	12	11	13	14	15	16	
.017	-.069	-.094	-.126	-.331	-.414	-.54	-.684	r
.574	.66	.685	.717	.922	1.005	1.131	1.275	16
.434	.52	.545	.577	.782	.865	.991	1.135	15
.232	.318	.343	.375	.58	.663	.789	.933	14
.213	.299	.324	.356	.561	.644	.77	.914	13
.209	.295	.32	.352	.557	.64	.766	.91	12
.19	.276	.301	.333	.538	.621	.747	.891	11
.129	.215	.24	.272	.477	.56	.686	.83	10
.123	.209	.234	.266	.471	.554	.68	.824	9
***	.086	.111	.143	.348	.431	.557	.701	8
	***	.025	.057	.262	.345	.471	.615	7
		***	.032	.237	.32	.446	.59	6
			***	.205	.288	.414	.558	5
				***	.083	.209	.353	4
					***	.126	.27	3
						***	.144	2
							***	

9	10	11	12	13	14	15	16
.575	.586	.595	.605	.613	.621	.629	.635

ESM FACTOR 1 - HIGH SKILLED GROUP

		8 .614	7 .398	9 .274	6 .239	10 -.036	5 -.173	11 -.321	12 -.549
8	.614	***	.216	.34	.375	.65	.787	.935	1.163
7	.398		***	.124	.159	.434	.571	.719	.947
9	.274			***	.035	.31	.447	.595	.823
6	.239				***	.275	.412	.56	.788
10	-.036					***	.137	.285	.513
5	-.173						***	.148	.376
11	-.321							***	.228
12	-.549								***
4	-.575								
2	-.639								
3	-.647								
1	-.648								
13	-.845								
14	-1.229								
15	-1.51								
16	-1.861								

r =	2	3	4	5	6	7	8
c.d =	.44	.526	.577	.614	.641	.663	.682

4	2	3	1	13	14	15	16	
-.575	-.639	-.647	-.648	-.845	-1.229	-1.51	-1.861	r
1.189	1.253	1.261	1.262	1.459	1.843	2.124	2.475	16
.973	1.037	1.045	1.046	1.243	1.627	1.908	2.259	15
.849	.913	.921	.922	1.119	1.503	1.784	2.135	14
.814	.878	.886	.887	1.084	1.468	1.749	2.1	13
.539	.603	.611	.612	.809	1.193	1.474	1.825	12
.402	.466	.474	.475	.672	1.056	1.337	1.688	11
.254	.318	.326	.327	.524	.908	1.189	1.54	10
.026	.09	.098	.099	.296	.68	.961	1.312	9
***	.064	.072	.073	.27	.654	.935	1.286	8
	***	.008	.009	.206	.59	.871	1.222	7
		***	.001	.198	.582	.863	1.214	6
			***	.197	.581	.862	1.213	5
				***	.384	.665	1.016	4
					***	.281	.632	3
						***	.351	2
							***	

9	10	11	12	13	14	15	16
.698	.710	.722	.735	.744	.754	.763	.771

ESM FACTOR 2 - HIGH SKILLED GROUP

		1 1.62	2 1.579	3 1.489	4 1.355	5 1.213	6 1.068	7 .929	8 .778
1	1.62	***	.041	.131	.265	.407	.552	.691	.842
2	1.579		***	.09	.224	.366	.511	.65	.801
3	1.489			***	.134	.276	.421	.56	.711
4	1.355				***	.142	.287	.426	.577
5	1.213					***	.145	.284	.435
6	1.068						***	.139	.29
7	.929							***	.151
8	.778								***
9	.693								
10	.457								
11	.351								
12	.255								
13	.126								
14	-.078								
15	-.269								
16	-.506								

r =	2	3	4	5	6	7	8
c.d =	.177	.212	.232	.247	.258	.267	.275

,

9	10	11	12	13	14	15	16	
.693	.457	.351	.255	.126	-.078	-.269	-.506	r
.927	1.163	1.269	1.365	1.494	1.698	1.889	2.126	16
.886	1.122	1.228	1.324	1.453	1.657	1.848	2.085	15
.796	1.032	1.138	1.234	1.363	1.567	1.758	1.995	14
.662	.898	1.004	1.1	1.229	1.433	1.624	1.861	13
.52	.756	.862	.958	1.087	1.291	1.482	1.719	12
.375	.611	.717	.813	.942	1.146	1.337	1.574	11
.236	.472	.578	.674	.803	1.007	1.198	1.435	10
.085	.321	.427	.523	.652	.856	1.047	1.284	9
***	.236	.342	.438	.567	.771	.962	1.199	8
	***	.106	.202	.331	.535	.726	.963	7
		***	.096	.225	.429	.62	.857	6
			***	.129	.333	.524	.761	5
				***	.204	.395	.632	4
					***	.191	.428	3
						***	.237	2
							***	

9	10	11	12	13	14	15	16
.281	.286	.291	.296	.300	.303	.307	.310

ESM FACTOR 3 - HIGH SKILLED GROUP

		1 .779	2 .527	4 .515	3 .512	5 .267	6 .170	7 .164	8 -.140
1	.779	***	.252	.264	.267	.512	.609	.615	.919
2	.527		***	.012	.015	.26	.357	.363	.667
4	.515			***	.003	.248	.345	.351	.655
3	.512				***	.245	.342	.348	.652
5	.267					***	.097	.103	.407
6	.170						***	.006	.31
7	.164							***	.304
8	-.140								***
9	-.190								
10	-.334								
11	-.335								
12	-.394								
13	-.509								
14	-.628								
15	-.838								
16	-1.054								

r =	2	3	4	5	6	7	8
c.d =	.244	.291	.319	.340	.355	.367	.378

9	10	11	12	13	14	15	16	
-.19	-.334	-.355	-.394	-.509	-.628	-.838	-1.054	r
.969	1.113	1.134	1.173	1.288	1.407	1.617	1.833	16
.717	.861	.882	.921	1.036	1.155	1.365	1.581	15
.705	.849	.87	.909	1.024	1.143	1.353	1.569	14
.702	.846	.867	.906	1.021	1.14	1.35	1.566	13
.457	.601	.622	.661	.776	.895	1.105	1.321	12
.36	.504	.525	.564	.679	.798	1.008	1.224	11
.354	.498	.519	.558	.673	.792	1.002	1.218	10
.05	.194	.215	.254	.369	.488	.698	.914	9
***	.144	.165	.204	.319	.438	.648	.864	8
	***	.021	.06	.175	.294	.504	.72	7
		***	.039	.154	.273	.483	.699	6
			***	.115	.234	.444	.66	5
				***	.119	.329	.545	4
					***	.21	.426	3
						***	.216	2
							***	

9	10	11	12	13	14	15	16
.386	.393	.400	.407	.412	.417	.422	.427

ESM FACTOR 1 - LOW SKILLED GROUP

		4 1.265	3 1.258	2 1.246	1 1.091	6 .952	5 .951	8 .630	7 .623
4	1.265	***	.007	.019	.174	.313	.314	.635	.642
3	1.258		***	.012	.167	.306	.307	.628	.635
2	1.246			***	.155	.294	.295	.616	.623
1	1.091				***	.139	.14	.461	.468
6	.952					***	.001	.322	.329
5	.951						***	.321	.328
8	.63							***	.007
7	.623								***
9	.498								
10	.353								
11	.188								
12	.166								
13	-.094								
14	-.289								
15	-.535								
16	-.793								

r =	2	3	4	5	6	7	8
c.d =	.310	.370	.407	.432	.451	.467	.480

9	10	11	12	13	14	15	16	
.498	.353	.188	.166	-.094	-.289	-.535	-.793	r
.767	.912	1.077	1.099	1.359	1.554	1.8	2.058	16
.76	.905	1.07	1.092	1.352	1.547	1.793	2.051	15
.748	.893	1.058	1.08	1.34	1.535	1.781	2.039	14
.593	.738	.903	.925	1.185	1.38	1.626	1.884	13
.454	.599	.766	.786	1.046	1.241	1.487	1.745	12
.453	.598	.765	.785	1.045	1.24	1.486	1.774	11
.132	.277	.442	.464	.724	.919	1.165	1.423	10
.125	.27	.435	.457	.717	.912	1.158	1.416	9
***	.145	.31	.332	.592	.778	1.033	1.291	8
	***	.165	.187	.447	.642	.888	1.146	7
		***	.022	.282	.455	.723	.981	6
			***	.26	.123	.701	.959	5
				***	.195	.441	.699	4
					***	.246	.504	3
						***	.258	2
							***	

9	10	11	12	13	14	15	16
.492	.501	.508	.517	.524	.531	.538	.543

ESM FACTOR 2 - LOW SKILLED GROUP

		4 -.156	3 -.177	6 -.194	2 -.267	5 -.275	7 -.472	1 -.541	8 -.627
4	-.156	***	.021	.038	.111	.119	.316	.385	.471
3	-.177		***	.017	.09	.098	.295	.364	.45
6	-.194			***	.073	.081	.278	.347	.433
2	-.267				***	.008	.205	.274	.36
5	-.275					***	.197	.266	.352
7	-.472						***	.069	.155
1	-.541							***	.086
8	-.627								***
9	-.664								
10	-.716								
11	-.845								
12	-.877								
13	-1.037								
14	-1.185								
15	-1.377								
16	-1.65								

r =	2	3	4	5	6	7	8
c.d =	.263	.314	.345	.367	.383	.396	.408

9	10	11	12	13	14	15	16	
-.664	-.716	-.845	-.877	-1.037	-1.185	-1.377	-1.65	r
.508	.56	.689	.721	.81	1.029	1.221	1.494	16
.487	.539	.668	.7	.86	1.008	1.2	1.473	15
.47	.522	.651	.683	.843	.991	1.183	1.456	14
.397	.449	.578	.61	.77	.918	1.11	1.383	13
.389	.41	.57	.602	.762	.91	1.102	1.372	12
.192	.244	.373	.405	.565	.713	.905	1.178	11
.123	.175	.304	.336	.496	.644	.836	1.109	10
.037	.089	.218	.25	.41	.558	.75	1.023	9
***	.052	.181	.213	.373	.521	.713	.986	8
	***	.129	.161	.321	.469	.661	.934	7
		***	.032	.192	.34	.532	.805	6
			***	.16	.308	.5	.773	5
				***	.148	.34	.613	4
					***	.192	.465	3
						***	.273	2
							***	

9	10	11	12	13	14	15	16
.417	.425	.431	.439	.445	.450	.456	.461

APPENDIX 17

Experience Questionnaire Eigenvalues

FACTOR	EIGENVALUE	% OF VAR	CUM %
1	19.44213	34.1	34.1
2	5.99278	10.5	44.6
3	3.43965	6.0	50.7
4	2.61861	4.6	55.3
5	2.07558	3.6	58.9
6	1.62889	2.9	61.8
7	1.44449	2.5	64.3
8	1.25674	2.2	66.5
9	1.11755	2.0	68.4
10	1.05453	1.9	70.3
11	.97092	1.9	72.0
12	.94011	1.6	73.7
13	.91400	1.6	75.3
14	.84630	1.5	76.7
15	.77197	1.4	78.1
16	.70760	1.2	79.3
17	.67281	1.2	80.5
18	.61168	1.1	81.6
19	.59947	1.1	82.6
20	.58031	1.0	83.7
21	.52252	.9	84.6
22	.50144	.9	85.5
23	.49069	.9	86.3
24	.46594	.8	87.1
25	.45930	.8	87.9
26	.40878	.7	88.7
27	.40110	.7	89.4
28	.38716	.7	90.0
29	.37256	.7	90.7
30	.34191	.6	91.3
31	.33174	.6	91.9
32	.29827	.5	92.4
33	.28990	.5	92.9
34	.28008	.5	93.4
35	.27285	.5	93.9
36	.26066	.5	94.3
37	.24479	.4	94.8
38	.23221	.4	95.2
39	.22604	.4	95.6
40	.21502	.4	95.9
41	.20479	.4	96.3
42	.19165	.3	96.6
43	.18795	.3	97.0
44	.17090	.3	97.3
45	.16313	.3	97.6
46	.15706	.3	97.8
47	.15411	.3	98.1
48	.14274	.3	98.4
49	.13481	.2	98.6
50	.12603	.2	98.8

51	.12163	.2	99.0
52	.11232	.2	99.2
53	.10164	.2	99.4
54	.09601	.2	99.6
55	.09062	.2	99.7
56	.07995	.1	99.9
57	.07557	.1	100.0

APPENDIX 18

Multivariate, Univariate And Simple Main Effects Tables
- Experience Questionnaire Analysis

EFFECT	VALUE	EXACT F	HYPOTH DF	ERROR DF	SIG OF F
DIFF	.08093	14.40992	75.00	1565.71	.000
GROUP	.73086	1.32572	5.00	18.00	.298
GROUP X DIFF	.32016	5.60371	75.00	1565.71	.000

Table 1 : MANOVA Table For Experience Effects

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
GROUP	12.96336	125.2643	12.96336	5.69383	2.27674	.146
DIFF	78.81074	56.95719	5.25405	.17260	30.4410	.000
G X D	27.50626	56.95719	1.83375	.17260	10.6244	.000

Table 2 : ANOVA Table For Experience Factor 1 Effects

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
GROUP	1.54525	204.2599	1.54525	9.28454	.16643	.687
DIFF	40.38820	46.91412	2.69255	.14216	18.9397	.000
G X D	26.66685	46.95719	1.77779	.14216	12.5052	.000

Table 3 : ANOVA Table For Experience Factor 2 Effects

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR SS	F	SIG OF F
GROUP	7.13974	31.5383	7.13974	1.43356	4.98043	.036
DIFF	188.65632	58.10386	12.57709	.17607	71.4313	.000
G X D	7.31559	58.10386	.48771	.17607	2.76992	.000

Table 4 : ANOVA Table For Experience Factor 3 Effects

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR SS	F	SIG OF F
GROUP	1.43616	114.6952	1.43616	5.21342	.27547	.605
DIFF	76.43684	145.4435	5.09579	.44074	11.5619	.000
G X D	30.84559	145.4435	2.05637	.44074	4.66575	.000

Table 5 : ANOVA Table For Experience Factor 4 Effects

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR SS	F	SIG OF F
GROUP	2.12667	325.1121	2.12667	14.77782	.14391	.708
DIFF	5.03686	47.83553	.33579	.14496	2.31650	.004
G X D	2.32272	47.83553	.15485	.14496	1.06824	.385

Table 6 : ANOVA Table For Experience Factor 5 Effects

GP	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
LOW	50.91637	20.20268	3.39442	.12244	27.72306	.000
HIGH	55.40062	36.75451	3.69337	.22275	16.58046	.000

Table 7 : Tests Of Simple Main Effects - Experience Factor 1

GP	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
LOW	63.66257	39.55286	4.24417	.23971	17.70512	.000
HIGH	3.39248	7.36126	.22617	.04461	5.06942	.000

Table 8 : Tests Of Simple Main Effects - Experience Factor 2

GP	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
LOW	132.71694	37.32935	8.84780	.22624	39.10828	.000
HIGH	63.25496	20.77451	4.21700	.12591	33.49319	.000

Table 9 : Tests Of Simple Main Effects - Experience Factor 3

GP	HYPOTH SS	ERROR SS	HYPOTH SS	ERROR MS	F	SIG OF F
LOW	61.97123	59.07999	4.13142	.35806	11.53832	.000
HIGH	45.31120	86.36351	3.02075	.52342	5.77122	.000

Table 10 : Tests Of Simple Main Effects - Experience Factor 4

GP	HYPOTH SS	ERROR SS	HYPOTH SS	ERROR MS	F	SIG OF F
LOW	6.07199	37.61096	.40480	.22795	1.77586	.042
HIGH	1.28760	10.22457	.08584	.06197	1.38525	.160

Table 11 : Tests Of Simple Main Effects - Experience Factor 5

APPENDIX 19

Newman Keuls Follow Up Tests
(Experience Questionnaire Factor Scores)

EXPERIENCE FACTOR 1 - DIFFICULTY EFFECT

		8 .637	7 .595	6 .590	5 .356	9 .329	4 .232	10 .128	3 .114
8	.637	***	.042	.047	.281	.308	.405	.509	.523
7	.595		***	.005	.239	.266	.363	.467	.481
6	.590			***	.234	.261	.358	.462	.476
5	.356				***	.027	.124	.228	.242
9	.329					***	.097	.201	.215
4	.232						***	.104	.118
10	.128							***	.014
3	.114								***
11	-.027								
1	-.042								
2	-.058								
12	-.290								
13	-.430								
14	-.451								
15	-.714								
16	-.882								

r =	2	3	4	5	6	7	8
c.d =	.235	.281	.309	.328	.343	.354	.365

11	1	2	12	13	14	15	16	
-.027	-.042	-.058	-.29	-.43	-.541	-.714	-.882	r
.664	.679	.695	.927	1.067	1.178	1.351	1.519	16
.622	.637	.653	.885	1.025	1.136	1.309	1.477	15
.617	.632	.648	.88	1.02	1.131	1.304	1.472	14
.383	.398	.414	.646	.786	.897	1.07	1.238	13
.356	.371	.387	.619	.759	.87	1.043	1.211	12
.259	.274	.29	.522	.662	.773	.946	1.114	11
.155	.17	.186	.418	.558	.669	.842	1.01	10
.141	.156	.172	.404	.544	.655	.828	.996	9
***	.015	.031	.263	.403	.514	.687	.855	8
	***	.016	.248	.388	.499	.672	.84	7
		***	.232	.372	.483	.656	.824	6
			***	.14	.251	.424	.592	5
				***	.111	.284	.452	4
					***	.173	.341	3
						***	.168	2
							***	

9	10	11	12	13	14	15	16
.373	.380	.386	.393	.398	.403	.408	.412

EXPERIENCE FACTOR 2 - DIFFICULTY EFFECT

		1	2	3	4	5	6	7	9
		.844	.411	.316	.285	.243	.035	.018	-.13
1	.844	***	.433	.528	.559	.601	.809	.826	.974
2	.411		***	.095	.126	.168	.376	.393	.541
3	.316			***	.031	.073	.281	.298	.446
4	.285				***	.042	.25	.267	.415
5	.243					***	.208	.225	.373
6	.035						***	.017	.165
7	.018							***	.148
9	-.130								***
8	-.131								
16	-.201								
12	-.237								
11	-.252								
14	-.279								
10	-.282								
13	-.304								
15	-.336								

r =	2	3	4	5	6	7	8
c.d =	.213	.255	.280	.297	.310	.321	.330

8	16	12	11	14	10	13	15	
-.131	-.201	-.237	-.252	-.279	-.282	-.304	-.336	r
.975	1.045	1.081	1.096	1.123	1.126	1.148	1.18	16
.542	.612	.648	.663	.69	.693	.715	.747	15
.447	.517	.553	.568	.595	.598	.62	.652	14
.416	.486	.522	.537	.564	.567	.589	.621	13
.374	.444	.48	.495	.522	.525	.547	.579	12
.166	.236	.272	.287	.314	.317	.339	.371	11
.149	.219	.255	.27	.297	.3	.322	.354	10
.001	.071	.107	.122	.149	.152	.174	.206	9
***	.07	.106	.121	.148	.151	.173	.205	8
	***	.036	.051	.078	.081	.103	.135	7
		***	.015	.042	.045	.067	.099	6
			***	.027	.03	.052	.084	5
				***	.003	.025	.057	4
					***	.022	.054	3
						***	.032	2
							***	

9	10	11	12	13	14	15	16
.338	.344	.350	.356	.360	.365	.370	.373

EXPERIENCE FACTOR 3 - DIFFICULTY EFFECT

		16 1.563	15 1.227	14 .816	13 .674	12 .243	11 .120	10 -.073	9 -.171
16	1.563	***	.336	.747	.889	1.32	1.443	1.636	1.734
15	1.227		***	.411	.553	.984	1.107	1.3	1.398
14	.816			***	.142	.573	.696	.889	.987
13	.674				***	.431	.554	.747	.845
12	.243					***	.123	.316	.414
11	.120						***	.193	.291
10	-.073							***	.098
9	-.171								***
8	-.225								
7	-.353								
6	-.492								
4	-.571								
3	-.585								
5	-.645								
2	-.682								
1	-.844								

r =	2	3	4	5	6	7	8
c.d =	.238	.285	.312	.331	.347	.359	.369

8	7	6	4	3	5	2	1	
-.225	-.353	-.492	-.571	-.585	-.645	-.682	-.844	r
1.788	1.916	2.055	2.134	2.148	2.208	2.245	2.407	16
1.452	1.58	1.719	1.798	1.812	1.872	1.909	2.071	15
1.041	1.169	1.308	1.387	1.401	1.461	1.498	1.66	14
.899	1.027	1.166	1.245	1.259	1.319	1.356	1.518	13
.468	.596	.735	.814	.828	.888	.925	1.087	12
.345	.473	.612	.691	.705	.765	.802	.964	11
.152	.28	.419	.498	.512	.572	.609	.771	10
.054	.182	.321	.4	.414	.474	.511	.673	9
***	.128	.267	.346	.36	.42	.457	.619	8
	***	.139	.218	.232	.292	.329	.491	7
		***	.079	.093	.153	.19	.352	6
			***	.014	.074	.111	.273	5
				***	.06	.097	.259	4
					***	.037	.199	3
						***	.162	2
							***	

9	10	11	12	13	14	15	16
.378	.384	.390	.399	.402	.408	.413	.417

EXPERIENCE FACTOR 4 - DIFFICULTY EFFECT

		7 .639	8 .475	6 .354	9 .258	10 .238	5 .228	12 .155	4 .099
7	.639	***	.164	.285	.381	.401	.411	.484	.54
8	.475		***	.121	.217	.237	.247	.32	.376
6	.354			***	.096	.116	.126	.199	.255
9	.258				***	.02	.03	.103	.159
10	.238					***	.01	.083	.139
5	.228						***	.073	.129
12	.155							***	.056
4	.099								***
11	.079								
13	-.029								
14	-.043								
15	-.087								
16	-.143								
3	-.257								
2	-.687								
1	-1.28								

r =	2	3	4	5	6	7	8
c.d =	.377	.450	.494	.525	.548	.567	.583

11	13	14	15	16	3	2	1	
.079	-.029	-.043	-.087	-.143	-.257	-.687	-1.28	r
.56	.668	.682	.726	.782	.896	1.326	1.919	16
.396	.504	.518	.562	.618	.732	1.162	1.755	15
.275	.383	.397	.441	.497	.611	1.041	1.634	14
.179	.287	.301	.345	.401	.515	.945	1.538	13
.159	.267	.281	.325	.381	.495	.925	1.518	12
.149	.257	.271	.315	.371	.485	.915	1.508	11
.076	.184	.198	.242	.298	.412	.842	1.435	10
.02	.128	.142	.186	.242	.356	.786	1.379	9
***	.108	.122	.166	.222	.336	.766	1.359	8
	***	.014	.058	.114	.228	.658	1.251	7
		***	.044	.1	.214	.644	1.237	6
			***	.056	.17	.6	1.193	5
				***	.114	.544	1.137	4
					***	.43	1.023	3
						***	.593	2
							***	

9	10	11	12	13	14	15	16
.597	.608	.617	.628	.636	.645	.653	.660

EXPERIENCE FACTOR 5 - DIFFICULTY EFFECT

		6 .216	7 .135	10 .103	5 .094	8 .071	4 .049	9 .037	13 .015
6	.216	***	.081	.113	.122	.145	.167	.179	.201
7	.135		***	.032	.041	.064	.086	.098	.12
10	.103			***	.009	.032	.054	.066	.088
5	.094				***	.023	.045	.057	.079
8	.071					***	.022	.034	.056
4	.049						***	.012	.064
9	.037							***	.022
13	.015								***
15	.014								
12	.012								
11	-.043								
3	-.077								
16	-.082								
14	-.151								
1	-.177								
2	-.216								

r =	2	3	4	5	6	7	8
c.d =	.216	.258	.283	.301	.314	.325	.335

15	12	11	3	16	14	1	2	
.014	.012	-.043	-.077	-.082	-.151	-.177	-.216	r
.202	.204	.259	.293	.298	.367	.393	.432	16
.13	.15	.178	.212	.217	.286	.312	.351	15
.089	.091	.146	.18	.185	.254	.28	.319	14
.08	.082	.137	.171	.176	.245	.271	.31	13
.057	.059	.114	.148	.153	.222	.248	.287	12
.065	.067	.092	.126	.131	.2	.226	.265	11
.023	.025	.08	.114	.119	.188	.214	.253	10
.001	.003	.058	.092	.097	.166	.192	.231	9
***	.002	.057	.091	.096	.165	.191	.23	8
	***	.055	.089	.094	.163	.189	.228	7
		***	.034	.039	.108	.134	.173	6
			***	.005	.074	.1	.139	5
				***	.069	.095	.134	4
					***	.026	.065	3
						***	.039	2
							***	

9	10	11	12	13	14	15	16
.342	.349	.354	.360	.365	.370	.374	.378

EXPERIENCE FACTOR 1 - HIGH SKILLED GROUP

		8 .546	7 .442	9 .121	6 .116	10 -.204	5 -.338	11 -.437	12 -.676
8	.546	***	.104	.425	.43	.75	.884	.983	1.222
7	.442		***	.321	.326	.646	.78	.879	1.118
9	.121			***	.005	.325	.459	.558	.797
6	.116				***	.32	.454	.553	.792
10	-.204					***	.134	.233	.472
5	-.338						***	.099	.338
11	-.437							***	.239
12	-.676								***
4	-.725								
3	-.791								
13	-.863								
1	-.885								
2	-.94								
14	-.983								
15	-1.092								
16	-1.225								

r =	2	3	4	5	6	7	8
c.d =	.377	.450	.494	.525	.548	.567	.583

4	3	13	1	2	14	15	16	
-.725	-.791	-.863	-.885	-.942	-.983	-1.092	-1.225	r
1.271	1.337	1.409	1.431	1.488	1.529	1.638	1.771	16
1.167	1.233	1.305	1.327	1.384	1.425	1.534	1.667	15
.846	.912	.984	1.006	1.063	1.104	1.213	1.346	14
.841	.907	.979	1.001	1.058	1.099	1.208	1.341	13
.521	.587	.659	.681	.738	.779	.888	1.021	12
.387	.453	.525	.547	.604	.645	.754	.887	11
.288	.354	.426	.448	.505	.546	.655	.788	10
.049	.115	.187	.209	.266	.307	.416	.549	9
***	.066	.138	.16	.217	.258	.367	.5	8
	***	.072	.094	.151	.192	.301	.434	7
		***	.022	.079	.12	.229	.362	6
			***	.057	.098	.207	.34	5
				***	.041	.15	.283	4
					***	.109	.242	3
						***	.133	2
							***	

9	10	11	12	13	14	15	16
.597	.608	.617	.628	.636	.645	.653	.660

EXPERIENCE FACTOR 2 - HIGH SKILLED GROUP

		1	2	16	3	15	4	14	5
		-.154	-.194	-.284	-.306	-.342	-.347	-.362	-.386
1	-.154	***	.04	.13	.152	.188	.193	.208	.232
2	-.194		***	.09	.112	.148	.153	.168	.192
16	-.284			***	.022	.058	.063	.078	.102
3	-.306				***	.036	.041	.056	.08
15	-.342					***	.005	.02	.044
4	-.347						***	.015	.039
14	-.362							***	.024
5	-.386								***
13	-.451								
6	-.473								
12	-.489								
10	-.407								
11	-.504								
7	-.563								
9	-.592								
8	-.628								

r =	2	3	4	5	6	7	8
c.d =	.169	.202	.221	.235	.246	.254	.262

13	6	12	10	11	7	9	8	
-.451	-.473	-.489	-.497	-.504	-.563	-.592	-.628	r
.297	.319	.335	.343	.35	.409	.438	.474	16
.257	.279	.295	.303	.31	.369	.398	.434	15
.167	.189	.205	.213	.22	.279	.308	.344	14
.145	.167	.183	.191	.198	.257	.286	.322	13
.109	.131	.147	.155	.162	.221	.25	.286	12
.104	.126	.142	.15	.157	.216	.245	.281	11
.089	.111	.127	.135	.142	.201	.23	.266	10
.065	.087	.103	.111	.118	.177	.206	.242	9
***	.022	.038	.046	.053	.112	.141	.177	8
	***	.016	.124	.031	.09	.119	.155	7
		***	.008	.015	.074	.103	.139	6
			***	.007	.066	.095	.131	5
				***	.059	.088	.124	4
					***	.029	.065	3
						***	.036	2
							***	

9	10	11	12	13	14	15	16
.268	.273	.277	.282	.285	.289	.293	.296

EXPERIENCE FACTOR 3 - HIGH SKILLED GROUP

		16	15	14	13	12	11	9	10
		.771	.565	.207	-.054	-.345	-.452	-.619	-.624
16	.771	***	.206	.564	.825	1.116	1.223	1.39	1.395
15	.565		***	.358	.619	.91	1.017	1.184	1.189
14	.207			***	.261	.552	.659	.826	.831
13	-.054				***	.291	.398	.565	.57
12	-.345					***	.107	.274	.279
11	-.452						***	.167	.172
9	-.619							***	.005
10	-.624								***
8	-.635								
7	-.749								
6	-.836								
3	-.969								
4	-1.026								
5	-1.046								
2	-1.079								
1	-1.167								

r =	2	3	4	5	6	7	8
c.d =	.283	.338	.37	.394	.411	.425	.438

8	7	6	3	4	5	2	1	
-.635	-.749	-.836	-.969	-1.026	-1.046	-1.079	-1.167	r
1.406	1.52	1.607	1.74	1.797	1.817	1.85	1.938	16
1.2	1.314	1.401	1.534	1.591	1.611	1.644	1.732	15
.842	.956	1.043	1.176	1.233	1.253	1.286	1.374	14
.581	.695	.782	.915	.972	.992	1.025	1.113	13
.29	.404	.491	.624	.681	.701	.734	.822	12
.183	.297	.384	.517	.574	.594	.627	.715	11
.016	.13	.217	.35	.407	.427	.46	.548	10
.011	.125	.212	.345	.402	.422	.455	.543	9
***	.114	.201	.334	.391	.411	.444	.532	8
	***	.087	.22	.277	.297	.33	.418	7
		***	.133	.19	.21	.243	.331	6
			***	.057	.077	.11	.198	5
				***	.02	.053	.141	4
					***	.033	.121	3
						***	.088	2
							***	

9	10	11	12	13	14	15	16
.448	.456	.463	.471	.477	.483	.490	.495

EXPERIENCE FACTOR 4 - HIGH SKILLED GROUP

		7 1.05	8 .903	9 .798	10 .688	6 .465	12 .437	11 .362	5 .292
7	1.05	***	.147	.252	.362	.585	.613	.688	.758
8	.903		***	.105	.215	.438	.466	.541	.611
9	.798			***	.11	.333	.361	.436	.506
10	.688				***	.223	.251	.326	.396
6	.465					***	.028	.103	.173
12	.437						***	.075	.145
11	.362							***	.07
5	.292								***
13	.142								
4	.054								
14	-.102								
3	-.201								
15	-.367								
16	-.388								
1	-.452								
2	-.458								

r =	2	3	4	5	6	7	8
c.d =	.579	.692	.759	.807	.842	.872	.897

13	4	14	3	15	16	1	2	
.142	.054	-.102	-.201	-.367	-.388	-.452	-.458	r
.908	.996	1.152	1.251	1.417	1.438	1.502	1.508	16
.761	.849	1.005	1.104	1.27	1.291	1.355	1.361	15
.656	.744	.9	.999	1.165	1.186	1.25	1.256	14
.546	.634	.79	.889	1.055	1.076	1.14	1.146	13
.323	.411	.567	.666	.832	.853	.917	.923	12
.295	.383	.539	.638	.804	.825	.889	.895	11
.22	.308	.464	.563	.729	.75	.814	.82	10
.15	.238	.394	.493	.659	.68	.744	.75	9
***	.088	.244	.343	.509	.53	.594	.6	8
	***	.156	.255	.421	.442	.506	.512	7
		***	.099	.265	.286	.35	.356	6
			***	.166	.187	.251	.257	5
				***	.021	.085	.091	4
					***	.064	.07	3
						***	.006	2
							***	

9	10	11	12	13	14	15	16
.918	.934	.949	.966	.978	.991	1.003	1.013

EXPERIENCE FACTOR 1 - LOW SKILLED GROUP

		4 1.189	6 1.064	5 1.051	3 1.020	2 .826	1 .800	7 .749	8 .728
4	1.189	***	.125	.138	.169	.363	.393	.44	.461
6	1.064		***	.013	.044	.238	.264	.315	.336
5	1.051			***	.031	.225	.251	.302	.323
3	1.020				***	.194	.22	.271	.292
2	.826					***	.026	.077	.098
1	.800						***	.051	.072
7	.749							***	.021
8	.728								***
9	.538								
10	.461								
11	.383								
12	.096								
13	.003								
14	-.099								
15	-.337								
16	-.539								

r =	2	3	4	5	6	7	8
c.d =	.280	.334	.367	.390	.407	.421	.433

9	10	11	12	13	14	15	16	
.538	.461	.383	.096	.003	-.099	-.337	-.539	r
.651	.728	.806	1.093	1.186	1.286	1.526	1.728	16
.526	.603	.681	.968	1.061	1.163	1.401	1.603	15
.513	.59	.668	.955	1.048	1.15	1.388	1.59	14
.482	.559	.637	.924	1.017	1.119	1.357	1.559	13
.288	.365	.443	.73	.823	.925	1.163	1.365	12
.262	.339	.417	.704	.79	.899	1.137	1.339	11
.211	.288	.366	.653	.746	.848	1.086	1.288	10
.19	.267	.345	.632	.725	.827	1.065	1.267	9
***	.077	.155	.442	.535	.637	.875	1.077	8
	***	.078	.365	.458	.56	.798	1	7
		***	.287	.38	.482	.72	.922	6
			***	.093	.195	.433	.635	5
				***	.102	.34	.542	4
					***	.238	.44	3
						***	.202	2
							***	

9	10	11	12	13	14	15	16
.443	.451	.459	.467	.473	.479	.485	.490

EXPERIENCE FACTOR 2 - LOW SKILLED GROUP

		1	2	3	4	5	7	6	8
		1.842	1.017	.938	.918	.873	.600	.544	.365
1	1.842	***	.825	.904	.924	.969	1.242	1.298	1.477
2	1.017		***	.079	.099	.144	.417	.473	.652
3	.938			***	.02	.065	.338	.394	.573
4	.918				***	.045	.318	.374	.553
5	.873					***	.273	.329	.508
7	.600						***	.056	.235
6	.544							***	.179
8	.365								***
9	.332								
12	.015								
11	-.001								
10	-.068								
16	-.118								
13	-.157								
14	-.197								
15	-.331								

r =	2	3	4	5	6	7	8
c.d =	.391	.467	.512	.544	.568	.588	.605

9	12	11	10	16	13	14	15	
.332	.015	-.001	-.068	-.118	-.157	-.197	-.331	r
1.51	1.827	1.843	1.91	1.96	1.999	2.039	2.173	16
.685	1.002	1.018	1.085	1.135	1.174	1.214	1.348	15
.606	.923	.939	1.006	1.056	1.095	1.135	1.269	14
.586	.903	.919	.986	1.036	1.075	1.115	1.249	13
.541	.858	.874	.941	.991	1.03	1.07	1.204	12
.268	.585	.601	.668	.718	.757	.797	.931	11
.212	.529	.545	.612	.662	.701	.741	.875	10
.033	.35	.366	.433	.483	.522	.562	.696	9
***	.317	.333	.4	.45	.489	.529	.663	8
	***	.016	.083	.133	.172	.212	.346	7
		***	.067	.117	.156	.192	.33	6
			***	.05	.089	.129	.33	5
				***	.039	.079	.213	4
					***	.04	.174	3
						***	.134	2
							***	

9	10	11	12	13	14	15	16
.619	.630	.640	.651	.660	.668	.677	.684

EXPERIENCE FACTOR 3 - LOW SKILLED GROUP

		16 2.356	15 1.889	14 1.425	13 1.042	12 .831	11 .693	10 .478	9 .277
16	2.356	***	.467	.931	.954	1.525	1.663	1.878	2.079
15	1.889		***	.464	.487	1.058	1.196	1.411	1.622
14	1.425			***	.023	.594	.732	.947	1.148
13	1.042				***	.571	.709	.924	1.125
12	.831					***	.138	.353	.554
11	.693						***	.215	.416
10	.478							***	.201
9	.277								***
8	.184								
7	.043								
4	-.117								
6	-.148								
3	-.202								
5	-.245								
2	-.285								
1	-.522								

r =	2	3	4	5	6	7	8
c.d =	.379	.453	.497	.529	.552	.571	.588

8	7	4	6	3	5	2	1	
.184	.043	-.117	-.148	-.202	-.245	-.285	-.522	r
2.172	2.313	2.473	2.504	2.558	2.601	2.641	2.878	16
1.715	1.846	2.006	2.037	2.091	2.134	2.174	2.411	15
1.241	1.382	1.542	1.573	1.627	1.67	1.71	1.947	14
1.218	1.445	1.519	1.55	1.604	1.647	1.687	1.924	13
.647	.788	.948	.979	1.033	1.076	1.116	1.353	12
.509	.596	.756	.841	.895	.938	.978	1.215	11
.294	.435	.595	.626	.68	.723	.763	1	10
.093	.234	.394	.425	.479	.522	.562	.799	9
***	.141	.301	.332	.386	.429	.469	.706	8
	***	.16	.191	.245	.288	.328	.565	7
		***	.03	.085	.128	.168	.405	6
			***	.054	.097	.137	.374	5
				***	.043	.083	.32	4
					***	.04	.277	3
						***	.237	2
							***	

9	10	11	12	13	14	15	16
.601	.612	.622	.633	.641	.649	.658	.664

EXPERIENCE FACTOR 4 - LOW SKILLED GROUP

		6 .244	7 .288	15 .193	5 .165	4 .145	16 .101	8 .048	14 .015
6	.244	***	.016	.051	.079	.099	.143	.196	.229
7	.288		***	.035	.063	.083	.127	.18	.213
15	.193			***	.028	.048	.092	.145	.178
5	.165				***	.02	.064	.117	.15
4	.145					***	.044	.097	.13
16	.101						***	.053	.086
8	.048							***	.033
14	.015								***
12	-.127								
13	-.201								
11	-.204								
10	-.211								
9	-.281								
3	-.314								
2	-.917								
1	-2.108								

r =	2	3	4	5	6	7	8
c.d =	.479	.573	.628	.668	.697	.721	.742

12	13	11	10	9	3	2	1	
-.127	-.201	-.204	-.211	-.281	-.314	-.917	-2.108	r
.371	.445	.448	.455	.525	.558	1.161	2.352	16
.355	.429	.432	.439	.509	.542	1.145	2.336	15
.32	.394	.397	.404	.474	.507	1.11	2.301	14
.292	.366	.369	.376	.446	.479	1.082	2.273	13
.272	.346	.349	.356	.426	.459	1.062	2.253	12
.228	.302	.305	.312	.382	.415	1.018	2.209	11
.175	.249	.252	.259	.329	.362	.965	2.156	10
.142	.216	.219	.226	.296	.329	.932	2.123	9
***	.074	.077	.084	.154	.187	.79	1.981	8
	***	.003	.001	.008	.113	.716	1.907	7
		***	.007	.077	.11	.713	1.904	6
			***	.07	.103	.706	1.897	5
				***	.033	.636	1.827	4
					***	.603	1.794	3
						***	1.191	2
							***	

9	10	11	12	13	14	15	16
.759	.773	.785	.799	.810	.820	.830	.839

APPENDIX 20

Experiment 3 ESM Instructions

1. Specific Activities
2. Random Activities

'

Attached to this sheet are 8 copies of a questionnaire which are to be completed during or immediately following specific activities or events. The form requires responses to what you are doing and how you are feeling, and should be completed during the event. If this is not possible, then you should complete the form as soon as possible after completing the activity. You should complete one form on two seperate occasions for each activity specified.

The activities are as follows:

1. During or following something you are very good at.
2. During or following something you find very difficult.
3. During or following an unstimulating or mundane work activity.
4. During or following a recreation or leisure activity.

Thank you

,

This booklet contains 30 copies of a self-report form to be completed at random periods over the next five days. To this objective, you are given a series of times which are indicated below (six per day) at which you should complete a self-report form immediately if at all possible.

The self-report form requires responses to what you are doing and how you are feeling at the time indicated. if you are unable to complete a form on time, you should complete the form as soon as possible afterwards about how you felt at the time specified. The schedule will specify that you should complete a form within every two hour block of time between 9am and 9pm (ie, 9-11am, 11am-1pm, etc) over a five day period.

MON	10.15am	11.30am	2.20pm	4.10pm	6.45pm	8.15pm
TUE	9.30am	12.10am	1.15pm	4.45pm	6.10pm	8.45pm
WED	10.50am	11.50am	2.45pm	3.50pm	5.10pm	7.40pm
THU	9.15am	12.45pm	1.35pm	3.10pm	5.30pm	7.10pm
FRI	9.55am	12.30pm	2.00pm	4.30pm	5.45pm	8.00pm

APPENDIX 21

Basic Programme For Multiplication Of Factor Score Matrices

```
 10 INPUT "SUBJECT NO"; A$
 20 CREATE £10, "B:" +A$
 30 DIM X(38,26), Y(26,3), Z(38,3)
 40 DATA -.02133 .11804 -.25442
 50 DATA .03240 -.16574 .03230
 60 DATA -.02631 .14106 -.01293
 70 DATA -.03595 .15704 -.06397
 80 DATA .02762 -.10772 -.09798
 90 DATA .03541 -.15209 -.03986
100 DATA -.00215 .07769 .19292
110 DATA .00358 -.13835 -.01356
120 DATA .01273 -.00584 .33530
130 DATA -.02984 .18589 -.24526
140 DATA -.01814 -.06343 -.00634
150 DATA .08564 -.01384 .15700
160 DATA .10764 -.06336 .04105
170 DATA -.07535 -.02181 .09984
180 DATA .05341 .05508 -.16015
190 DATA -.08060 -.00172 .03950
200 DATA .09805 -.05285 .02559
210 DATA -.09504 .02673 -.05194
220 DATA -.09835 .02911 -.09214
230 DATA .10323 -.01976 -.00683
240 DATA .11185 -.03229 .04362
250 DATA .10089 -.00965 -.00773
260 DATA .11128 -.03245 .00950
270 DATA .10492 -.01932 .03135
280 DATA -.06298 -.02586 -.04874
290 DATA .04233 -.04910 .48692
300 FOR I=1 TO 26: FOR J=1 TO 3
310 READ Y(I,J)
320 NEXT J: NEXT I
330 FOR I=1 TO 38: FOR J=1 TO 26
340 PRINT "ROW:"; I; "COLUMN:"; J; "PLEASE"
350 INPUT X(I,J)
360 IF X(I,J)=999 THEN GOSUB 2000: GOTO 350
370 NEXT J: NEXT I
380 PRINT "DO YOU WANT TO CHECK YOUR MATRIX ?"
390 PRINT "IF SO TYPE Y OR y, IF NOT TYPE N OR n"
400 INPUT M$: IF ASC(M$)=121 OR ASC(M$)=89 THEN GOSUB 3000
410 PRINT "THE RESULTS MATRIX IS AS FOLLOWS:"
420 FOR A=1 TO 38: FOR B=1 TO 3: FOR J=1 TO 26
430 Z(A,B) = Z(A,B) + (X(A,J)*Y(J,B))
440 NEXT J
450 PRINT Z(A,B);
460 PRINT £10, Z(A,B);
470 NEXT B
480 LPRINT: PRINT £10: NEXT A: CLOSE £10
490 END
2000 INPUT "WHICH ROW"; F1
2010 INPUT "WHICH COLUMN"; F2
2020 INPUT "INPUT CORRECT VALUE"; X(F1,F2)
2030 RETURN
3000 FOR I=1 TO 38: FOR J=1 TO 26
3010 PRINT X(I,J):
3020 NEXT J: PRINT: NEXT I
```

```
3030 INPUT "ANY VALUES STILL TO BE CORRECTED (Y OR N)"; D$
3040 IF ASC(D$)=121 OR ASC(D$)=89 THEN GOSUB 2000: GOTO 3030
3050 RETURN
```

APPENDIX 22

Worry-Emotionality Inventory

DIRECTIONS

To the left of each of the following statements, indicate your feelings, attitudes, or thoughts as they are RIGHT NOW in relation to this course examination. Use the following numerical scale :

1 The statement does not describe any present condition.
2 The condition is barely noticable.
3 The condition is moderate.
4 The condition is strong.
5 The condition is very strong; the statement describes my present condition very well.

_____ I feel my heart beating fast.

_____ I feel regretful.

_____ I am so tense that my stomach is upset.

_____ I am afraid that I should have studied more for this exam.

_____ I have an uneasy, upset feeling.

_____ I feel that others will be disappointed in me.

_____ I am nervous.

_____ I feel I may not do as well on this exam as I could.

_____ I feel panicky.

_____ I do not feel very confident about my performance on this exam.

APPENDIX 23

Anagram Test Instructions

DIRECTIONS

You will be asked to solve three anagrams. As you know, anagrams are words with the letters scrambled. The problem for you is to unscramble the letters so that they form a word. The anagram will be presented on the overhead projector and you have a time limit of 100 seconds to solve it. There could be a pattern or principle by which to solve the anagram. You are asked to time yourself from the clock at the front of the room. The anagram will be presented when the second hand reaches 12 to make this easier for you. DO NOT WRITE ANYTHING DOWN UNTIL YOU HAVE SOLVED THE ANAGRAM IN YOUR HEAD. When you think you have the solution, note the time from the clock in seconds, and write both the time and solution in the space provided. Raise your hand and we will check if the solution is correct. If it is incorrect, continue until you either have the correct solution or 100 seconds have elapsed. All the anagrams are soluble, and there is only one correct solution.

When 100 seconds has elapsed, you should stop whether you have solved the anagram or not. There will then be a short interval of 20 seconds before the next anagram is presented. The same conditions apply for the second and third anagrams.

Name ______________________________

Solution 1 ____________________________ Time __________

Solution 2 ____________________________ Time __________

Solution 3 ____________________________ Time __________

APPENDIX 24

Eysenck 4 Type Personality/Proneness
To Disease Questionnaire

This questionnaire contains a description of four types of persons and their behaviour. Give a Yes answer to each question which describes you accurately; if it does not, answer No.

In answering the question, you should concentrate on persons and conditions or situations which have been of the greatest importance emotionally for you, either in a positive or negative direction. Particularly important are feelings, emotions and behaviours which lasted a long time and are still active at the time of filling in this questionnaire. Pay particular attention to the last five years, and consider that any emotion or behaviour referred to in the question should have lasted a minimum of one year.

TYPE 1

1. Do you have a marked tendency to concern yourself lastingly with one emotionally important person, or one important aim in life, combined with a strongly marked faithfulness and a desire for belongingness ?

2. Is it for you emotionally particularly important to achieve a lasting closeness and emotional attatchment to a person who is important to you, but who has left you or is in the process of leaving you, or to achieve a very important aim which unfortunately is impossible for you to achieve ?

3. After the departure of an emotionally important person, or the failure of an important aim, do you have feelings of inner emptiness, hopelessness or depression, feelings which you try to hide from other people ?

4. After the departure of an emotionally important person, or the failure to achieve an important aim, have all your attempts to reestablish a degree of happiness failed, eg, because you were not in a position to find other people who could replace the missing one ?

5. Do you find it impossible to separate yourself emotionally and mentally from one particular person, or an aim which you found it impossible to reach because you consider this person or condition or aim as the most important for your own happiness ?

6. Would you consider it better and less painful to die than to live in a position of emotional distance from a particular person, or an unreachable but desired condition, but of course without actually committing suicide because of concern with duties, consideration for your family etc ?

7. Do you have a strong tendency to view emotionally important people, aims and conditions in a positive, favourable and improving light, and only very rarely to attribute negative characteristics to them ? At the same time are you more likely to recognise negative characteristics in yourself, together with a difficulty to recognise positive characteristics in yourself ?

8. Do you constantly face the difficulty of failing to reach a desired emotional nearness or connection with a particular person, or a desired condition (eg, in your working life) ?

9. Do you regard a person who has left you, or a condition that no longer obtains, or an aim that cannot be realised as the most important condition for your personal wellbeing ?

10. Is your feeling of personal worth, and your positive ragard for yourself very low when you lack the emotional nearness to an important person who has left you, or without the realisation of a desired aim which cannot be realised ? In other words, is your sense of personal worth and your positive regard for yourself dependent on the attachment of certain persons or the realisation of certain highly valued aims ?

11. Do you experience in your life the permanent absence of a highly desired person, or a highly desired condition or situation, which is of the utmost importance to your happiness ?

TYPE 2

1. Do you have a special tendency to be connected for a long period of time with several persons, aims or conditions, which pose expectations for you which are contradictory and acnnot be reconciled leading to a lack of success in filling all these different expectations ?

2. Do you suffer constant criticisms by persons close to you because of your failure to fulfil their expectations, leading to your judgement of yourself in a negative manner in spite of your wish to view your own person rather as positive, perfect and valuable ?

3. Would you say that there is a particular person or a particular condition disturbing you, being the most important cause for your own happiness, mental anguish, or upset at your workplace, from which you cannot emotionally disengage yourself in spite of a negative evaluation of the person or condition ?

4. Have you resigned yourself to give up the battle with such a disturbing, excitement-producing and negatively evaluating person, or a condition which disturbs you, because you are not in a position to change the behaviour of the person or the circumstances at work, nor to distance yourself from these, or effect a separation ?

5. Do you often react with feelings of excitement, annoyance and helplessness to the experience that you cannot change a person or condition which you find disturbing, and from which you cannot withdraw ?

6. In spite of all attempts turning away, sepatation, mental and emotional distancing and detatchment from a permanently disturbing person or condition, have you nevertheless failed to achieve this ?

7. Has your desire remained permanently unsatisifed to free yourself of a person or condition which disturbs you, eg, by distancing yourself from that person or condition, in spite of the importance you attribute to achieving such an emotional separation ?

8. In relation to emotionally important persons and conditions, do you usually voice largely negative feelings and thoughts, ie, of criticism, dissatisfaction, dislike etc, leaving the positive feelings and thoughts, eg, of love, affection, satisfaction and recognition unspoken ?

9. Do you often feel that you would rather die than continue to

live with the feelings of excitement, annoyance and helplessness, although you would never commit suicide because of a consideration for your duties, family etc ?

10. Do you have a tendency not to show to other people your inner emotional tensions, eg, agitation, annoyance, helplessness vis-a-vis the disturbing persons or conditions, but ratherdemonstrate your emotional strength and react appropriately to the situations and demands made upon it ?

11. Do you experience the continuing presence of an undesired person or a condition which prevents you from satisfying your needs and achieving happiness ?

TYPE 3

1. Do you often experience contradictory feelings and evaluations, which are impossible to reconcile, such as love and hate, attatchment and rejection, in relation to emotionally important persons, or in your judgement of certain conditions and situations which are very important for you emotionally ?

2. Do you often experience contradictory and mutually exclusive reactions and messages of an emotional kind from people who are important to you, without being in a position to separate these out and interpret them, so that you are never in a condition to know which of these messages is the correct one, eg, whether the person loves you or does not, accepts you or rejects you ?

3. Is your behaviour, in relation to people who are important for you emotionally, usually unsuitable. In other words, do you behave in relation to such emotionally important people quite differently to what is expected, ie, aggressively, unexpectedly etc, thus giving some expression to your contradictory feelings for the person ?

4. Do you experience great difficulties in the expression of contradictory feelings, eg, like and dislike, towards emotionally important people or conditions in such a way that you do justice to both types of feelings, but rather alternate in an extreme expression of first one feeling and then another ?

5. Do you frequently have a strong feeling that you must die, or wish to die, while at the same time experience that you must live and want to live ?

6. Is a particular person or condition for you simultaneously or alternately the most important condition for your personal happiness, as well as the most important cause for your personal unhappiness, and do you consider that you are emotionally dependent on such a person or such a condition ?

7. Do you usually experience great fear when you are close to persons who make emotional demands on you and do you usually react to such people who express expectations and demands by

means of unsuitable behaviour, eg, by failing to turn up at dates, start a quarrel, or react with rejection to expressions of love ?

8. Do you attempt to reach the desired nearness to emotionally important persons through the use of unsuitable behaviour, eg, by siezing the initiative in such a way that your partner is completely overwhelmed, thus evading at the same time any emotional demands upon you ?

9. Do you experience strong feelings of anxiety and aggression directed towards your own person or other persons in situations in which you live in oppressive nearness to a person who makes emotional demands upon you, or in which an emotionally important person is finally leaving you ?

10. Do you frequently try to attract persons who are important for you, and reject others who expect too much of you, by means of unsuitable behaviour, eg, by expressing love for people who wish to avoid you, together with aggressive threats and sexual fantasies ?

11. Through most of your life, have you experienced a condition in which a needed and desired person was lacking, or a person who was making disturbing demands upon you was present ?

TYPE 4

1. Do you find it easy to preserve your own independence against all other people, and also to recognise the emotional independence of all other people, even of those who are particularly important to you emotionally ?

2. Are you a very independent person whose emotional equilibrium is difficult to upset for any length of time when emotionally important people leave you, or disturb you, or love you and hate you in turn ? Along the same lines can you be happy and contented living either with or without emotionally important people and social conditions, being always in the position of dealing adequately with all people and all situations ?

3. When you have contradictory feelings and evaluations, such as love and hate, toward some person or condition, are you able to unify these in your behaviour, for instance by showing that in some ways you like a person but reject them in others ?

4. Are you able to evaluate yourself positively and to feel secure, even when things are not going particularly well, ie, when you are anxious, suffer from depression or excitement, or feel unsure in a certain situation ?

5. Do you have a permanent and distinct trust in God, so that you are not emotionally dependent upon anybody and have a high degree of autonomy ?

6. Do you always accept yourself in a positive manner, regardless of the behaviour of other people, and regard yourself as sympathetic, successful, important, capable etc, and can rely on yourself even in a situation where you are uncertain, experience anxiety and other emotions and are very strongly challenged ?

7. Do you change your behaviour according to consequences of previous behaviour, ie, do you repeat ways of acting which have in the past led to positive results, such as contentment, wellbeing, self reliance etc, and to stop acting in ways which lead to negative consequences, eg, to feelings of anxiety, hopelessness, depression, excitement, annoyance etc ? In other words have you learned to give up ways of acting which have negative consequences, and to rely more and more on ways of acting which have positive consequences ?

8. Are you regularly able to engage, through your behaviour and your evaluation of other persons, in interpersonal relationships in which you can express and satisfy your most important emotional needs ?

9. Are you able to manage your own behaviour in most life situations in such a way that your most important needs are satisfied ?

10. Do you hardly ever get into conflicts through incompatible expectations of different persons which you attempt to fulfil simultaneously, because you rather orient to your own valuations and not to others expectations ?

11. Are you regularly able to manage your own behaviour in such a way that it leads to positive long term consequences, for which you are prepared to accept some negative short term consequences ?

12. Do you have the ability to love yourself, other people and God and be content with your life ?

13. Are you always in a position to regulate life in such a way that you can achieve a desired nearness or a desired distance

14. Are the people and conditions in your life such that they serve the best possible satisfaction of your needs, ie, are you in a position to make the best of each particular situation so that you are always stimulated by your surroundings ?

15. Do you have a continual positive attitude towards yourself, originating in yourself and your activities, so that your self attitude is not overtly dependent upon the behaviour of emotionally important others ?

16. Does your behaviour and your valuations regularly enable you to overcome all obstacles to your most important emotional needs ?

17. Do you have a marked ability to perceive emotionally important persons in such different ways that you do justice to

their individuality, without being influenced by the opinions of other people ?

18. Are you regularly able to achieve a good interplay of your emotions and your reason, so that in general a behaviour ensues which satisfies your needs ?

APPENDIX 25

Multivariate Analysis Table - Experiment 4 Analysis

EFFECT	VALUE	APPROX F	HYPOTH DF	ERROR DF	SIG OF F
Eysenck	.63615	6.34448	6.00	150.00	.000

Table 1 : MANOVA Of Eysenck Classification And Flow Factor Scores

VAR	HYPOTH SS	ERROR SS	HYPOTH MS	ERROR MS	F	SIG OF F
F1	1951.5021	5121.073	975.75106	66.50745	14.67131	.000
F2	1346.8861	6793.132	673.44306	88.22249	7.63346	.001
F3	2220.7254	13478.82	1110.3627	175.0499	6.34312	.003

Table 2 : ANOVA Of Factor Scores X Eysenck Typology

APPENDIX 26

Experiment 4 Flow Factor/Eysenck Classification
Newman Keuls Follow Up Tests

FACTOR 1

EYSENCK CLASS	FACTOR SCORE	N. OBS
2	36.106	8
3	22.406	12
4	36.254	60

	(8) 36.254	(60) 36.106	(12) 22.406
36.254 (8)	****	.148	13.848
36.108 (12)		****	13.7
22.406 (60)			****

r =	3	2
q.05(r,77) =	3.39	2.82

m(12,8) = 7.42

m(60,8) = 6.12

m(60,12) = 6.19

FACTOR 2

EYSENCK CLASS	FACTOR SCORE	N. OBS
2	-.108	8
3	-10.757	12
4	.818	60

	(60) .818	(8) -.108	(12) -10.757
.818 (60)	****	.926	11.575
-.108 (8)		****	10.649
-10.757 (12)			****

r =	3	2
q.05(r,77) =	3.39	2.82

m(12,8) = 8.54

m(60,8) = 7.05

m(60,12) = 7.12

FACTOR 3

EYSENCK CLASS	FACTOR SCORE	N. OBS
2	-6.794	8
3	-10.460	12
4	2.996	60

	(60) 2.996	(8) -6.794	(12) -10.46
2.996 (60)	****	9.79	13.456
-6.794 (8)		****	3.666
-10.46 (12)			****

r =	3	3
q.05(r,77) =	3.39	2.82

m(12,8) = 12.04

m(60,8) = 9.93

m(60,12) = 10.03