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The psychology of physical risk taking behaviour

by

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A thesis presented in

fulfilment of the

requirements for

the degree of

Doctor of Philosophy

2003

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ACKNOWLEDGEMENTS

I would like to thank the many people who assisted me in the production of this thesis. Although it is not possible to give specific thanks to the multitude of individuals who have kindly helped over the years, particular credit must be given to Dr. Peter Martin for his supportive yet critical style of supervision, and to Peter Clarke for finding the time to humour me in his busy schedule! I would like to thank my family for helping me in my academic career over the years, without whose support this thesis would not exist. Special thanks must also go to Victoria Hodrien whose encouragement, patience and humour are greatly appreciated. Lastly thanks must also be given to the hundreds of people who kindly agreed to participate in this study as subjects, without whose cooperation this thesis would not have been possible.

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ABSTRACT OF THESIS

The Psychology Of Risk Taking Behaviour

A Thesis By David J. Llewellyn

This study investigates the psychology of risk taking, and in particular the personality profiles associated with different physical risk taking behaviours. It was hypothesised that there may be three fundamental approaches to risk: 'Risk avoiders' avoid activities they perceive to contain risk, 'risk reducers' participate in high risk activities in spite of the risks involved, and 'risk optimisers' who are motivated by the exposure to risk. An appropriate measure of subjective risk assessments was not identified in the existing literature, and the 27-item Physical Risk Assessment Inventory (PRAI) psychometric measure was therefore developed. After initial piloting the PRAI was administered to 407 subjects. Subsequent analyses revealed that two oblique factors accounted for much of the variance in physical risk assessments, and these were initially identified as "Sports" and "Health" factors. A wide ranging test battery (including the EPQ-R and selected scales of the ZKPQ) was then administered to 113 subjects, and further analyses suggested that high risk sports and health risk behaviours were associated with independent psychological profiles. Health risk behaviours were associated with an "Antisocial" factor that was identified by high social and physical risk propensity, Sensation Seeking and Psychoticism. The participation in high risk sports loaded on a second "Venturesomeness" factor that was associated with high confidence, physical risk propensity, Sensation Seeking, peer behaviours and being male. A third "Physical Risk Assessment" factor was associated with high physical risk assessments, being female, and low Addiction scores. Multiple regression analyses suggested that 38% of health risk behaviours, and 60% of sports risk behaviours could be predicted by the variables included in this study. Convergent qualitative data provides additional support for the validity of these findings. The notion of a universal physical risk taking personality therefore appears to be limited to the role of Sensation Seeking and physical risk optimisation.

Chapter 1.
INTRODUCTION

1.1 Introduction

Why do people take risks? This recurring question presented a motivational paradox to academics and clinicians attempting to understand high-risk behaviours from a psychoanalytic perspective at the turn of the 20th century. They could not conceive of any reason why people would choose to risk their lives, and as a result concluded that risk takers were acting without reason. It was therefore proposed that people such as mountaineers were illogical, or even pathological. Their own failure to understand risk taking behaviour from within the confines of their own hypotheses lead them to classify risky behaviours as expressive of suicidal tendencies, a death wish or repressed feelings of masculine inadequacy. Indeed the legacy of this train of thought continues to be influential although the balance of intellectual power has long since shifted.

A new breed of theory emerged in the 1950's based upon the scientific study of sensory deprivation. A breakthrough occurred when Marvin Zuckerman began to suspect that the people who volunteered for these sensory deprivation experiments might share a similar set of personality characteristics. These individuals appeared to be especially venturesome and inquisitive, eager to have new and exciting experiences even if they did contain a degree of social or physical risk. After fifty years of intensive research these individuals would now be classified as high "Sensation Seekers" a personality trait that is linked with high Psychoticism, Impulsiveness and Openness to experience, and to low Conscientiousness and Agreeableness. A large number of studies (Zuckerman, 1979, 1994) have shown that people who engage in a range of high risk behaviours tend to be high Sensation Seekers which quickly leads to the hypothesis that people take risks in order to have exciting, novel and intense new experiences. Studies involving identical twins that are reared apart suggest that a large proportion of Sensation Seeking is genetically

determined, and exciting new studies have begun to identify the specific genes that regulate this need (Zuckerman, 1994). On average men tend to be higher in Sensation Seeking than women, and Sensation Seeking also tends to decline with age (Zuckerman, 1994). This goes some way to explain why many people who take potentially fatal risks are young men. However it should be borne in mind that many women are high Sensation Seekers, and an increasing number of women participate in high risk sports and take health risks such as smoking and binge drinking.

It is fair to say that Zuckerman's Sensation Seeking theory continues to dominate the field of risk taking psychology at the start of the 21st century, and not without warrant. However, epistemological advances have led psychologists to question the validity of such simple models of behaviour. As a result a tension exists between the desire to develop straightforward or reductionist models of behaviour which can be reliably demonstrated, communicated and replicated on the one hand, and the recognition that behaviour may be subject to a large number of conscious and subconscious influences on the other. Nowhere is this conflict more evident than in the study of personality and risk taking. On balance we might conclude here that due to the principle of parsimony variables other than Sensation Seeking are only of interest if they help us to predict or understand a significantly greater amount of risk taking behaviour. This issue can only be settled empirically, and as Levenson (1990: p.1079) suggests, different types of risk taking may be associated with different psychological profiles: "Future research on risk taking should focus on a more comprehensive taxonomy, delineating the various antecedents of different types of risk taking." Similarly Trimpop, Kerr and Kirkcaldy (1999, p.250-251) argue that a multidimensional approach to risk taking behaviour is most appropriate:

> "... future research should consider that multidimensional constructs may be more revealing than a one-dimensional categorisation of people as being merely risk-inclined or risk-avoidant. For example, future studies might attempt to differentiate between planned, reckless or assertive risk-taking, risk-taking with or without a high level of personal control, and various forms of risk and uncertainty avoidance. Only then can a more

sophisticated and more accurate picture of risk-taking behaviour be constructed."

Psychologists have therefore begun to consider the limitations of Sensation Seeking and the influence of other variables. For example, Slanger and Rudestam (1997) ask why some people are willing to take risks in certain areas of their lives and not others. Firstly it is interesting to note that Sensation Seeking is a multifaceted construct (covered in depth later), and subtle differences in an individual's Sensation Seeking 'orientation' may therefore lead to different types of risk taking behaviour. People may lack the opportunity to participate in certain activities, for example outdoor pursuits such as skiing may be prohibitively expensive for many, and the same needs may therefore find different behavioural expressions. Lastly, other variables (such as additional personality traits) may predispose people to take certain kinds of risk, for example people who are low in Neuroticism may be more likely to become parachutists than drug users.

The study of risk taking behaviour has become virtually synonymous with the use of the Sensation Seeking Scale V (SSS V), however this measure is often used inappropriately (Jackson & Maraun, 1996; Zuckerman, 1994). Zuckerman has systematically altered the item content to allow for early connotational problems (for example explaining the use of the word "swingers") although out of date versions are sometimes used by mistake. Perhaps more serious is the tautologous nature of many studies (Slanger & Rudestam, 1997; Zuckerman, 1994). In particular the SSS V contains a number of items that refer to the willingness to participate in specific behaviours (e.g. mountain climbing), and as groups such as mountain climbers are often selected as experimental groups, they can only state that they are willing to participate in an activity they are known to do anyway. As a way of avoiding the problem of tautology some researchers (e.g. Gomà-I-Freixanet, 1991, 1995) have excluded the subscales that contain specific behaviours that overlap with the characteristics of the sample. Zuckerman (1994: p.45) adopted a different approach by developing a new measure, the Impulsive Sensation Seeking Scale (Imp-SS) which is not susceptible to problems of tautology:

> "One advantage of this scale is that all items are of a general type and do not specify particular activities like drinking, drug use, or sex that might be objectionable in some settings, or specific sports that might be very uncommon or even unfamiliar in some cultures. Such items are a confounding influence when Sensation Seeking is related to these activities."

Sporting behaviours have been shown to correlate positively with the Imp-SS scale, and prostitutes (many of whom were drug users) have been shown to score higher on the scale. As yet no studies have yet examined its relationship with risk taking sports (Zuckerman, M., personal communication, January 25, 2002).

Although we can confidently say that risk takers tend to be Sensation Seekers the future study of risk taking behaviour must concern itself with the possible role of additional variables that may progress our understanding beyond Sensation Seeking. Psychometric improvements in the measurement and quantification of Sensation Seeking are also of key importance here, and new scales by Zuckerman (such as the Imp-SS) point in the direction of future advances. Traditionally researchers have focused upon the variables that are shared by different types of risk taker, in an attempt to construct a universal "risk taking personality" profile. However theorists are increasingly interested in the variables which differentiate between different types of risk taking behaviour, and some believe this may provide the key to the modification of antisocial risk taking. No account of risk taking behaviour would be complete without reference to the Sensation Seeking trait. However, a more exploratory approach may lead to the identification of other important variables. The role of additional variables may even have been neglected for a time as the successes of Sensation Seeking were explored. As the role of Sensation Seeking is now well understood, this effectively frees researchers to return to the empirical verification or falsification of theories that remain essentially speculative. For example, are risk takers "fearless" as Lykken (1982) suggests? Do risk takers underestimate the risks involved? Or are risk takers simply confident that they can manage the risks involved as Slanger and Rudestam (1997) suggest? The present study aims to address this lesser known area of risk psychology, and in particular investigate the

role of Sensation Seeking and additional individual differences. By adopting this kind of broad ranging focus, by investigating the similarities and differences between different types of risk taking behaviour, and by addressing the methodological shortcomings of many previous studies, it is hoped that a greater understanding of risk taking behaviour will be achieved.

1.2. Rationale

The field of psychology itself has evolved from the desire to describe, understand, predict and control behaviour and mental processes, and the study of risk taking behaviour exemplifies this pursuit (Wade & Tavris, 1993). Researchers have stressed both the theoretical and practical importance of this area in being better able to understand risk taking behaviour, and modify the willingness or direction of risk taking behaviour (Cronin, 1991; Lightfoot, 1997; Slanger & Rudestam, 1997). Harris (1973) suggests that the possibilities for research in this field are almost unlimited, and that the area warrants stringent investigation. Viewed from a certain perspective all actions can be seen to contain risk (Franken, 1998), and risk taking behaviour can be seen as a central facet of human information processing and part of the larger fields of cognitive, personality, motivational and social psychology (Tenenbaum, 1995).

The rationale for this study essentially comprises three themes that are all related to the benefits of greater understanding. Firstly, a more detailed understanding of risk taking behaviour is interesting in a purely theoretical or academic context. It provides us with a unique case study in individual differences, personality and motivation. In a broader context these behaviours have the potential to tell us much about decision-making under conditions of uncertainty. Secondly, a greater understanding might be useful to people working in applied settings such as health psychologists, police officers, teachers and social workers. A more effective understanding of the antecedents of different risk taking behaviours and the motivations to take different kinds of risk may allow the early identification of 'at risk' individuals who are more likely to take antisocial or criminal risks (Lightfoot,

1997; Scott & Spencer, 1998). Connoly (1981) hypothesised that a greater understanding of risk taking behaviours could be used to educate health care providers and provide better psychosocial care for injured high risk sports participants, and Bandura (1997) also suggested that greater insight might lead to more effective therapeutic programme designs. Knowledge relating to the antecedents of risk taking behaviours may also be of interest to the risk takers themselves, indeed many sporting risk takers have expressed such an interest in previous studies. Lastly, risk taking behaviours have captured the public's imagination and many non-specialists are interested to gain insight into these behaviours. For example the participation in high risk sports is rapidly increasing and many people gain vicarious excitement from reading books or watching films about the experiences of others. A deeper understanding of these behaviours may therefore be of educational value or simply provide a form of interest and entertainment.

The concept of risk is relevant to anyone who makes decisions in life, from business executives to mountaineers, from parents to adolescents. The reasons for avoiding risk are obvious, but why do some people seek experiences that contain potentially fatal risks? This study addresses this question and others by synthesising a broad range of academic writings and by generating new theories and empirical evidence. Beyond the role of Sensation Seeking a considerable amount of uncertainty pervades this field, which also provides a reason for further research.

Chapter 2.
UNDERLYING CONCEPTUAL ISSUES

2.1. Introduction

In order to understand risk taking behaviour as fully as possible, it is useful to first explore the underlying conceptual issues that are central to this study, and inform all subsequent debate. The construct and definition of risk are therefore of key importance here. It is useful to explore associated ideas in some depth, but not as a point of intellectual pedantry, rather it allows us to explore the nature and meaning of risk related concepts, and to subsequently approach the study of risk taking from a shared perspective for discussion. After the nature of risk has been reviewed the focus therefore shifts towards the nature of risk assessments, risk taking and risk taking behaviours, and as we shall see the conclusions in this section have practical implications for the study of risk taking behaviour in general. In essence therefore this chapter aims to provide an introduction to the constructs of risk, risk assessments and risk taking behaviour.

2.2. The Construct Of Risk

To understand fully risk taking behaviour we must first understand the very concept of risk. What is risk? Is risk a 'thing', an object, a perception, or even an idea? The Collins Concise Dictionary (1995) defines risk as: "The possibility of incurring misfortune or loss." Similarly, the Concise Oxford Dictionary (1990) defines risk as: "A chance or possibility of danger, loss, injury, or other adverse consequences (a health risk; a risk of fire)." In order to go beyond these straightforward definitions of risk it is important to consider two different interpretations of the fundamental nature of risk – we shall call them probabilistic interpretations and combinational interpretations. From a probabilistic perspective risk (R) is the probability (p) of an unwanted event occurring ($R = p$). Smith (1992: p.6) suggests that:

> "Risk is sometimes taken as synonymous with hazard but risk has the additional implication of the chance of a particular hazard actually occurring. Thus, we may define hazard as 'a potential threat to humans and their welfare' and risk as 'the probability of hazard occurrence'."

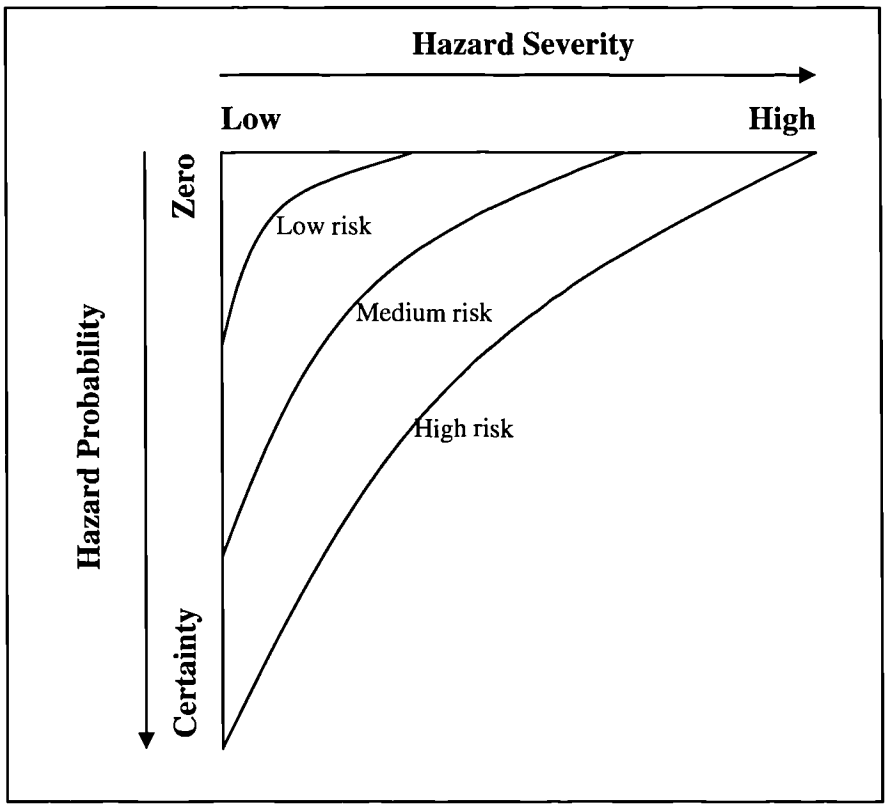
To use a simple example, if there is a 40% chance of rain today, then there is a 40% risk of rain. Advantages of this approach include its apparent simplicity and ease of comprehension. Perhaps most importantly it allows the use of a systematic approach to make predictions about risk from regularities that occur in the past. However, there are also a number of limitations to this approach. Firstly there are practical limitations, as it is often difficult or even impossible to quantify all relevant variables accurately. The problem is particularly acute with infrequent events such as natural disasters, where there is often no consensus as to how data should be interpreted to predict the probability of future events (and by direct implication the degree of risk). The scientific community has often downplayed disagreements and disputes of this kind, arguably in an attempt to protect the notion of detached scientific objectivity that is associated with modernist philosophy. A probabilistic interpretation of risk can also be criticised for making no allowance for the magnitude of potential loss.

In the following example two people take a risk, but do they take the same risk? Amy and Nick both place a bet on the same horse to win in the same race. The probability of the horse winning or loosing is of course the same for both people, and so according to a probabilistic interpretation they take the same risk. However they do not bet the same amount and Amy places a bet of twenty thousand pounds, whereas Nick only bets one pound. As a result Nick has very little to loose and is not really bothered whether the horse actually wins or not, on the other hand Amy will have incurred a comparatively severe financial loss if the horse does not win is very nervous about the outcome of the race. It is more convincing to argue that the two people in this example do not take the same risk, and this also has the advantage of helping to explain their differing emotional responses to the situation.

A probabilistic account of risk only includes the likelihood of an unwanted event occurring, and if additional considerations are in fact relevant here then we are in effect arguing for a combinational interpretation of risk. More contemporary theorists tend to argue that risk (R) can be taken to be the product of both the probability (p) of an unwanted event occurring, and the severity (s) of potential loss ($R = p \ \& \ l$). For example Douglas (1992: p.23) states that risk is "the probability of an event occurring, combined with the magnitude of the losses... that would be entailed." Smith's (1992: p.7) interpretation of how the probability and severity of a hazard interact to determine the overall level of risk is shown in Figure 1 below:

Figure 1

Risk As The Combination Of Hazard Severity And Probability



There are also disadvantages to this approach, and the incorporation of severity of potential loss makes the entire notion of risk more complicated. What is especially unclear is exactly how the probability and severity of risk can be "combined" as

Douglas suggests. Smith's model illustrated in Figure 1. above can be criticised for assuming that hazard severity and probability have an equal influence on the overall level of risk. If the hazard severity and probability are both quantified using a scale of 0 to 1 as Smith suggests, then is a highly likely (0.8) minor hazard (0.2), necessarily equivalent to a highly unlikely (0.2) major hazard (0.8)? For example, public risk assessments are influenced by a 'potential disaster factor' that means that people tend to have higher risk assessments in situations that may involve heavy losses, a good example being the nuclear power industry (Moore, 1983). This suggests that the public do not necessarily treat the probability and severity of a hazard interchangeably as Smith suggests is optimal. We can conclude from this that public risk assessments are therefore biased, or we can question the validity of the notion of hazard probability/severity equivalence in scientific risk assessments. Other limitations of Smith's model include the arbitrary use of lines to differentiate between levels of overall risk, and the number and shape of these of lines. The degree to which abstractions of this kind can be considered to be objective (in a literal sense) remains controversial.

The same difficulties and ambiguities that surround the estimation of risk probability are magnified when the additional factor of risk severity is incorporated. Is there are objective way to combine the severity and probability of risk or is this process simply convenient? To use a controversial example, what is a human life 'worth' in financial terms? Of course there are obvious ethical issues involved here, yet in practice decisions of this kind often need to be made in order to allocate limited resources in occupational and other settings. The difficulties involved in attempting to present any kind of systematic estimate of 'worth' or 'value' have meant that in practice scientists have tended to focus the majority of their attention on incidence of death and financial loss that are both simple to quantify and rationalise. It is easy to argue that two deaths are twice as 'bad' as one, and that a loss of $40 is twice as 'bad' as $20. But are 200 serious injuries equivalent to 10 deaths? Is the life of a young person worth more than an old person? Is it worth the risk attempting to rescue items of great sentimental value from a burning building? What value is the life of someone in a permanent vegetative state? Is a friend's life more valuable to

you than that of a complete stranger? These examples serve to raise the difficult issue of how values can be measured and quantified.

A more minor concern with the combinatorial approach to risk relates to the relationship between risk and uncertainty. It is generally agreed that for there to be risk, there has to be an element of uncertainty. However combinatorial (and probabilistic) interpretations imply that the greatest risk would result from the greatest probability of loss, i.e. 100% probability or certainty. However this goes against the notion that risk always involves an element of uncertainty. If the outcome of a situation were to be known with certainty (whether it involves loss or not) then there is no risk, at least in a strict sense, rather there will or will not be a loss of a defined magnitude. In reality the outcome of specific situations is never known with absolute certainty, but this does not refute the point, rather it circumvents the argument itself. Either the greater the probability the greater the risk, in which case an element of uncertainty is unnecessary for there to be risk. Or alternatively the level of risk may increase in relation (linear?) to the probability of loss up to the point at which the outcome is certain, at which the level of risk drops to zero and only statements about the severity of what will happen can be made. Conceptual confusion abounds here; suffice to say that statements about the relationship between risk and uncertainty often contain logical contradiction.

Assuming that a combinatorial approach to risk is adopted, we are closer to reaching agreement about the fundamental nature of risk. However the word fundamental in itself mirrors the desire to establish what risk *really* is, that is the underlying nature and origin of risk. To say that risk is comprised of the probability of a harmful event occurring combined with the severity of loss that would be entailed is a useful yet incomplete answer to the question "What is risk?" Perhaps risk is "in the eye of the beholder" as Franken (1998: p.409) suggests? In other words is risk the perception or judgement of the probability and severity of negative events occurring? Alternatively risks might exist "in themselves" independently of our perceptions – basically is there more to risk than meets the eyeball? Our subjective phenomenological insights into the future and the risks that the future contains are of

course fallible. This leads some to point out possible discrepancies between "perceived" and "objective" risks (e.g. Barnes, 1997), which intentionally or otherwise often serves to denigrate subjective risk assessments as essentially biased and hopelessly idiosyncratic. This argument reflects a Descartian view of the world, in which scientific observations are made in a position divorced from space and time (a form of dualism). An approach that is received with growing scepticism by the academic community as this postmodern analysis by Tarnas (1996: p.396) illustrates:

> "One cannot regard reality as a removed spectator against a fixed object; rather, one is always and necessarily engaged in reality, thereby at once transforming it while being transformed oneself. Although intransigent or provoking in many respects, reality must in some sense be hewed out by means of the human mind and will, which themselves are already enmeshed in that which they seek to understand and effect. The human body is an embodied agent, acting and judging in a context that can never be wholly objectified, with orientations and motivations that can never be fully grasped or controlled. The knowing subject is never disengaged from the body or from the world, which form the background and condition of every cognitive act."

Perhaps, then, risks are a characteristic of the objective situation and our understanding of the situation is indirect, and ultimately a more or less useful abstraction of the external world. It is a short step from this position to argue that risks therefore exist in themselves and are truly objective. But risk is not an object or a 'thing' within a situation that can be poked and prodded. Rather it concerns the characteristics of a future objective situation and ultimately the relationship between people (and other conscious beings with values) and their environment. It is convincing to say that the agent of loss may have objective essence (a falling rock or a speeding bullet), but that is not necessarily to say that there are objective risks. It is a mistake to assume that risks are "out there" *or* "in here". Risks cannot exist independently of the mind because risks cannot exist independently of values. It is only the objective situations and events that may exist independently of the mind.

This slight revision to the concept of risk belies its importance, as it has surprisingly significant ramifications. The role of both consciousness and values are suggested here, and it is argued that these are both a necessary condition for the existence of risk. In other words a situation cannot meaningfully be said to contain risk unless there is the possibility of potential loss or harm. And in turn there cannot be loss or harm without something being of realised value to someone (or something else conscious). Curiously the corollary being that if a suicidal person placed absolutely no value on their own life then they could not be said to be "at risk" of killing themselves, at least as far as they themselves are concerned (other people may value their life). Risk exists in the interaction between something of value to someone and something else that presents a threat to this 'thing' of value. It may sound somewhat vague to refer to *things* of value, but a wide variety of things are seen to contain value such as property, relationships, money, health, and even feelings or ideas.

Reeve (1997: p.358) argues that: "No one likes risk per se, which is essentially the perception of the probability that a behaviour will produce aversive consequences." However Reeve makes two mistakes in this statement about risk; firstly some individuals do seem to enjoy experiences with risk and may even seek them out, and it is therefore incorrect to state that no one likes risk, at least in any circumstances. Secondly, some but not all risks are the result of our own behaviours. Possible injuries sustained from a fall on a rock climb are the result of voluntarily engaged in behaviours, and in this instance it is correct to say that the risks are the result of these behavioural choices. However, individual behaviours are irrelevant to the probability of a meteorite crashing into the earth. Similarly people's actions may place a different person at risk (for example a pedestrian is at risk from a dangerous driver), and yet the risk that they will be exposed to is nothing to do with their own behaviours. It can be argued that all actions contain risk, to some degree at least, but not that all risks are the result of our own behaviours. If all behaviours contain a degree of risk, then it can be argued that people who avoid specific behaviours because of the risks involved are also taking a risk because they may miss out on any potential gains. Of course some risks are more substantial than others, but it is difficult to see how notions of "significant" or "acceptable" risk are anything other

than necessary subjective decisions made by individuals in relation to their own values and ideas.

Although risk may be said to be interactive in origin, that is not to say that the existence of risk is in any way dependent upon the perception of risk by the person or people 'at risk'. For example, a person walking through a minefield is at risk whether or not they know that they are walking through a minefield. Conversely, people who believe themselves to be walking through a minefield may or may not be actually exposed to a high degree of risk, and there may not even be any mines. Again this leads to the conclusion that the nature of risk is interactive, and that the everyday assessment of risk is a subjective judgement. Another way in which the nature of risk can be said to be interactive is that certain risks are relative to an individual's ability to control them. It is often overlooked that people are sometimes able to influence levels of risk through their own abilities, a point that is especially important in outdoor pursuits. For example in mountaineering some risks such as avalanches and rockfall (called "objective risks" by mountaineers) can only be controlled by avoiding the situation itself when the risks are high, whereas other risks such as falling off a cliff due to a navigational mistake are obviously highly dependent upon individual abilities.

Douglas (1992: p.23) argues that a definition of risk should include the possibility of gain, arguing that the word risk has been pre-empted to mean bad risk, and she encourages us to consider the strategic and political use of the concept and language of risk in more depth. Should risk therefore be taken as the product of the probability of an event occurring, and the degree of potential loss or gain? It is difficult to conceive of a risk without the potential for harm or loss, and yet the incorporation of potential gains seems an artificial addition. If risk cannot exist without the potential for loss, and yet if it can exist without the potential for gain, then it is not an essential component of any definition. Contemporary continental theorists such as Derrida and Lyotard heavily influence Douglas' critique of risk, and its value is perhaps to point out that situations that contain risk may also include the possibility of gain. While we may question the balance of Douglas' conclusions, it serves to

counter the argument that risks should be minimised as much as possible at all times without regard to the context in which these risks occur. Now that the concept of risk has been defined additional issues associated with the assessment of risk will be considered.

2.3. The Assessment Of Risk

The preceding discussion relating to the definition of risk contains several points that are relevant to the assessment of risk. Notably risk was defined as the probability of an unwanted event occurring combined with the severity of potential harm or loss. Some of the difficulties and ambiguities involved in the risk assessment process were outlined, as were the various elements of subjectivity. Particularly controversial are the notions of acceptable and significant risk. Can any risk said to be acceptable? And how risky does a situation have to be in order to contain significant risk? The conclusion was made that risk assessments are attempts to predict the future and are essentially abstractions based upon the application of inductive logic. The point was also made that some risks are relative to attempts to control them, and as such individual abilities. From this basis we will further explore the issues that surround the risk assessment process, and the nature of the process itself. There are two main types of risk assessment, namely intuitive personal risk assessments and formal systematic risk assessments.

We all make intuitive personal risk assessments on a day-to-day basis, and they are an indispensable aid in order to safeguard our physical and mental health. It is this type of risk assessment that alerts us to the danger involved in both familiar and unfamiliar situations such as using a sharp knife, making a public speech, driving a car, bungee jumping and beginning a new relationship. As all situations can be said to contain some degree of risk it cannot be avoided, and our only option is to learn to manage it. This approach has a number of advantages in that it is sensitive to the specific nature of the individual situation, and is both adaptable and ongoing (we tend to learn from our experiences). However there are also a number of difficulties involved. For example, it can be difficult to make meaningful generalizations, as

these insights are often too specific to previously experienced situations. The outcome of such assessments may be vague and unreliable, and is open to both bias and error due to its unsystematic nature. Risk assessments of this kind may also be difficult to rationalize and communicate, and may be misleading as in the case of phobias and overconfidence. Indeed some theorists have speculated that people only take risks because they miscalculate the risks involved. Intuitive risk assessments are especially useful in situations with which the individual is familiar (extrapolation from experience), and people tend to fear the unknown partly because they are unable to make accurate risk assessments of these situations and may therefore suspect the worse. Bandura suggests that the assessment of risk is an essential self-regulatory mechanism that is heavily influenced by perceptions of self-efficacy:

> "...threat is a relational matter concerning the match between perceived coping abilities and potentially hurtful aspects of the environment. Therefore, to understand people's appraisals of external threats and their affective reactions to them, it is necessary to analyse their judgements of their coping capabilities. Efficacy beliefs determine, in large part, the subjective perilousness of environmental events. Efficacy beliefs affect vigilance toward potential threats and how they are perceived and cognitively processed." (1997: p.140)

Formal and systematic risk assessments are used by scientists and are synonymous with the use of quantitative statistical techniques. Because this approach is systematic it has the potential to produce accurate generalisations that are less susceptible to bias than a purely intuitive approach. The results of such analyses are also potentially easy to comprehend and communicate, although in practice this may not be the case. There are disadvantages to this approach however, and the general results of such risk analyses may not relate to specific situations that people find themselves in (especially in cases where the risks are partially controllable). Formal risk analyses are also expensive, time consuming and special skills are needed in order to conduct and interpret them effectively. Because such procedures rely upon the application of inductive logic they are especially ineffective at predicting infrequent events and the implications of change in complex systems. It is often

difficult or even impossible to quantify relevant variables, and the adequacy of variable sampling is never guaranteed. Formal risk assessments are most useful in the prediction of general risks for society as a whole, especially then a large body of relevant data has been accumulated. To understand what kind of predictions are made from the basis of a formal risk assessment process it may be useful to consider some specific examples. For instance, Moore (1983: p.149) details the risks involved in sporting and industrial contexts as measured by probability of death (see Table 1 below).

Table 1

The Probability Of Death From Sporting And Industrial Risks

Overall type of risk	Activity	Risk of death per year per person exposed
Sporting	Motor cycling	0.2
	Car racing	0.012
	Car driving	0.0017
	Rock climbing	0.0014
	Football	0.0004
Industrial	Quarrying	0.00033
	Underground coal mining	0.00020
	Agriculture	0.00014
	Chemical industries	0.00007
	Food, drink and tobacco	0.00003
	Clothing and footwear	0.000002

These figures are based upon the estimated average level of participation per year, which it should be noted effectively enhance the risk rating of frequently participated in activities (such as driving a car), and makes infrequent behaviours (such as rock climbing) appear less dangerous. Another difficulty lies in the paucity of data and inconsistent methods of data collection, which implies a fair degree of

inaccuracy. That said these estimates provide us with a useful guide, and it is clear that the risks involved in sporting activities are generally higher than those involved in industrial contexts.

The probability of death involved in different activities is also commonly expressed as the Fatal Accident Rate (FAR) per million hours spent on an activity, and Turner (1994) provides us with the following example:

Table 2

Fatal Accident Rates For Recreational Activities, Smoking And Driving

Activity	Number Of Deaths Per Million Hours Of Participation
Smoking	20.00
Climbing/Mountaineering	7.93
Motorsport	1.46
Driving	0.83
Fishing	0.37
Skiing	0.20

This means that in terms of the probability of death involved, smoking is the most risky activity in comparison with the other activities in this study. The calculation of Fatal Accident Rates has the advantage that it does not effectively suppress the level of risk associated with infrequently participated in activities, and we can see that in this study driving appears to be less risky than climbing/mountaineering, whereas Moore's (1983) results would lead to the opposite conclusion. One would perhaps expect there to be more injuries than deaths, and this is in fact the case as shown in Table 3 (Liddle & Storck, 1995) below which details the rate of injury per million hours of participation involved in a range of sports:

Table 3

Injury Rates Associated With Different Sports

Sports	Number Of Injuries Per Million Hours Of Participation
Recreational games	485.8
Downhill skiing	273.3
Climbing (rock and ice)	97.3
Ski touring	76.1
Backpacking	48.3
Swimming	44.5
Camping	15.7

Whereas skiing appeared to be a comparatively low risk sport in terms of its Fatal Accident Rate it would appear to be a high risk sport in terms of the probability of an accident occurring. How the probability of fatalities and injuries should be combined in order to determine the overall level of physical risk continues to be a matter for debate, with activities with inconsistent probabilities of outcome according to level of severity (like skiing) presenting the greatest difficulty.

The risk assessment process can be seen to reflect the nature and limits of the scientific method in general, which continues to be hotly debated, however Scrutton (1996: p.17) gives an eloquent interpretation of the rough working principles:

> "First, that the search for causes involves a search for laws; secondly, that laws are statements of probability; thirdly, that laws are themselves explained through wider and more general laws; fourthly, that however far we investigate the causes of something, we can always go further; and finally, that the further we go, the more remote we find ourselves from the world of observation... Of nothing in the natural world can it be said that it must be so, but at best that it is highly likely to be so."

All risk assessments rely upon the use of inductive logic in order to make predictions about the future. Inductive logic can be contrasted with deductive logic, and induction and deduction are two different sorts of argument. An inductive argument involves a generalisation from observations to unobserved events in the past, present and future. A deductive argument on the other hand follows directly from the original premises and is 'truth-preserving' because if the original premises are correct then the conclusion that follows must also be correct. A commonly quoted deductive argument is as follows:

Premises: All birds are animals and swans are birds.

$\therefore$

Conclusion: All swans are animals.

If both of these premises ("all birds are animals" and "swans are birds") are true, then it must be true by definition that all swans are animals. Otherwise the argument would not be a deductive one. In contrast, the conclusions of inductive arguments with true premises may or may not be true. If we are to know virtually anything about the past, present or future we must use general principles of some kind by which inferences can be extrapolated from our experiences. Consider the following example:

Observation: A has always been seen be followed by B ($A \rightarrow B$)

$\therefore$

Inference: B *always* follows A

If we were not able to make inferences of this kind we could never extend our knowledge beyond the limited sphere of our present experiences. Regularities and patterns in our experienced reality lead us to believe that we can rely on the application of inductive logic without the slightest of doubts, but Hume questioned the absolute basis for this belief in what has become known as the "Problem of Induction". Russell (1998) suggests that we are forced to assume the validity of the inductive principle not least because there is no viable alternative. Attempts to

defend the use of the inductive principle because of its pragmatic value are pointless, as this argument is itself inductive and therefore circular (it has proven to be useful in the past therefore it will continue to do so!). What this means in practice is that predictions about the future cannot be made with certainty even if little or no ambiguity exists in the assessment of the present situation, or as financial risk takers would say, "past performance is no guarantee of future success."

There are generally agreed to be five main stages associated with a formal risk assessment:

1. **Identification stage** – hazards are identified.
2. **Estimation stage** – probability and magnitude of the risk is assessed.
3. **Evaluation stage** – significance and acceptability of the risk is assessed.
4. **Control stage** – interventional or non-interventional strategies are implemented.
5. **Review stage** – attempts to assess and manage the risk are assessed for their effectiveness and revised where necessary.

Risks are relative to values, and the consideration of value is a crucial component of the evaluation stage in the risk assessment process. Smith (1992: p.6) for example, proposes that hazards can be ranked in order of the level of effect:

> "In terms of decreasing hazard severity, we can recognise the following threats:
>
> 1. hazards to people – death, injury, disease, stress
> 2. hazards to goods – property damage, economic loss
> 3. hazards to environment – loss of flora and fauna, pollution, loss of amenity."

It is highly questionable whether it is possible to rank hazards, and by implication values, in such a way. For example, is it acceptable to state that material goods are more important that the environment? Are people necessarily more important than the environment? Attempts of this kind to rank values in a universally applicable

order have received widespread criticism, and it has been argued that these decisions represent personal preferences rather than technical or scientific issues. In short, the acceptability of different risks is clearly a matter of debate. Kates (1978) suggests that natural disasters tend to set a base guide for the acceptability of risk. Basically, if the probability of a hazard is seen to be small compared to that of a natural disaster it will therefore be considered to be acceptable. Why? This is the obvious objection to this argument. Is there any real reason why this should be so? Or, perhaps more likely, it forms a useful cut off point for scientists to use as a rule of thumb. However if the later possibility is the case then this cut off point is completely arbitrary. It could just as easily be argued that we should tolerate or accept higher or lower levels of risk. The Health and Safety Executive has proposed a maximum tolerable Fatal Accident Rate of 0.48 for workers in all occupations, below which no action is required by employers to minimise the risks involved (Loynes, 1995). However this attempt to set a baseline for acceptable risk is open to the same criticisms as attempts to use the level of risk associated with natural disasters as a baseline.

> "...Although objective rationality appears highly desirable, a universally acceptable value system for risk decisions is not available and a subjective element is always present. Techniques such as cost-benefit analysis enable us to compare the cost of mitigating a hazard with the costs of the damage and injury it will produce, multiplied by the probability that it will occur. This implies that, like many other commodities, safety is something that can be bought at a price. In a totally rational world, resources would not be allocated to mitigate one hazard beyond the point at which they could be more usefully deployed to reduce other local risks. On the other hand, the fact remains that there is no market value for human life and risk-benefit analysis can sometimes focus attention on data which are readily measured rather than on factors that are important for social choice." (Smith, 1992: p.63)

Both intuitive and systematic approaches to the assessment of risk have advantages and disadvantages, however on balance we might conclude that they are in many

respects essential and complementary. The issue of risk acceptability remains controversial however, and nowhere is the issue more contentious than the evaluation of risk taking behaviour, the subject to which we now turn.

2.4. The Nature Of Risk Taking Behaviour

What is risk taking behaviour? And how can it be differentiated from other behaviours? Risk taking behaviour can be defined or exemplified in two main ways, firstly from a purely conceptual basis, and secondly by giving concrete examples. The closely related concept of risk taking is also relevant here and it will also be introduced in this section. Reber (1995: p.673) usefully defines risk taking as: "a hypothesised personality dimension reflecting the degree to which an individual willingly undertakes actions that involve a significant degree of risk." This definition provides us with a useful starting point, as it raises several issues that are central to the conceptualisation of risk taking and risk taking behaviour. There are four key elements to Reber's definition which are either directly stated or inferred:

1. Risk taking is a personality trait.
2. Risk taking is a matter of degree.
3. Risk taking acts must be voluntarily engaged in.
4. Some, but not all actions contain a significant degree of risk.

Risk taking may be a matter of degree; however when a specific behaviour is described as 'risk taking', or an individual as a 'risk taker', a significant or above average degree of risk is implied. In other words behaviours that contain an unusually high degree of risk or people who take more risks than most. It can be argued that what is considered to be a "significant risk" is partly conventional or relative to social norms, the corollary being that what is considered to be risk taking behaviour in one society may be classified differently in another. While the notion of a culture of positive attitudes towards risk or "risk society" appears to be a reasonable sociological proposition, the degree of actual risk the individual is exposed to is not related to these social norms. Behaviours conventionally classified

as risk taking behaviour (such as white water kayaking, gambling and drug taking), also tend to be associated with a relatively high actual probability of health, social/criminal and/or occupational/financial loss. It is also important that these behaviours are perceived to contain a high degree of risk, as true risk taking, at least according to an analysis of the concept itself, must be voluntarily engaged in. The exposure to risk does not necessitate a risk taking act, although conversely a risk taking act does necessitate an exposure to risk. A person who does not choose to be exposed to a risk, or who is not aware of the risks involved, is not a risk taker in a strict sense at least, as the very notion of risk *taking* infers a volitional quality. If a person underestimates the risks involved in a situation, then they have not chosen to take the risk involved; therefore they have chosen to take a lesser risk. On the other hand a person may overestimate the risks involved, in which case they have actually taken a small risk, and yet interestingly may still be seen to be a risk taker (at least from their own perspective). From a certain viewpoint then risk taking, at least on an individual basis, may be "all in the mind" as Franken (1998) would say. Of course risk taking behaviours are not normally viewed on an entirely individual basis, and in practice people are classified as risk takers or otherwise according to the degree of participation in activities generally agreed to contain a high degree of risk.

The thorny issue of risk acceptability is relevant here too, and the acceptability of both specific risk taking behaviours and risk taking in general is a matter of ongoing public debate. What is clear is that a strategy of avoiding risks completely is impossible, and risk can at best be effectively managed. While some people may be extremely risk averse, it is also clear that some people are prepared to tolerate a certain degree of risk. More controversially some people are also thought to enjoy the element of risk involved in certain behaviours, and these approaches appear to constitute three different "risk taking types" or approaches to risk, which may represent different motivational dispositions. As we have seen some people attempt to minimise or in their own eyes avoid risk completely, and we can classify these people as "risk avoiders". Risk avoiders would certainly avoid all activities that are traditionally labelled as being risky (e.g. parachuting) and consider the risks to be unacceptable and unjustifiable, a belief that may or may not generalise to the actions

of others. In short they prioritise safety needs and feelings of security above all other needs and motivations. A concrete example of a risk avoider is an individual who refuses to go kayaking with their friends because they think that the risks involved are unjustifiably high.

Some individuals may participate in risk taking activities, but participate in spite of the risks involved and seek to minimise the risks as much as possible, and we might call them "risk reducers". Risk reducers may not enjoy the exposure to risk, and may consider it to be unwanted yet unavoidable. In this way other motivations may take priority over safety needs if the risks can be justified and controlled to the degree that they are seen to be acceptable. Risk reducers may therefore participate in risk taking activities due to other reasons such as social needs, the development of skills, and so on. To take a practical example, in rock climbing advances in protective equipment technology (e.g. stronger ropes) have meant that in general climbing routes have become both safer and easier to protect. This in turn has meant that the sport has become increasingly popular to people who want to enjoy the physical and technical elements of the sport while reducing the psychological demands associated with the exposure to risk (Craggs & James, 2001). We may conclude from this that changes in the nature of the sport itself may have made it more accessible to risk reducers, and by implication broadened its appeal to a wider audience.

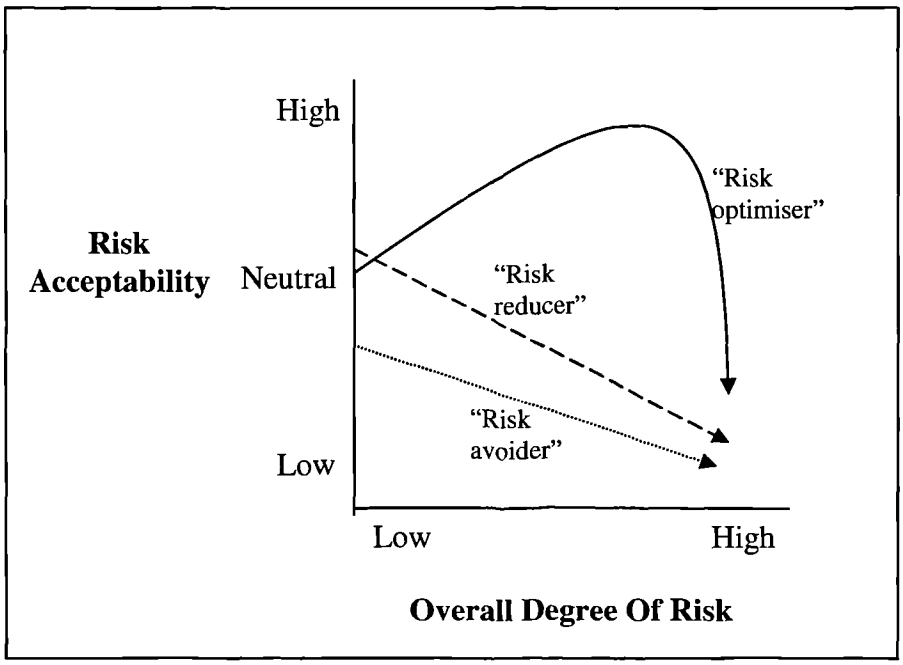
Lastly some people may actually choose to expose themselves to high levels of risk and participate in certain activities in part because of the risks involved, and these individuals can be classified as "risk optimisers". It should be noted that risk optimisers do not necessarily seek to blindly maximise the risks involved (perhaps in an impulsive or foolhardy way), and as we shall later discuss in some depth they may only be happy to take these risks if they believe that they are able to exercise control over them and they envisage a positive outcome. The reasons why risk optimisers may actually participate in risk taking behaviours *because* of the risks involved will also be covered in some depth in later chapters of the literature review. Suffice to say at this stage that there are numerous motivational factors involved. The level of risk they are willing to tolerate or consider to be acceptable is therefore

the result of conflicting forces: The higher the level of risk the greater the potential rewards, but also the greater the difficulty in controlling the risks to acceptable levels. Basically if they "push it" too far they will terrify, injure or kill themselves as a result of their own actions. Through their experiences with risk they may learn to take an "optimal risk" which is neither uncontrollably high nor unrewardingly low, and the relationship between the degree of overall risk and its acceptability may therefore be curvilinear. A practical example of a risk optimiser would be someone who climbs "solo" or "free solo" (that is without a rope or other protective equipment) in order to increase the psychological challenge associated with an ascent.

It is possible that people could adopt different approaches to risk taking in an attempt to maximise their experiences. However it has been shown that risk taking propensities tend to be stable over time (risk taking is a personality trait) and as such the empirical evidence suggests that people tend to have relatively stable attitudes towards risk over time (Zuckerman, 1994). That said there is also evidence to suggest that many people take risks in some areas of their lives and not others, and so risk taking may be stable but specific in orientation for many people (Slanger & Rudestam, 1997; Zuckerman, 1994). Traditionally risk takers have been contrasted with non-risk takers, controls or even "normal" people. However, as we have seen, all people take risks to some degree, and everyone also adopts an approach to risk which can be allocated to one of the three risk taking types described here, or a combination of these types. Risk avoiders, risk reducers and risk optimisers can all be conceptualised as lying on a continuum of risk propensity – between one low extreme (risk avoiders), through a midpoint (risk reducers), to a high extreme (risk optimisers). One limitation of an approach that classifies people as risk takers or non-risk takers is that it ignores the complexities of the issue and makes no allowance for the fact that people may participate in the same behaviours for different reasons. Figure 2 illustrates how the different types of risk taker may perceive the acceptability of different risks to vary as a result of the overall degree of risk:

Figure 2

The Hypothesised Relationship Between Degree Of Risk And Acceptability Of Risk As A Function Of Risk Taking Type



2.5. Summary

Risk is sometimes seen as the probability of an unwanted event occurring, but here risk is taken to mean the probability of an unwanted event occurring and the severity of potential loss. However it is not clear how the probability and severity of risk can be combined in an objective fashion, and methodological difficulties of this kind mean that in practice even systematic risk assessments contain an element of subjectivity and ambiguity. Another major difficulty is in the estimation of the values associated with things thought to be at risk, and a reasonably convincing argument can be made that these should represent social choices rather than technical issues. Although the perception and assessment of risk are essentially phenomenologically based, the nature of risk is fundamentally interactive. Risks exist because things considered to have value are placed at risk, and as such the nature of risk concerns the interaction of people in their environment. Some, but not all risks are the result of our own behaviours, and risks vary in the degree that they can be controlled by our actions. The concept of risk is sometimes said to

incorporate the possibility of gain, however it is difficult to see how this constitutes an essential addition, although this might serve as a useful reminder that risky situations may also contain opportunities.

The risk assessment process can be seen as the attempt to predict future situational outcomes based upon the extrapolation from experience and the application of inductive logic. The constructs of significant risk and acceptable risk are extremely difficult to pin down, and remain controversial. Indeed it may be questionable whether these are anything other than subjective "rule of thumb" judgements made by scientists and lay people alike. Intuitive assessments of risk are perhaps particularly susceptible to bias and error, and yet remain an essential aid to individuals in a wide variety of situations. On the other hand formal risk assessments are more systematic but are time consuming, expensive and often difficult to relate to the specific situations that people find themselves in. The use of inductive logic is not infallible in any instance, even if all relevant variables can be taken into account or quantified unambiguously, which is often not the case. On balance we might conclude that both approaches to the risk assessment process have merit, and yet inevitable limitations often lead to assessments that are less "hard and fast" than some people suggest.

Risk taking behaviour is the voluntary participation in behaviours that contain, or are at least seen to contain, a significant degree of risk. As previously noted the notion of significant risk is a slippery one to define, however a case can be made that certain behaviours are assessed to involve a high degree of risk in comparison with other equivalent behaviours, and also involve a high degree of actual risk as measured by the probability of death, injury, financial loss and so on. In practice there is often a surprisingly high degree of agreement between intuitive and systematic risk assessments, and these can be used in combination as a basis to decide which are risk taking behaviours. People adopt different approaches to risk, and there are three different risk taking types, namely "risk avoiders" (who avoid activities due to the risks involved), "risk reducers" (who participate in high risk activities in spite of the risks involved), and "risk optimisers" (who participate in

high risk activities partly because of the risks involved). In theory people may move between different approaches to risk, although existing empirical evidence suggests that risk taking is a personality trait, and as such people's attitudes to risk are predicted to be reasonably stable over time.

Chapter 3.
PSYCHOANALYTIC THEORY

3.1. Introduction

Why do people take risks? In the following chapters (chapters 3, 4 and 5) the literature that attempts to provide an explanation for risk taking behaviour is reviewed. An overview of these ideas, and the corresponding empirical evidence, are reviewed as a progression of ideas in roughly chronological order. It is useful to do so because it gives more of a feel for how these theories have evolved, and in what context. By exploring the way that these theories have developed it may also be easier to appreciate where this body of literature may be leading. We will therefore focus on the early literature first, in this case psychoanalytic theory, before going on to consider more recent developments and future directions.

3.2. Psychoanalytic Theory

Psychoanalytic theory is, perhaps above all else, a theory of human behaviour and a doctrine originally rooted in Sigmund Freud's (1856-1939) theories. Freud made the assumption that motives are in essence determined by the libido (energy from the sexual drive), and that its behavioural expression is controlled or directed by unconscious forces, namely a conflict between primitive libidinal urges and social training (Sutherland, 1995). The term psychoanalysis has also come to include many offshoots of neo-Freudianism, including Jung's analytic psychology in which more of a balance between conflicting wishes are stressed, and Adler's individual psychology in which goal setting and feelings of inferiority are examined (Sutherland, 1995). The wider impact of psychoanalysis has been extensive, and the only link with Freud's original ideas is often a preoccupation with hypothesised hidden motives and "deep" causes (Reber, 1995). Psychoanalysis is also associated with the use of certain techniques (especially free association, rich interpretation and transference), and the use of these methods in the psychoanalytic treatment of

neuroses (Reber, 1995). Since psychoanalytic treatment is lengthy and expensive, requiring prolonged treatment with a trained therapist, many have questioned its effectiveness (e.g. Kline, 2000a). There has been little systematic research to evaluate the efficacy of psychoanalytic theory and methods in comparison with competing therapeutic approaches. However the research that has been done in this area has proven to be controversial and largely unsupportive (Comer, 1998; Cooper, 1998). Although more effective forms of therapy have probably been subsequently developed (e.g. cognitive behaviour therapy), it can also be argued that these newer forms of therapy are indirectly derived from psychoanalysis (Eysenck, 2000).

On a theoretical level a number of assumptions are made in psychoanalytic theory. The mind was thought to be divided into three parts (Eysenck, 2000): The "id" which works from a hedonistic perspective (the "pleasure principle"), especially the immediate gratification of aggressive and sexual basic motivational instincts. The "ego" which is the conscious rational minds evaluation of the environment and the situation with which it is faced. And, lastly, the "superego" which is partly conscious and partly unconscious, consisting of the conscience and ego-ideal, which in turn relate to the feelings of guilt and pride linked to social influences. Freud believed that conflicts between the id, ego and superego occurred, and caused anxiety, which the ego in turn devoted much time to resolve using "defence mechanisms" (Wade & Tavris, 1993). People may think about threats in a way that allow emotion to be removed (intellectualisation), regress to an earlier developmental stage (regression), keep troubling thoughts out of their conscious awareness (repression), transfer impulses from a threatening thing to a less threatening one (displacement), attribute undesirable characteristics to others (projection), transform unconscious anxiety into the conscious opposite (reaction formation), or refuse to accept the existence of a threat (denial). The idea of defence mechanisms has proven to be a reasonably useful one, and a large body of research lends support to the theory that people tend to think in distorted ways in order to control their emotions and protect their self-esteem (Cooper, 1998; Eysenck, 2000). Because Freud put forward a systematic argument, now largely accepted in a broad sense, that an understanding of childhood can help us to understand adults, and also

that childhood consists of a number of developmental stages, he is sometimes credited as the founder of developmental psychology. Freud thought that adult personality depends to a large degree on childhood experiences, and that certain characteristics (e.g. orderliness and tough mindedness) would cluster together. In this way Freud's ideas can be seen as a forerunner to modern personality theory, and there is extensive evidence to suggest that certain personality attributes tend to form second order factors (Kline, 2000a, 2000b). Freud popularised the existence of the unconscious mind (although this was not an original idea), and he developed complicated ideas about the function of the unconscious that many contemporary cognitive psychologists regard as convoluted and unnecessarily obtuse.

In evaluating the psychodynamic approach in general we might conclude that its main contributions have been to broaden the horizons of what was considered to be the legitimate scope of psychology, and also to provide thought provoking and controversial ideas about childhood development, adult mental life and the therapeutic treatment of mental illness. A major weakness of Freud's approach is that many aspects of the theory are untestable and vague, and as a result said to be unscientific, after a number of 20th century philosophers (such as Popper) pointed out that we should not accept theories that cannot be falsified by empirical evidence (Comer, 1998). The aspects of psychosexual development that can be adequately tested have largely contradicted Freud's predictions, and more specifically there is very little evidence for "Oedipus" and "Electra" complexes (Eysenck, 2000). Freud relied heavily on untested observations and the interactions between himself and his patients, which were made in an unsystematic (biased?) way, with an unrepresentative sample of middle-class Viennese women (Eysenck, 2000). Psychoanalytic approaches to therapy are also criticised for underplaying the role of social and environmental factors, and for focusing to readily upon unconscious processes and past events – the so-called "looking-backward" fallacy (Wade & Tavris, 1993). Freud's work on feminine sexuality has also received criticism from feminists for reproducing the values of a patriarchal society and legitimising the subjugation of women (Rojek, 1999). On balance we might conclude that Freudian ideas have played an important role in the development of psychology as a

discipline, however the majority of early psychodynamic theory has been superseded by newer ideas that take a more balanced view of the individual and rely for their support upon empirical evidence that incorporates the possibility of falsification (Cooper, 1998; Kline, 2000a).

3.3. Psychoanalytic Interpretations Of Risk Taking

> "There is a preconceived idea that freeclimbing [rock climbing] is a dangerous sport. A common image is of prospective suicides, undaunted by death, working their way up a rock face, reaching dizzying heights and occasionally crashing to their death. However, such notions have nothing to do with modern freeclimbing." (Strobl & Zeller, 1997: p.128)

The first attempts to give an explanation of risk taking behaviours such as mountaineering were made from a psychoanalytic perspective, and the preceding quote gives something of a feel for the motivational puzzle presented to early theorists at the turn of the 20th century. They assumed, quite reasonably, that the desire to live was a characteristic of normal psychological functioning. They then postulated that if this was the case, then a normal person would seek to avoid situations that are life threatening. The corollary of this argument in their eyes being that there could be no rational reason to risk ones own life, therefore any dangerous activities that were voluntarily engaged in were evidence of irrationality, or even abnormality and pathology. Interestingly the influence of this train of thought is still clearly evident today in both everyday and academic contexts (e.g. Kohler, 1996), and for some time these ideas were widely accepted as truth despite a number of limitations that will be discussed in detail later in this chapter. Risk takers were therefore branded as 'counterphobics' who needed to take risks in order to allay deep-rooted fears of masculine inadequacy, that is to say castration fear (Slanger & Rudestam, 1997). Risk taking was seen to be the sublimation of sexual drives, aggression, exhibitionism and narcissism:

> "The sport becomes a medium in which an inner conflict is transformed into a pleasurable game. Unconsciously the conflict is projected into the

sport activity which permits temporary symbolic mastery of the conflict." (Connoly, 1981: p.11)

Psychoanalysts also argued that risk takers had an unconscious death wish (often referred to as "thantos", "mortido" and "destrudo") and the desire to take risks was evidence of underlying suicidal tendencies. Either way risk taking behaviour was thought to be symptomatic of mental illness and pathology. Is risk taking therefore an example of inwardly directed mortido? Hoover (1978: p.630) reviewed a number of related psychodynamic theories in an attempt to explain skydiver's motivations:

> "There are many perspectives from which to view why skydivers jump out of aeroplanes. Murray's (1955) interpretation considers the parachutist to be suffering from a full blown Icarus Complex. Freudians would see the parachutist as struggling with rational and irrational forces, self-destructive urges and the prevalence of the death instinct. Fenichel (1939) observed that people actively seek anxiety-provoking situations which produce a type of counter-phobic pleasure. Also, a sado-masochistic aggressive drive may be directed against the self by exhibiting the potentially and frequently self-destructive behaviour. Participating in a dangerous sport is also a technique to direct aggression against loved ones by maintaining them in a state of perpetual fear over seeing the skydiver crash."

Is risk taking behaviour therefore suicidal? Suicide is generally considered to be an intentioned death – a self-inflicted death in which one makes an intentional, direct, and conscious effort to end one's life (Comer, 1998; Fairbairn, 1995). The Collins Concise Dictionary (1995) defines suicide as "The act or an instance of killing oneself intentionally." Not all people who kill themselves commit suicide, as many people die as a result of their actions without intending to die: "A man who crashes his car into a tree after falling asleep at the steering wheel is hardly trying to kill himself" (Comer, 1998: p.306). To demonstrate that a risk taker is in fact suicidal, it is therefore necessary to show that the risk taker consciously intends to die, and that the deaths associated with the participation in high risk activities are not simply accidental. This runs contrary to the idea that risk takers are suicidal because they

have an unconscious death wish. However others have proposed that there are fundamentally different kinds of suicide, and Shneidman (1993) categorises people who intentionally end their lives into four main categories:

1. Death Seekers – have a clear intention of ending their life at the time they commit suicide.

2. Death Initiators – also clearly intend to end their lives, but act thinking that they are going to die anyway and they are merely avoiding a more prolonged and perhaps painful process. Many suicides among the elderly and sick fall into this category (Valente & Saunders, 1995).

3. Death Ignorers – do not believe that their death will mean the end of their existence. Perhaps they believe that they are simply "going to a better place." Many child and religious suicides fall into this category (Comer, 1998).

4. Death Darers – are ambivalent in their intent to die, and this ambivalence is reflected in the act itself. Although to some degree they wish to die, and they often do, they take actions that contain a certain amount of uncertainty and may or may not lead to death. Death darers are often as interested in gaining attention, making someone feel guilty, or expressing anger as they are in dying (Comer, 1998).

Comer (1998: p.309) hypothesises that some physical risk takers may be death darers:

> "Thrill-seekers often progress from one dangerous activity to another, giving rise in recent years to such "sports" as white-water rafting, bungee jumping, and rock climbing. Are these people daredevils searching for new highs, as many of them claim, or are some of them actually death darers?"

Comer (1998) makes the important point that risk takers may claim to be motivated by one thing, but *actually* be motivated by another (whether or not they are

conscious of it). Fairbairn (1995) argues that risk takers could participate in dangerous activities with the intention of dying in at least two clearly distinguishable ways. Firstly, participants may wish to die, and anticipate that by engaging in dangerous pursuits they will increase the probability of death and eventually be killed as a result. In Shneidman's understanding risk takers of this kind would be categorised as death darers:

> "...A keen mountain climber might decide to pursue his interest in climbing at the expense of other safer ones, in order to put himself at grave risk as often as possible. A person could even decide to become a mountaineer because he believed this was one way of eventually ensuring his death." (Fairbairn, 1995: p.113)

Alternatively, a course of particularly life threatening behaviour may be undertaken that is expected to result in death in the short term. Risk takers of this kind would be categorised by Shneidman as death seekers, death initiators or death ignorers depending upon their specific intentions and beliefs.

> "A more clear cut example of suicidal action in this context would be where a rock climber climbed beyond his capacity, solo and without protection, in poor conditions, with the intention of putting himself in the situation where death was likely." (Fairbairn, 1995: p.113)

Menninger (1938) created a category called chronic suicide to describe people who behave in life endangering ways over an extended period of time. According to Comer (1998) people who are 'chronically suicidal' may consume excessive alcohol, abuse drugs, or indulge in risky activities or occupations. Although certain risk taking behaviours may sometimes reflect a certain kind of suicidal tendency the risk takers *true intention* often remains unclear. The term "suicide" is used here to mean only self-inflicted deaths in which an intentional, direct, and conscious effort to die is made. The psychoanalytic interpretation of "suicide" is clearly different from the one adopted here because they suggest that suicidal tendencies may be the result of purely *unconscious* processes. This interpretation of suicide has more in common with Schneidman's (1993) suicide-like concept that he refers to as

subintentional death. He applies this term to individuals who only exert an indirect, covert, partial or unconscious influence over their own death.

Even if a risk taker is aware and accepting of the risks involved, that does not necessarily mean that they are suicidal. Risk takers, or at least the majority, may not *intend* to die, consciously or unconsciously as Fairbairn (1995: p.111) argues:

> "Most trivially, suicide is to be distinguished from a wide range of high risk activities including the smoking of tobacco, the use of hard drugs, driving fast cars recklessly, climbing mountains and hang gliding. Though the individuals may be aware of the possibility that what they are doing will lead to death and accept the risk that this is so, in general they do not intend to die."

There are three different ways in which a risk taker could participate in the same high risk behaviours depending upon their intentions:

1. Suicidal Risk Taking – risk takers could engage in risk taking behaviours with the conscious intention of bringing about their own death as a direct result of those behaviours.
2. Subintentional Suicidal Risk Taking – risk takers may engage in risky behaviours with a partial, covert, indirect or unconscious desire to die.
3. Non-suicidal risk taking – this type of risk taker engages in risk taking behaviours for other reasons, and has no desire to die, consciously or unconsciously.

A truly suicidal risk taker would probably not last very long in a hazardous environment, as they would have ample opportunity to kill themselves. This kind of risk taking would probably be the most easily to identify as the risk taker's intentions might be unambiguous, they are consciously and directly attempting to kill themselves. However the fact that most risk takers do not seem to bring about their own deaths directly, means one of two things: (1.) They are suicidal risk takers

and they have simply been unable to kill themselves, or, (2.) perhaps more likely, that for many people these behaviours represent one of the other two types of risk taking (subintentional suicidal risk taking or non-suicidal risk taking).

One of the major difficulties here seems to lie in differentiating between the second and third types of hypothetical risk taking. For example, it may be difficult to differentiate between a climber who has a conscious desire to live and an unconscious desire to die (a subintentional suicidal risk taker), and a climber who has both a conscious and unconscious desire to live (a non-suicidal risk taker):

> "In relation to mountaineering, and other high risk sports such as hang gliding, there seems to be a slippery distinction between the motives and intentions underpinning the behaviour of individuals who otherwise might seem to be acting in just the same way." (Fairbairn, 1995: p.113)

Part of the problem is that both of these risk takers (the subintentional suicidal risk taker and the non-suicidal risk taker mentioned above) might behave in exactly the same way and would both believe that they had absolutely no intention of killing themselves. The psychoanalysts who argued that all risk takers have an unconscious death wish are in effect arguing that they are subintentional suicidal risk takers. Many risk takers express their desire to live and are quick to refute pathological interpretations of their actions (e.g. O'Connell, 1993). But this does not necessarily undermine the psychoanalytic argument. Risk takers could be lying (a covert death wish) or they could be telling the truth but they could be wrong (an unconscious death wish). To complicate matters further a risk taker may not have polarised intentions; for example, they may have a *partial* or *variable* intention to die. But if the risk takers' own elicited opinions are no reliable guide to their actual or underlying intentions, then how are we to differentiate between the different types of risk taking? A risk taker may cause their own death by their actions - it would therefore be fair to say that they killed themselves. But to say that they committed suicide is to pass judgement over their intentions, a judgement that is not made correct or incorrect by the nature of their behaviour. How then are we to try to understand these intentions? It is necessary to review the available empirical

evidence in order to evaluate the hypothesis that risk takers actually have suicidal intentions or symptoms of mental illness.

3.4. Research Findings

O'Connell (1993: p.11) interviewed seventeen of the worlds leading climbers and is inclined to reject the risk taking as pathology argument:

> "I was sometimes asked whether climbers indeed have a death wish. The assumption seemed to be that anybody who attempts such hazardous and improbable objectives must be mentally unbalanced in some way, that consciously or unconsciously climbs must be suicide missions, species of Russian roulette, where losing means death and winning means – what does it mean? After interviewing some of the world's leading climbers and thinking about the significance of their chosen activity, I can honestly say that nothing could be farther from the truth. What animates climbers is not a death wish, but a *life wish*, a desire to live – fully, intensely, completely. I have never met a group of people more truly alive – physically, emotionally, intellectually, spiritually. Rather than courting danger for its own sake, they do so as a means of deepening and enriching their experience of life."

Although this argument is not without intuitive appeal, O'Connell's approach can be criticised for being largely unsystematic and thus particularly open to subjectivity and bias. However other researchers have used more sophisticated methods and it is to this body of research that we now turn to.

Slanger and Rudestam (1997) conducted a study in which possible differences in death anxiety were examined between 20 "extreme" risk sports participants, 20 "high" risk sports participants and 20 "low" risk sports participants. Although the extreme risk sports participants did score lowest on Templer's (1969) "Death Anxiety Scale", the differences were not statistically significant ($p > .05$). Although a larger sample would have been preferable for reasons of statistical power, this does not lend support to the hypothesis that risk takers are suicidal or unconcerned about

death. They also conducted semi-structured interviews, and the results were congruent with the quantitative findings. Slanger and Rudestam (1997: p.368) argue "a further implication of these findings is that there is no support for the assertion that risk taking is, in general, counterphobic behaviour."

Schrader and Wann (1999) also examined the relationship between the engagement in high risk sports and a number of individual differences including death anxiety, as measured by Templer's scale also used by Slanger and Rudestam (1997) in the preceding study. The subjects were 169 volunteer students (82 females, 87 males). A small negative correlation between risk taking behaviour and death anxiety was found (r = -.22, $p < .005$), however using standard multiple regression procedures they determined that death anxiety did not account or a significant degree of variance in the dependent variable, the participation in high risk sports ($p > .05$). The results of a hierarchical multiple regression also indicated that death anxiety did not account for a significant degree of variance when the influence of the other variables was statistically controlled ($p > .1$). Taken together Schrader and Wann's (1999) and Slanger and Rudestam's (1997) studies do not support the notion that death anxiety plays an important predisposing role towards risk taking sports, at least as measured by Templer's scale. In the study in which a significant correlation was found, the degree of association was small and non-significant when the effects of other more important variables were statistically controlled.

Hoover (1978) attempted to construct a composite psychoanalytically oriented personality profile of 18 skydivers, in comparison with 18 controls (matched for age, education and sex). Hoover administered a number of projective measures, namely the Rorschach, Hand Test, House Tree Person, and Draw a Person tests. He hypothesised that parachutists may be counterphobics struggling to control irrational urges, self-destructive urges and the prevalence of the death instinct, or sado-masochists directing aggressive drives against the self and others by participating in dangerous activities. Hoover also argues that parachutists may deny the risk involved in their sport to be any higher than in other sports. No statistically significant differences were found between skydivers and controls in respect of these

hypotheses, although parachutists tended to be "less inhibited and more flamboyant and people-orientated" than non-skydivers (Hoover, 1978: p.629), aspects of personality that may equate to a form of Extraversion. Hoover concludes (1978: p.630) that the evidence does not provide any support for psychodynamic speculation:

> "Perhaps many skydivers participate simply for the psychological experience, which may begin long before and/or last for hours after the few seconds of free fall. The parachutist attains some real physical mastery of the elements, feeling exhilaration and power by fighting the force of gravity and winning."

The counterargument here might be to argue that with such a small number of subjects (36 in total) statistically significant findings were not likely to be found due to a lack of statistical power, even if a real difference did indeed exist. The type of projective technique incorporated in this study has also been criticised for a lack of reliability due to poor inter-scorer reliability and the highly subjective nature of the data itself. That said the outcome of this study cannot be taken to provide support for the hypothesis that risk taking behaviour is due to suicidal intentions or the result of mental abnormality.

Norris and Weinman (1996) administered various psychometric measures to 43 trainee transatlantic voyagers on a 3-month journey from the U.K to the Caribbean in a sailing ship, and their results were compared with that of 33 controls at two equivalent times. They found that there was a significant increase in Self-Esteem ($p = 0.001$), and Coping Strategies – "positive reinterpretation and growth" subscale ($p = 0.036$), when two-way interactions (group x time) were calculated. There were also non-significant improvements in General Health, Generalised Self-Efficacy, and Satisfaction With Life scores, and Norris and Weinman themselves suggest that these changes might have been statistically significant with a larger sample. In other words they raise the possibility that a Type II error may have been made, and the null hypothesis may not have been rejected simply due to a lack of statistical power. A series of t-tests confirmed that the voyagers had increased significantly in Self-Esteem ($p < 0.0005$), General health ($p = 0.001$), Self-Efficacy ($p = 0.001$), and the

following Coping Strategies – 'behavioural disengagement' ($p = 0.028$), 'positive reinterpretation and growth ($p = 0.024$), and 'humour' ($p = 0.047$). The two-way interaction in self-esteem was clearly the strongest and highly significant, and this confirms the results found in previous studies (e.g. Herskovitz, 1990). Norris and Weinman (1996: p.189) therefore conclude that "there was a trend toward reduction in psychological distress and there was no evidence of any aversive effects." This runs contrary to the predictions that would be made on the basis of existing psychoanalytic theory. This study does not only fail to find evidence that these kind of experience are counterproductive or self-destructive (as psychoanalytic theory would predict), rather it provides evidence to the contrary, that participants can expect to benefit from these kinds of challenging outdoor experiences.

If risk taking is not a form of suicidal behaviour, then this helps to understand the "thirst for life" that risk takers mention themselves:

> "Without danger of death, climbing is no longer climbing. I'm not seeking death on the climb – exactly the opposite – I'm trying to survive. But it's very easy to survive if there's no danger of death. Climbing is the art of surviving in very difficult situations that involve the danger of death. And the best climber is not the one who does a crazy thing once or twice and dies the second time; the best climber is the one who does many things on the highest level and survives." (O'Connell, 1993: p.22)

Although it would be unwise to dismiss psychoanalytic ideas completely due to the scarcity of research studies in this area it is clear that these results are not encouraging. The possibility exists, however unlikely, that technical deficiencies in each of these studies may have resulted in misleading results, however the evidence to suggest that the participation in outdoor activities may have a *positive* effect upon mental health is particularly damming. What this means is that the results of these research studies have not lent support to psychoanalytic speculations, and risk takers, in general, do not appear to be either pathological or suicidal. That is not to say that no risk takers are suicidal, as there are suicidal people in the general population, what it means is that strictly speaking the proportion of suicidal risk

takers is not likely to be disproportionately high. Indeed modern attempts to explain risk taking behaviours are largely free of references to pathology, and these approaches have a far greater body of supportive empirical evidence which is largely supportive.

Part of the reason that the pathological argument seems to have been so convincing at the time is that there was no antithesis, there was no convincing theory to explain why rational or normal people would take physical risks. Franken (1998: p.313) states the problem thus:

> "It is easy to understand why people should learn to overcome fear of public speaking or fear of failure, but why should someone overcome a fear that seems to serve a clear adaptive function, such as reducing the likelihood of death?"

This unsolved dilemma forced theorists to label the phenomenon as self-defeating, irrational and destructive, or to acknowledge limitations in their own understanding. (Perhaps unsurprisingly most if not all researchers opted for the former option.) Inglehart and Hildebrandt (1990) suggest that it was the disproportionate prioritisation of safety and physical security needs, and the overlooking of other motives (such as the desire to develop self-potential) that created this conflict. Early researchers seem to have conceptualised risk taking behaviours as purely negative events and made no allowance for potential gains. Like Maslow (1970) and others they had tried to rank needs in an inflexible universally applicable hierarchy. An approach that Wade and Tavris (1993: p.373) suggest has failed partly because:

> "Human history is full of examples of people who would rather starve than be humiliated... rather die of torture than sacrifice their convictions; rather explore, risk, or create new art than be safe and secure at home."

The argument here is that rather than the pathological theory proving that all risk taking is abnormal, behaviours such as risk taking have forced us to re-evaluate psychoanalytic theory. If it is a mistake to label risk taking as pathological, then there are other reasons to suggest how this mistake could have been made. Many

criticisms of the psychoanalytic approach in general are also relevant to the analysis of psychoanalytic risk theory. The same motivations can be interpreted in entirely different ways. For example, in what Deluze and Guattari (1977; 1988) call "Schizoanalysis" the same desires are seen as a sign of health, and risk taking could be seen as the liberation of desire. Written as an alternative to the psychoanalytic perspective, they attempt to deneuroticise the individual and illustrate how the psychoanalysts' emphasis on sexual conflicts may be a relative, not universal principle. Perhaps the psychoanalysts were guilty of generalising from experiences with patients in therapy to all human beings, the "patients-represent-everyone" fallacy. Deluze and Guattari liberate the individual from notions of fixed identity and do not assume that behaviours are necessarily the direct result of previous events, the so called "looking backward" fallacy, (just because A came before B does not mean that it *caused* B). As we have seen psychoanalytic theory also seems to overemphasise the importance of unconscious processes rather than real experiences and conscious thoughts.

> "...An individual who pursues a risky life course with the intention of ending up dead will be a suicide. However, where such a person does not intend to die but merely accepts the risk of death as a foreseen but not intended consequence of the activity, he will not in any sense be suicidal. All that lots of climbers really want to do is simply to get to the top of the mountain." (Fairbairn, 1995: p.114)

Risk taking may be said to be suicidal in jest due to the risk of death involved. However that is not to say that risk taking is literally suicidal or that risk takers are mentally ill or motivated by a death wish. However, this argument simply raises further questions, for example why would a mentally healthy individual choose to risk their lives and participate in an activity that might lead to their own death? If safety needs were the only consideration, then the process of risk management would become synonymous with the minimization of all risks, as much as possible, at all times. But surely there is more to life than physiological survival alone. If there are further issues, then what are they and how are they relevant? In the following chapters (4 & 5) contemporary theories are reviewed, and it is hoped that taken

together they will provide this 'missing piece' in the motivational puzzle presented by risk taking behaviours.

3.5. Summary

Psychoanalysts at the turn of the 20th century could not conceive of any reason why people would choose to risk their lives, and as a result concluded that risk takers were acting without reason. They proposed that risk takers such as mountaineers were illogical, or even pathological. Their own failure to understand risk taking behaviour from within the confines of their own elaborate and speculative theories lead them to classify risky behaviours as expressive of suicidal tendencies, a death wish, or repressed feelings of masculine inadequacy. Indeed the legacy of this train of thought continues to be influential although the balance of intellectual power has long since shifted due to the development of more convincing new theories grounded in empirical evidence.

Chapter 4.
PERSONALITY TRAITS

4.1. Introduction

In chapter 3 psychoanalytic attempts to explain risk taking behaviour were examined, and for both theoretical and empirical reasons the need for more effective theory is stressed. Indeed, the need for a more convincing explanation brings us to consider the effectiveness of contemporary theories. In this chapter the role of personality traits are evaluated, and a theoretical introduction to this area is complimented by an overview of the relevant research findings. In short, the idea here is that people with a certain kind of temperament may be predisposed to participate in risk taking behaviours, for example they may be resilient to the debilitating effects of anxiety or they may require a greater amount of stimulation and excitement than the majority. In personality trait theory today there is what can loosely be described as a reasonable degree of agreement about the nature and structure of the main dimensions of personality. This is important in that it provides us with a basis from which to be critical of both personality theories and their corresponding psychometric measures. Obviously a link between a particular personality dimension and risk taking behaviour is meaningless if there is considerable evidence to suggest a lack of validity (regardless of the size of association or degree of statistical significance). A review of current trait theory is therefore presented, followed by an overview of the empirical relationships between risk taking behaviours and different aspects of personality.

4.2. Trait Theory

The Collins English Dictionary (1995) defines a trait as "a characteristic feature or quality distinguishing a particular person or thing." However psychologists use the word slightly differently, and in the context of personality a trait is a conceptual entity, a hypothesised underlying characteristic of an individual that is relatively

enduring and provides an explanation for regularities in behaviour (Reber, 1995). Traits are sometimes referred to as descriptive statements that are made without explanatory intent (e.g. regularities in behaviour), however this is closer in meaning to the general usage of the word trait as a mere characterisation of regularity, and it is a mistake to assume that these differing interpretations are simply interchangeable. According to trait theory, an individual's personality comprises a range of traits, which in turn lead to a characteristic range of thinking, feeling, behaving etc. (Reber, 1995). Traits are assumed to exist in relative amounts in each individual, and many believe that the ultimate goal of personality theory is in behavioural prediction or explanation. Recently multivariate statistical procedures, such as factor analysis, have been used in order to identify and isolate the underlying dimensions of personality. Empirical advances of this kind that have led trait theory to become arguably the most popular approach within the field of personality theory today, however there is less agreement about precisely which approach to trait theory is most appropriate (Cooper, 1998). In order to evaluate the appropriateness of competing trait theories, it is also necessary to consider the validity of the questionnaires that have been developed in an attempt to measure these traits. For example evidence of reliability and construct validity are thought to be necessary (Kline, 2000b). Many traits are thought to have a biological or genetic basis, at least in part, and social interactions are also proposed. The integration of biosocial factors is increasingly popular in this field (a form of interactionism), in response to the weaknesses inherent to the more single-minded approaches that incorporate only biological or social influences (Matthews & Deary, 1998; Reber, 1995).

Trait based approaches do not focus on the phenomenological world of the individual, which has proven to be difficult to compare, rather they focus on the primary ways in which people differ from each other – that is their personalities (Cooper, 1998). In order to do this the main dimensions of personality have to be established, and from this basis potentially valid tests can be constructed to aid in the comparison of individuals. The assumption here is that people's actions are not completely determined by the situation in which they find themselves. This relates closely to our everyday experiences in which we often describe others and ourselves

as being "a worrier", "bossy", "aggressive", a "party animal" and so on. However we must be careful of circularity here, as behaviours often explained by traits, and in turn these traits are defined by reference to these behaviours. To be confident that a trait is a 'real' underlying characteristic of the individual we have to show that its use extends beyond a matter of mere taxonomic convenience, and it can be shown to be consistently linked with genetic factors, social influences, etc. Perhaps the main problem faced by trait theorists is to determine the number of underlying personality traits and their nature. Cattell (1946) argued somewhat convincingly that a wide range of adjectives would cluster together to form the main dimensions of personality when factor analysis, this is known as the 'lexical hypothesis' and is essentially the basis for most modern psychometric personality tests. Cattell subsequently developed the 16 Personality Factor Questionnaires (16PF), however the factor structure of this test has proven to be difficult or impossible to replicate, leading some to suggest that the use of Cattell's primary scales should be abandoned completely (e.g. Matthews, 1989). Kline and Cooper (1984) also found that the 16PF appeared to be measuring ability rather than personality, and attempts to measure personality by 'objective tests' were if anything less successful (Cooper, 1998). Technical difficulties associated with Cattell's original work (such as the use of factor analysis by hand which is especially error prone) may provide a partial explanation why his work resulted in unreliable factors, and in conclusion most modern psychometrists agree that a smaller number of orthogonal factors should have been extracted which would incorporate Cattell's more narrow oblique factors.

Eysenck (Eysenck & Eysenck, 1996) adopted a different approach to personality than Cattell, and theorised about the nature of personality based upon clinical experiences and experimental evidence. He concluded that Extraversion (vs. Introversion) and Neuroticism (vs. Emotional Stability) were the main dimensions of personality, later adding Psychoticism (vs. Humaneness). Highly Neurotic individuals are moody, depressive, anxious and touchy, whereas people low in Neuroticism are confident, relaxed, even-tempered and calm. Extraverted people are outgoing, gregarious, optimistic and sociable individuals, on the other hand people low in Extraversion are reserved, shy, pessimistic and socially inhibited. People high

in Psychoticism are cruel, risk taking, egocentric, impulsive and emotionally cold, whereas people low in Psychoticism are agreeable, warm-hearted, and socialised. The degree of association between these dimensions is normally small, and the most recent questionnaire designed to measure these factors – the Revised Eysenck Personality Questionnaire (EPQ-R), typically produces three orthogonal factors that perform as expected (Cooper, 1998; Kline, 2000a, 2000b). Indeed the fact that there is a substantial amount of construct validity evidence for this measure and the general approach leads many theorists to argue that this is the best approach for trait theorists and applied psychologists to adopt. For example Cooper (1998: p.71) argues in favour of Eysenck's approach and the use of the EPQ-R: "My own view is that Eysenck's model of personality is more promising than those of Costa and McCrae or of Cattell, not least because the questionnaire designed to measure these traits clearly does its job." In a similar vein Kline (2000a: p.505) also recommends the use of the EPQ-R: "If we want a reliable and valid measure of these three basic personality factors the EPQ is about as good as can be desired. It represents a clear marker in personality factor space."

The factors of Extraversion and Neuroticism generate no discernable controversy and are widely accepted. Concerns with Eysenck's model relate primarily to the Psychoticism factor, and alternative conceptualisations of personality are proposed in which more than one factor is used in place of Psychoticism. Zuckerman, Kuhlman, Thornquist and Kiers (1991) argue that three-factor and five-factor solutions may simply represent different levels of analysis, a theory they demonstrate empirically, and which has been subsequently replicated (e.g. Zuckerman et al. 1993). A large number of studies have examined the degree of heritability of Eysenck's personality dimensions and on balance the results suggest that around 40% of these traits are due to genetic influences (Eysenck, 2000; Matthews & Deary, 1998; Zuckerman, 1994). Eysenck theorised about biological differences between personality types, for example Extraverts might be higher in cortical arousal, however these ideas have gained only limited support (Butler & McManus, 1998). Neuroticism has been linked with the neurotransmitter serotonin (also called 5-hydroxytryptamine or 5-HT), and a single gene on chromosome 17

codes for the 5-HT transporter which regulates the reuptake of 5-HT at the synapses where it is released, although the link is small at 3% to 4% (Matthews & Deary, 1998).

Costa and McCrae (1992a, 1992b) propose an alternative model of personality based upon the proposition that there are actually five fundamental personality factors, commonly referred to as the "big five". Taken together with Eysenck's three-factor model these are currently the most popular personality theories, and a considerable amount of lively debate currently ensues as to which model is superior. Two of Costa and McCrae's five factors are shared with Eysenck's model (Extraversion (E) and Neuroticism (N)), and the three additional factors are Agreeableness (A), Conscientiousness (C) and Openness to experience (O). Agreeable people are likeable and fit in well with other people, Conscientious individuals are reliable, rule observing and persevering, and people high in Openness to experience are open to new ideas, flexible and liberal (Kline, 2000a). However, there are certain difficulties with the "big five" model despite its current popularity, and criticisms of this model revolve around three major deficiencies: Firstly, the five factors obtained by different researchers are not necessarily interchangeable, in other words the same factors may not have been replicated (Hayes, 2000b). Secondly, five broad factors may not be sufficient, for example in organisational psychology they prefer to use narrow first order traits such as Impulsivity, and the placement of individual traits within an overall model of personality remains surprisingly open to debate (see for example Zuckerman, Kuhlman, Joireman, Teta & Kraft, 1993). And lastly, five factors may be too many, as we have seen Eysenck's three-factor model has a considerable amount of construct validity evidence and factors beyond E and N tend to be correlated (Eysenck, 2000; Kline, 2000a, 2000b). An evolving body of evidence seems to suggest that Eysenck's Psychoticism scale provides a good marker in a three factor solution that also loads C, A and O which confirms their lack of independence and their relationship with P, as Eysenck (1992) and Kline (2000a) have argued. The highest degree of uncertainty seems to surround the Openness factor that is also called intellect, culture and imagination in lexical systems and these factors are often only weakly correlated with each other

(Matthews & Deary, 1998). The weak theoretical basis for O, C and A is also commented upon by Kline (2000a, 2000b), and Costa and McCrae's largely taxonomic "bottom up" approach can be contrasted with Eysenck's "top down" theory led approach. The psychological meaning of O, C and A are thus brought into question, and future research is necessary to determine whether these factors have any validity beyond a circular description of related behaviours. Kline (2000a) also questions whether simple structure has been reached in a five-factor analysis, for example taking issue with low factor loadings and other technical deficiencies. Costa and McCrae (1992a) attempt to counter by suggesting that simple structure is not important, although this is far from convincing. Taking into account these concerns it is understandable that there are dissenting voices (e.g. Block, 1995), and if anything it is somewhat surprising that Costa and McCrae's model of personality has gained such widespread approval. Perhaps some of its appeal lies in the "sensible compromise" argument (e.g. Eysenck, 2000), which suggests that Cattell extracted too many factors and Eysenck too few, however although such an argument may appeal intuitively it distracts attention from the impartial evaluation of available evidence. The degree of hereditary associated with the big five model of personality is suggested to be moderately strong, however the especially strong relationship between genetic influences and Openness may actually be seen as a weakness to the theory as it adds weight to the argument that this dimension of personality may simply reflect intelligence (which is strongly influenced by genetics) and not be a dimension of personality at all (Eysenck, 2000).

Zuckerman and Kuhlman (2001) share Eysenck's determination to obtain factors that are more closely related to psychobiological processes than the big five. They propose an "alternative five" factor model of personality in which Conscientiousness and Openness are dropped and Activity (Act) and Impulsive-Sensation Seeking (Imp-SS) are added. The Agreeableness factor in the big five model is also renamed Aggression-Hostility, which is scored in the opposite direction. People high in Impulsive-Sensation Seeking do not plan carefully and tend to act without thinking things through, and they are also motivated by a need for thrills, excitement and novelty. People high in Activity are impatient, restless, prefer challenges and hard

work, and have an excess of energy for work and other tasks. This model of personality is also especially relevant to this study as the narrow first order traits of Impulsivity and Sensation Seeking are conceptually related to risk taking, and have also been consistently linked empirically with various risk taking behaviours (Zuckerman, 1994). Preliminary analyses suggest that both of these factors comprise two oblique factors that relate to Impulsivity and Sensation Seeking in Imp-SS, and general activity and work effort in Act. One limitation of the lexical hypothesis is that the behavioural importance of certain traits may not be fully reflected in language, and furthermore the 'bottom up' approach of factor analysing the structure of traits should not be the final word in the definition of basic traits. For example the adequacy of variable sampling is crucial to the outcome of the factor analysis, and to guard against circularity factors must be grounded in theory and identified using external criteria such as biosocial foundations (Kline, 2000a; Zuckerman et al., 1993). According to this model of personality, and unusually, Activity is conceptualised as a separate factor than Extraversion (which are grouped in the same factor by Eysenck and Costa and McCrae). The factor analytic findings suggest that in a three-factor analysis Activity tends to load on the Extraversion factor, and it is perhaps the weakest factor in the alternative five model from a statistical standpoint. In response Zuckerman et al. (1993) argue that judgement upon the Activity factor should be postponed until the relationship with behavioural and biological phenomenon allows the comparison of competing personality models. These criteria should also be used to evaluate the importance of a separate Openness factor (as in the big five), and a separate Aggression/Agreeableness factor (as in the big five and alternative five). Impulsive-Sensation Seeking loads on the same factor as Conscientiousness (and Psychoticism) in a three-factor or five-factor solution and a high degree of similarity or functional equivalence is suggested (Zuckerman, et al., 1993). Sensation Seeking is relatively unusual in that reasonably strong, significant and consistent links with biological differences have been found, and in particular around 10% of the Sensation Seeking trait can be specifically attributed to variance in the D4 dopamine receptor gene (Matthews & Deary, 1998; Zuckerman, 1994).

In short we can say that there is a great deal of agreement that Extraversion and Neuroticism are the most important dimensions of personality. Beyond E and N there is a reasonable degree of agreement that Psychoticism is a good marker for the other dimensions of personality (especially in a three-factor solution), namely Agreeableness, Conscientiousness, Impulsive-Sensation Seeking and Openness. Whether these are better considered to be separate fundamental dimensions of personality remains a matter of continuing debate, but in practice P may provide a useful marker in applied settings for all of these aspects of personality. It is also interesting that in the alternative five Activity is conceptualised as a separate dimension of personality to Extraversion, as a result further investigation is needed in order to establish whether external criteria suggest it to be an independent dimension of personality.

4.3. The Influence Of Conceptually Related Narrow Traits

Although we have previously concerned ourselves with the main broad dimensions of personality, in this section the influence of more specific aspects of personality (narrow first order traits) are also reviewed. As there are a very large number of first order narrow personality traits proposed to be valid, it is necessary to be very selective here, and the focus of this section is upon those traits that have been consistently linked with risk taking behaviours (especially Sensation Seeking), and also those studies that include a large number of individual trait measures or are in some sense exploratory.

A new type of theory emerged in the 1950s based upon the scientific study of sensory deprivation. Marvin Zuckerman began to suspect that the people who volunteered for these sensory deprivation experiments might share a similar set of personality characteristics. These individuals appeared to be especially venturesome and inquisitive, eager to have new and exciting experiences even if they did contain a degree of social or physical risk. After fifty years of intensive research these individuals would now be classified as high "Sensation Seekers" a personality trait that is linked with Impulsiveness, tough mindedness, and independence. Sensation

Seeking is defined by Zuckerman (1994: p.27) as "... a trait defined by the seeking of varied, novel, complex, and intense sensations and experiences, and the willingness to take physical, social, legal, and financial risks for the sake of such experience."

The first Sensation Seeking Scale was developed in the 1960s and the Sensation Seeking trait has been linked with a surprisingly large variety of behaviours such as risk taking, sports, vocations, relationships, vicarious experiences such as art, health related behaviours such as smoking, and attitudes. A large number of studies have shown that people who engage in a range of high-risk behaviours (including sports and occupations) tend to be high Sensation Seekers that quickly leads to the hypothesis that people take risks in order to have exciting and intense new experiences. Studies involving identical twins suggest that approximately 58 to 69% of the Sensation Seeking is genetically determined, and interesting new studies have begun to identify the specific genes that regulate this need (Zuckerman, 1994). On average men tend to be higher in Sensation Seeking than women, and Sensation Seeking also tends to decline with age. This goes some way to explain why many people who take potentially fatal risks are young men. However it should be borne in mind that many women are high Sensation Seekers, and an increasing number of women participate in high risk sports and take health risks such as smoking or binge drinking.

The study of risk taking behaviour and the measurement of Sensation Seeking has become synonymous with the use of the Sensation Seeking Scale V (SSS V). The SSS V is a 40 item self-report inventory based on dichotomous forced choice items, divided into four ten-item factorially derived subscales which are thought to relate to different aspects of Sensation Seeking. Each item on the SSS V offers the respondent two situations or activities from which to choose the more preferable alternative. One alternative is a "high stimulation activity", while the second is a "low stimulation activity." The four SSS V subscales are Thrill and Adventure Seeking, Experience Seeking, Disinhibition, and Boredom Susceptibility, which are summarised below:

Thrill and Adventure Seeking (TAS) items relate to the desire to engage in sports or other physically risky activities that provide unusual sensations of speed or defiance of gravity, such as parachuting, scuba diving, or skiing (Reeve, 1997; Zuckerman, 1994). Most of the items are expressed as intentions rather than reports of experiences because many of the activities are uncommon (Zuckerman, 1994). Zuckerman has found that the factor is summarised by the attitude: "I sometimes like to do things that are a little frightening" (1994; p.31). The activities included in this section of the test are thought to be socially acceptable but exciting, challenging and risky outdoor activities (Franken, 1998; Harris, 1973; Reeve, 1997).

Experience Seeking (ES) items encompass the "seeking of novel sensations and experiences through the mind and senses, such as arousing music, art, and through social nonconformity, as in association with groups on the fringes of conventional society (e.g., artists, hippies, homosexuals)" (Zuckerman, 1994: p.31). Experience seeking "typifies experience seeking through the mind" (Reeve, 1997: p.355).

Disinhibition (Dis) items relate to the seeking of excitement through parties, social drinking, gambling, and sexual activities (Reeve, 1997; Zuckerman, 1994). An attitude item that Zuckerman suggests describes the factor is "I like to have new and exciting experiences even if they are a little unconventional or illegal" (Zuckerman, 1994; p.32).

Boredom Susceptibility (BS) items relate to intolerance for repetitive experience of any kind, including boring work and boring people (Reeve, 1997; Zuckerman, 1994). An item Zuckerman suggests encapsulates this attitude is: "The worst social sin is to be a bore" (1994, p.32). It is hypothesised that people who have a low tolerance for repetition and sameness will seek out Sensation Seeking activities in an attempt to escape the monotony of everyday life (Franken, 1998).

Internal reliabilities of the total score on SSS V (the sum total of each of the four subscales) ranged from .83 to .86; the ranges for the subscales were: TAS, 0.77-

0.82; ES, 0.61-0.67; Dis, 0.74-0.78; and BS, 0.56-0.65 (Zuckerman, 1994). Three of the four subscales have been shown to have good cross-gender and cross-cultural replication, although the Boredom Susceptibility scale has not. Zuckerman (1994) suggests that age and sex are the most powerful demographic influences on Sensation Seeking. Sensation Seeking, as measured by the SSS V, has been found to be higher in men than women ($df = 1/2065$, $F = 55.7$, $p < .001$: Zuckerman, 1994: p.114), although some argue that the reasons for these differences are not clear (e.g. Franken, 1998). Sensation Seeking has also been shown to correlate significantly with age ($df = 5/2065$, $F = 9.1$, $p < .001$: Zuckerman, 1994: p.114). Sensation Seeking is thought to rise between the ages of 9 and 14, peak in adolescence or the early twenties, and then steadily decline with age thereafter (Franken, 1998; Zuckerman, 1994). No other demographic variables have been shown to correlate with Sensation Seeking consistently (Zuckerman, 1994).

Sporting participation has been shown to correlate with Sensation Seeking, but the results seem to vary unpredictably as a function of sex, education, and extent of participation (Zuckerman, 1994). High risk sports (e.g. kayaking) seem to attract high sensation seekers, and medium risk sports (e.g. rugby) also seem to attract high sensation seekers (Franken, 1998; Freixanet, 1991; Robinson, 1985; Slanger & Rudestam, 1997; Thuen, 1994; Zuckerman, 1994). Sensation Seeking does not seem to be related to low risk sports participation (Zuckerman, 1994). Generally, the participants in risky sports differ from others on the total, TAS and ES scales, but rarely on the Dis scale, although there are exceptions (Zuckerman, 1994). Those who engage in risky sports are often interested in a range of activities that provide novel and exciting experiences, yet they are not necessarily socially disinhibited Sensation Seekers or susceptible to boredom (Zuckerman, 1994). Of the large numbers of studies that have tested for a link between Sensation Seeking and risk taking behaviours, few have found inconclusive or contradictory results. Those that have found non-supportive findings (e.g. Slanger & Rudestam, 1997) can often be criticised for limitations in the research design, especially small sample sizes.

Sensation Seeking is also thought to be related to other types of risk taking behaviours such as driving habits, health, gambling, financial activities, alcohol and drug use, and sexual behaviour (Anderson & Brown, 1984; Franken, 1998; Grasha, 1995; Kraft & Rise, 1994; Reeve, 1997; Zuckerman, 1994; Zuckerman & Neeb, 1980). The trait is also postulated to relate to vocational preferences and choices, job satisfaction, premarital and marital relationships, eating habits and food preferences, media and art preferences, humour, fantasy, creativity, and social attitudes (Franken, 1998; Reeve, 1997; Zaleski, 1984; Zuckerman, 1994).

Sensation Seeking has already been discussed in relation to broad second order traits and in the alternative five five-factor model of personality it combines with Impulsivity to form a second order factor. Sensation Seeking has also been found to cluster together with measures of risk taking to form a single factor suggesting that they represent different facets of the same broad personality dimension (Zuckerman, 1994). Eysenck originally classified Sensation Seeking as a component of Extraversion, but later concluded that it was in fact a key component of the Psychoticism factor. In a three-factor analysis Zuckerman (1994) has found that all aspects of Sensation Seeking consistently load on an "Impulsive Unsocialized Sensation Seeking" factor that is well defined by Eysenck's Psychoticism scale. In short there is close agreement between Eysenck and Zuckerman's conceptualisations of how Sensation Seeking fits within the main dimensions of personality, and their ideas gain support from empirical research findings. It is somewhat surprising then that Costa and McCrae envisage "Excitement Seeking" (a construct closely related to Sensation Seeking) as a facet of Extraversion. This may of course be a limitation of Costa and McCrae's attempts to organise narrow traits within the big five five-factor model of personality which they themselves admit involved educated guesses. There is little evidence as to the validity of the NEO-PI-R (Neuroticism Extraversion Openness – Personality Inventory – Revised) facet scales, the use of six facet scales per second order trait is completely arbitrary, and many facets that are supposed to be independent are actually highly correlated (Cooper, 1998). Taken together this leads us to be wary of the NEO-PI-R facet scales, and some have even suggested that they may simply represent bloated specifics that are only linked by semantic

similarity. In short the placement of a Sensation Seeking related construct within the broader dimension of Extraversion by Costa and McCrae does no damage to the idea that Sensation Seeking is actually a subcomponent of Psychoticism or Impulsive Unsocialized Sensation Seeking. To the contrary in fact, as it leads us to question the validity of the NEO-PI-R facet scales.

Trimpop, Kerr and Kircaldy (1999) administered the Sensation Seeking Scale V (SSS V), the Tension Risk Adventure Inventory, the Desire for Control Scale, and the Telic Dominance Scale to 120 male Canadian subjects. They aimed to investigate the relationships between measures, and by implication the underlying personality constructs related to risk taking behaviour. They found numerous interscale associations, notably significant negative correlations (mainly $p < .01$, all $p < .05$) between the SSS V subscales and planning orientation (r = -.237 for TAS to -.406 for Dis), serious mindedness (r = -.122 for BS to -.354 for Dis), arousal avoidance (r = -.409 for TAS to -.497 for ES), and positive relationships with recklessness (r = .219 for TAS to .655 for Dis). More specific associations were also found between Disinhibition and preparation-prevention (r = -.402, $p < .001$), and between risk taking and Thrill and Adventure Seeking (r = .606, $p < .001$). No link was found between recklessness and risk taking which leads Trimpop et al. to conclude that the participation in outdoor activities such as mountaineering is not the result of impulsive or thoughtlessness. They also found that risk taking was correlated with the desire for control (r = .280, $p < .01$) suggesting that risk takers are motivated by the desire to master risk related situations and in general take control over their lives. 'Phenomenological or protective frames' related to perceptions of control may also explain why risk takers are able to overcome the anxiety that motivates others to avoid these activities.

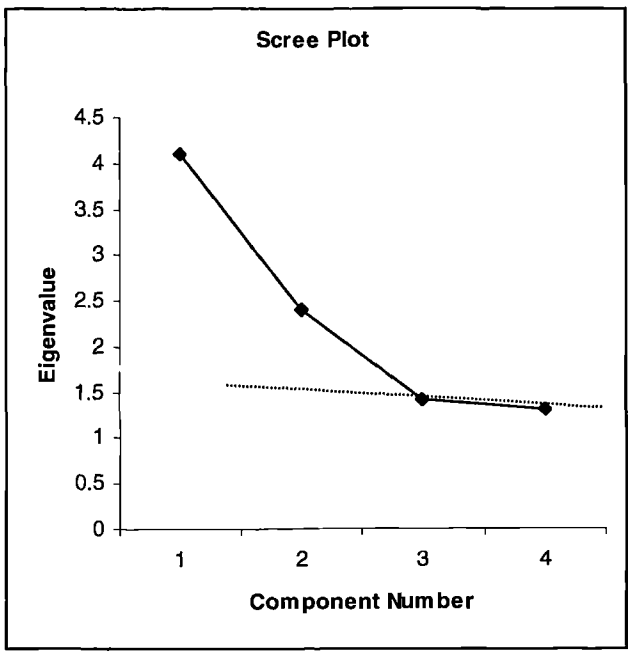
Trimpop, Kerr and Kircaldy (1999) also factor analysed the correlation matrix, and extracted four principal components with varimax rotation, which accounted for 58.1% of the initial variance. They selected four principle components because they had eigenvalues that exceeded unity (the Kaiser-Gutman criterion)) and accounted for approximately 10% of the variance. The first component (25.8% variance) was labelled "planning and order vs. chaos, novelty and complexity" and had high

loadings on Experience Seeking (+ .60), planning orientation (- .72), and non-perfectionism / compulsiveness (+ .89). The second component (15.1%) variance was called "self-Sufficiency" and had high loadings on the desire for control (+ .81) and leadership (+ .79). The third factor (9.0% variance) was labelled "venturesome vs. cautiousness" with high loadings on Thrill and Adventure Seeking (- .70) and cautiousness (+ .66). The fourth component (8.2% variance) and was called "arousal-seeking" with high loadings on Disinhibition (+ .72) and recklessness (+ .85). A number of points regarding the adequacy of this factor analysis need to be considered however. Firstly the wrong number of factors may have been extracted, and a scree plot (reproduced from the eigenvalues reported) suggested that 2 factors should have been extracted rather than four[1] (See Figure 3 below). Furthermore we might question the appropriateness of orthogonal rotation in this case, as these components were a priori unlikely to be uncorrelated, especially when several marker variables were moderately correlated. Considering these reservations concerning the adequacy of the factor analysis to represent simple structure it may be safer instead to rely instead upon the interpretation of bivariate correlations, and simply conclude that the personality constructs associated with risk taking are likely to cluster together to form a small number of factors (2-4?) in future analyses.

[1] The number of factors extracted depends upon whether Cattell's original or revised criteria are applied (Cooper, 1998). Cattell's original criterion would suggest 3 factors.

Figure 3

Reproduced Scree Plot Suggesting That 2 Factors Should Have Been Extracted In Trimpop Et Al.'s (1999) Study



Cronin (1991) administered Zuckerman's Sensation Seeking Scale V to 20 mountaineering club members and 21 undergraduate psychology students. He found that the mountaineers scored higher on the total scale (Mean = 23.3, SD = 4.8 for mountaineers, and Mean 18.5, SD = 6.6 for students, $p < .01$), the Experience Seeking subscale (Mean = 6.7, SD = 1.5 for mountaineers, and Mean = 4.7, SD = 1.6 for students, $p < .001$) and the Thrill and Adventure Seeking subscale (Mean = 8.6, SD = 1.4 for mountaineers, and Mean = 6.9, SD = 2.8 for students, $p < .05$). This suggests that the influence of Sensation Seeking on risk taking sports behaviour is not confined to the willingness to participate in high risk sports (the TAS subscale), and also that sporting risk takers may not differ from the general population in Disinhibition or Boredom Susceptibility. Mountaineers were involved in the sport for an average of 4 years suggesting that their participation in mountaineering is not the result of a disposition to fleetingly participate in a wide range of sports.

Donohew, Zimmerman, Cupp, Novak, Colon, and Abell (2000) conducted an HIV prevention study in which 2949 U.S. high school students were administered scales measuring Sensation Seeking, Impulsivity and a number of indicators of sexual risk taking and drug usage. They theorise that Impulsivity and Sensation Seeking may or may not be rational, and that the combination of these characteristic may predispose individuals to a greater risk of HIV infection, other sexually transmitted diseases, and pregnancy making them a prime target for health intervention programs. The results suggest that both Impulsivity and Sensation Seeking were associated with higher levels of sexual behaviour, alcohol usage, marijuana usage, condom ownership, sexual intensions, sexual closeness, having unwanted sex under pressure, and having unwanted sex whilst drunk ($p \leq 0.01$). The strongest associations were found among sexually active students high in both Sensation Seeking and Impulsivity. They suggest that health campaign interventions should attempt to address the specific needs of high risk groups, perhaps using behavioural rehearsal which might increase the probability of the desired behaviours. That said they do not fully address the possibility that the repetition of behaviours in this way is likely to seem monotonous to high Sensation Seekers whom thrive on new and novel experiences and may become easily bored with the same activities.

Levenson (1990) administered Zuckerman's Sensation Seeking Scale IV along with measures of substance abuse proclivity, emotional arousability, depression, conformity, moral reasoning, empathy and psychopathy to 24 residents of a long-term drug treatment facility, 18 rock climbers, and 21 "heroes" (policemen and firemen who had been decorated for bravery). He found that two discriminant analysis functions correctly identified 98.18% of all cases. Drug-unit residents were characterised by an "Antisocial" function associated with Sensation Seeking (Disinhibition), depression, emotionality, substance abuse proclivity, psychopathy and low moral reasoning. Rock climbers in contrast, had high scores on an "Antistructural" function, associated with high Sensation Seeking (Experience Seeking, General Sensation Seeking and Thrill and Adventure Seeking), and principled moral reasoning, the later perhaps reflecting the rock climber's higher

level of education. In addition the heroes were characterised by low scores on both discriminant functions, suggesting that heroes, rock climbers and drug unit residents are characterised by different psychological profiles, which are in turn reflected by different forms of physical risk taking. After examining the measures that load on the second discriminant function we might question the appropriateness of the label "Antistructural" to characterise this function. Levenson borrowed this term from Csikszentmihalyi's (1977) description of the motives of rock climbers, although there were no significant differences on the measure of independence/conformity, which would be predicted on the basis of this hypothesis. Levenson (1990: p.1077) goes on to describe rock climbers as "adventurous risk takers whose risky behaviour is premeditated and based upon the acquisition of relatively rare skills". Perhaps then this second function would have been better labelled as "Adventurous" risk taking? Levenson's work is interesting because it is one of the few studies to adopt a multivariate approach in which different types of risk taking are included along with a range of personality measures. It is also interesting because it shows that different facets of Sensation Seeking may be associated with different forms of risk taking, for example, the Disinhibition subscale was associated with drug usage, but not rock climbing or heroic occupational risk taking. Due to the marked differences between the risk takers in this study, Levenson (1990: p.1079) concludes:

> "...There appear to be different types of risk taking that may have very different antecedents and consequences. Risk taking may involve physical or social action, it may be premeditated or impulsive, prosocial or antisocial. It may also be governed by a lack of fear or by courage based upon qualities other than fearlessness. Future research on risk taking should focus on a more comprehensive taxonomy, delineating the various antecedents of different types of risk taking."

Stanford, Greve, Boudreaux, Mathias and Brumbelow (1996) investigated whether Impulsiveness as measured by the Barratt Impulsiveness Scale- Version 11, was found to be linked with a number of health risk behaviours among 568 high school and 592 college students. The first main finding was that the high school students were significantly higher in Impulsivity compared to the College students for both

males and females ($p < 0.0001$), suggesting that Impulsivity may decrease with age, an alternative explanation being that educational level is associated with Impulsivity. Males were also significantly higher in Impulsivity than females for both College ($p < 0.0001$) and high school students ($p < 0.05$). The results also suggested that both high Impulsivity males and females were 1.3 to 8.4 times more likely to be aggressive (fighting), use drugs, drive whilst under the influence of alcohol, and neglect to use a seatbelt. They also suggest that self-report measures of Impulsivity may therefore be useful in identifying individuals whom are most at risk of personal injury, and may present a risk of injury to others, in order to target them for education intervention.

Moore and Rosenthal (1993) examined the relationship between four health related behaviours and Impulsivity and Venturesomeness in 236 late adolescents (81 female and 156 male). The health risk behaviours assessed were sexual (having unprotected intercourse), smoking (current behaviour), driving (dangerous driving), and passenger risk (accompanying a dangerous driver). Impulsiveness was found to be correlated with smoking risk ($r = .36$, $p < .01$), driver risk ($r = .18$, $p < .01$), and passenger risk ($r = .28$, $p < .01$). Similarly Venturesomeness was associated with sexual risk taking ($r = .19$, $p < .01$), smoking ($r = .27$, $p < .01$), dangerous driving ($r = .49$, $p < .01$), and passenger risk ($r = .40$, $p < .01$). Moore and Rosenthal therefore conclude that antisocial behaviours may, in theory, be displaced to more socially acceptable alternatives, while retaining a degree of creativity and spontaneity.

Nicholson, Fenton-O'Creevy, Soane and Willman (2002) conducted a study in which the participation in a range of risk taking behaviours were assessed along with a five-factor model of personality as assessed by the NEO-PI-R. Their study incorporated a sample of 1,512 international business students and executives undergoing training programs (576 females and 936 males). Risk taking behaviours were measured with their Risk Propensity Scale which asks respondents to rate the frequency of their participation in six different areas of risk at present and in the past using a 1-5 rating scale ("never" to "very often"). The six areas of risk (Nicholson, et al., 2002: p.11) were (1.) recreational risks (e.g. rock-climbing, scuba diving), (2.)

health risks (e.g. smoking, poor diet, high alcohol consumption), (3.) career risks (e.g. quitting a job without another to go to) (4.) financial risks (e.g. gambling, risky investments), (5.) safety risks (e.g. fast driving, city cycling without a helmet), and (6.) social risks (e.g. standing for election, publicly challenging a rule or decision). As part of their analysis they conducted a stepwise regression analysis incorporating the 30 NEO-PI-R facet scales as independent variables (See Table 4 below). It is evident that the "Excitement Seeking" facet scale (Extraversion 5) emerged as a particularly important predictor for each type of risk, and was the primary predictor in five areas of risk taking behaviour including the overall total.

Table 4

The Relationship Between Risk Taking Behaviours And NEO-PI-R Facet Scales

Recreation	Health	Career	Finance	Safety	Social	Overall
Excitement seeking (+)	Excitement seeking (+)	Actions (+)	Excitement seeking (+)	Excitement seeking (+)	Assertiveness (+)	Excitement seeking (+)
Actions (+)	Impulsiveness (+)	Fantasy (+)	Ideas (+)	Assertiveness (+)	Fantasy (+)	Ideas (+)
Anxiety (-)	Order (-)	Excitement seeking (+)	Deliberation (-)	Compliance (-)	Ideas (+)	Deliberation (-)
Compliance (-)	Straightforwar d-ness (-)	Tender-minded (-)	Straightforwar d-ness (-)	Deliberation (-)	Actions (+)	Compliance (-)
Values (+)	Values (+)	Ideas (+)	Depression (-)	Anxiety (-)	Self-discipline (-)	Values (+)
	Gregariousnes s (-)	Straightforwar d-ness (-)	Self-discipline (-)	Order (-)	Achievement striving (+)	Anxiety (-)
	Tender-minded (-)	Values (+)	Impulsiveness (-)	Straightforwar d-ness (-)	Excitement Seeking (+)	Straightforwar d-ness (-)
	Deliberation (-)	Self-discipline (-)	Aesthetics (-)	Values (+)	Aesthetics (+)	Actions (+)
	Competence (+)	Anxiety (-)		Gregariousnes s (-)	Vulnerability (-)	Self-discipline (-)
	Trust (-)	Achievement striving (+)		Activity (+)	Compliance (-)	Activity (+)
	Dutifulness (-)	Compliance (-)		Self-discipline (-)	Values (+)	Tender-minded (-)
		Assertiveness (-)			Order (-)	Assertiveness (+)
					Modesty (-)	Gregariousnes s (-)
						Order (-)

"(+)" = positive association, "(-)" = negative association. Facets are presented in rank order of strength of association with the dependent variable.

The "values" facet scale (Openness 6) is interpreted as a tolerance for multiple perspectives, and is a predictor of all areas of risk taking behaviour except financial risk taking. A low level of compliance (Agreeableness 4), a measure of competitiveness, was a factor in five areas of risk including overall risk taking behaviours, but not in health or financial risks. A lack of straightforwardness (Agreeableness 2) was also a factor in five areas of risk including overall risk taking behaviours, but not in recreational or social risks. A lack of self-discipline (Conscientiousness 5) was a predictor of risk taking behaviour in five areas including overall risk taking, but was not a predictor for recreational or health risks.

Although this suggests a reasonable degree of overlap between the psychological profiles associated with different types of risk taking behaviour there were further exceptions to these generalisations. Some facet scales had a complex relationship with different areas of risk; for example, health risk behaviours were positively associated with impulsiveness, whereas financial risk behaviours were negatively associated with impulsiveness. Facet scales from the same broad dimension of personality were also associated with the dependent variable in a contradictory fashion, for example gregariousness and excitement seeking are both conceptualised as facets of extraversion, but are associated with health, safety and overall risk behaviours in opposite directions.

In conclusion we can say that clearly the bulk of the evidence available suggests that the relationship between Sensation Seeking and a wide range of risk taking behaviours is both an important and robust one. The participation in high risk sports appears to be characterised by a Venturesomeness function, (representing high Thrill and Adventure Seeking and Experience Seeking), while the participation in health risk behaviours may be characterised by an Disinhibited function (representing high Disinhibition, Experience Seeking and Impulsivity). Thus there appears to be both significant overlap and differences between the personality profiles associated with these forms of risk taking behaviour.

4.4. The Influence Of Broad Personality Traits

After examining the relationship between risk taking behaviour and narrow first order traits (such as Sensation Seeking) we will examine the relationship with the broad dimensions of personality that have been previously introduced. The links with personality dimensions are grouped according to which theoretical model is adopted, beginning with Eysenck's three factor model and then progressing to Costa and McCrae's and Zuckerman and Kuhlman's five factor models.

Breivik, Roth and Jørgensen (1998) administered Eysenck's Personality Questionnaire – revised (EPQ-R), Zuckerman's Sensation Seeking Scale V (SSS V),

Spielberger's State Trait Anxiety Inventory (STAI) and various measures of psychological and physiological states to a sample of 14 "novice" and 21 "expert" parachutists. This study was relatively unusual in that it did not focus primarily on the differences between risk takers and controls, rather it examined why 85% of parachutists drop out after less than 10 jumps. They hypothesised that individual differences could explain this selection process, and more specifically that "drive factors" such as Extraversion, Psychoticism and Sensation Seeking combine with "avoidance factors" such as Anxiety and Neuroticism, to determine whether a person has "got what it takes" to continue to participate. They found that expert parachutists were similar in personality to the novices, but much higher in Psychoticism (Mean = 7.8, SD = 3.1 for experts, and Mean = 4.3, SD = 2.2, $t = 3.9$, $p < .001$) and higher in Experience Seeking (Mean = 6.7, SD = 1.8 for experts, and Mean = 5.2, SD = 1.4 for novices, $t = 2.65$, $p < .05$). Expert parachutists were also more Extraverted, less Neurotic and lower in social desirability (Lie) than novices, as predicted, although these results were not statistically significant. Both groups of parachutists were also high in Extraversion, low in Neuroticism, high in Psychoticism and high in Sensation Seeking compared with control groups of sports students and military recruits. Novice parachutists experienced more trait anxiety, were more excited and experienced more symptoms of anxiety whilst jumping, in comparison to expert jumpers. Experienced parachutists, and by direct implication other sporting risk takers, may therefore take greater risks in order to trigger the more extreme psychological and physiological states associated with new and challenging situations that contain an element of danger.

In an attempt to further understand the interaction of personality and the risk taking experience Breivik, Roth and Jørgensen (1998) also examined the relationship between state and trait variables. They found that none of the EPQ-R scales correlated statistically significantly with the state measures ($r = .00$ to $-.29$, $p > .05$), the Thrill and Adventure Seeking scale of the SSS V correlated negatively with three measures of state anxiety ($r = -.36$ to $-.40$, $p < .05$), and the STAI trait measure correlated positively with three measures of state anxiety ($r = .35$ to $.47$, $p < .05$). None of the trait measures correlated significantly with the state measure of

excitement (r = .00 to -.29, $p > .05$), although these associations were generally in the expected directions. We should perhaps be wary here of overemphasising the importance of statistical over psychological significance, as the total sample size was small (35 parachutists). For example the association between Neuroticism and state excitement (r = -.29, $p > .05$) warrants further investigation with an independent sample, and may have been statistically significant had a larger sample had been used. They also examined the interaction between psychological traits and physiological states, and found that Psychoticism was the best predictor of increase in heart rate due to fear and stress (r = -.53 to -.58, $p < .01$).

Gomà-I-Freixanet (1995) administered the EPQ, the Sensation Seeking Scale V, the Impulsiveness scale of the IVE, the Socialisation scale of the CPI, and the Susceptibility to Punishment and Reward scales to 77 "antisocial" risk takers incarcerated for armed robbery, 332 risky sportsmen (e.g. mountain skiing), 170 "prosocial" risk takers (employed in risky occupations, e.g. fireman), and 54 controls that did not engage in engage in risky activities. All subjects were male, and there were no differences between groups in educational level. Gomà-I-Freixanet aimed to identify the aspects of personality that are shared by all risk takers, and also to identify the aspects of personality that differentiate between different kinds of risk taking. Thrill and Adventure Seeking emerged as the only variable differentiating between controls and all risk taking groups ($p < .01$), which may reflect the willingness of these risk takers to take physical risks. The antisocial risk takers scored higher than the other three groups on Neuroticism, Psychoticism, Impulsivity, Susceptibility to Punishment, overall Sensation Seeking, Experience Seeking, Disinhibition and Boredom Susceptibility, and lower in Socialisation, (differences that were almost significant at the $p < .01$ level for all groups). Risky sportsmen were higher than prosocial risk takers and controls on overall Sensation Seeking, higher than prosocial risk takers on Experience Seeking, and higher than controls on Extraversion (all $p < .01$).

In order to test the efficiency of all of these measures to differentiate between risk taking group Gomà-I-Freixanet (1995) conducted a stepwise discriminate analysis.

Three discriminate functions were identified, and the function structure matrix (see Table 5 below) illustrates the associations between these functions and each measure. Highest loadings are indicated in bold to ease interpretation of the function structure matrix:

Table 5

Discriminate Analysis Results: The Function Structure Matrix

	Function 1	**Function 2**	**Function 3**
Socialisation	**.87**	-.10	.10
Neuroticism	**-.47**	-.14	.19
Dis	**-.39**	.17	.38
Impulsivity	**-.38**	.11	.23
BS	**-.28**	.09	.14
TAS	-.07	**.96**	.17
Extraversion	.07	**.37**	.05
Sus. to Punishment	-.13	**-.20**	.08
Lie	-.02	**-.06**	.01
ES	-.28	.29	**.52**
Psychoticism	-.33	-.03	**.35**
Sus. to Reward	-.29	.17	**-.33**

The first function is characterised by a very high loading on Socialisation (.87), and by moderate to small negative loadings (-.47 to -.28) on Neuroticism, Disinhibition, Impulsivity, Boredom Susceptibility, and Psychoticism. The second function was characterised by a very high positive loading on Thrill and Adventure Seeking (.96), and smaller loadings on high Extraversion (.37), high Experience Seeking (.29), and low Susceptibility to Punishment (-.20). And the third function can be interpreted by a high loading on Experience Seeking (.52), and smaller loadings on high Psychoticism (.35), high Disinhibition (.38), and low Susceptibility to Reward (-.33). The first function would be called Impulsive Sensation Seeking by Zuckerman (1994), and discriminated between the antisocial risk takers and the other groups, suggesting that people incarcerated for armed robbery are poorly socialised,

Disinhibited, Neurotic and Impulsive. Gomà-I-Freixanet suggests that elevated levels of Neuroticism may be due to incarceration. Eysenck and Eysenck (1996) offer a different explanation, suggesting that elevated levels of Neuroticism may be a spurious effect related to drug consumption rather than a stable disposition. The second function, a dimension of personality that Eysenck and Eysenck (1996) would term Venturesomeness, discriminated between the physical risk taking groups and the controls, presumably reflecting the willingness to take physical risks. The third function appeared to reflect the search for experiences through an unconforming lifestyle (high Experience Seeking, Psychoticism and Disinhibition), and prosocial risk takers could be discriminated from the other groups by their low scores on this dimension.

The three functions in Gomà-I-Freixanet's (1995) study correctly identified 48.8% of cases (see Table 6 below), and best classified the antisocial risk takers (75.8%) and controls (51.9%), which differed from the other groups on the most salient functions (Impulsive Unsocialized Sensation Seeking and Venturesomeness respectively). The prosocial risk takers were the most difficult type of risk taker to correctly classify (39.5%), with more than half being accidentally classified as risky sportsmen (30.6%) or controls (20.4%). We might therefore conclude that, in this study at least, the prosocial and sporting risk takers were the most similar in psychological profile. All three types of risk taking can be differentiated from controls as being willing to take physical risks (Venturesomeness). But different types of risk taking can be further differentiated into two main groups according to the degree of Impulsive Unsocialized Sensation Seeking (Antisocial risk takers high on this dimension, and risky sportsmen and prosocial risk takers low on this dimension).

The three risk taking groups shared therefore shared a common willingness to take physical risks (Venturesomeness), but could be classified into three different groups according to the specific nature of their physical risk behaviours: (1.) People incarcerated for armed robbery were high in Impulsive Unsocialised Sensation Seeking, (2.) high risk sports participants were unconforming Experience Seekers,

and (3.) those involved in risky occupations were socially conforming people comparatively low in Experience Seeking.

Table 6

Classification Results From The Discriminate Analysis

Actual group	No. of cases	Predicted group membership			
		Antisocial	Risky sports	Prosocial	Control
Antisocial	66	50 (75.8%)	3 (4.5%)	6 (9.1%)	7 (10.6%)
Risky sports	309	41 (13.3%)	146 (47.2%)	71 (23.0%)	51 (16.5%)
Prosocial	157	15 (9.6%)	48 (30.6%)	62 (39.5%)	32 (20.4%)
Control	52	6 (11.5%)	9 (17.3%)	10 (19.2%)	27 (51.9%)

Gomà-I-Freixanet (1991) also conducted another study in which he investigated the personality profile associated with the participation in high risk sports. 27 Himalayan alpinists, 72 mountaineers, 221 risky sportsmen (engaged in a variety of high risk sports such as parachuting), and 54 controls (subjects who did not engage in any risk taking activity, were administered the same measures as in the 1995 study previously reported above (the EPQ, the SSS V, the Impulsiveness Scale of the IVE, the Socialisation scale of the CPI, and the Susceptibility to Punishment and Reward Scales). The risk taking sports participants were higher than controls in Thrill and Adventure Seeking, Experience Seeking, overall Sensation Seeking, and Extraversion, and lower in Susceptibility to Punishment ($p < .05$). The groups did not differ significantly in Disinhibition, Boredom Susceptibility, Neuroticism, Psychoticism, Lie, Impulsivity, Socialisation, and Susceptibility to Reward ($p > .05$). There were no differences between the different types of sporting risk taking, the

exceptions being that Himalayan alpinists, who were categorised as the "elite group", were higher than the risky sportsmen in TAS, ES and overall Sensation Seeking ($p < .05$). With such a close degree of similarity between risk taking groups it may therefore have been better to conduct additional analyses in which controls were compared with a combined risk taking sports group, as the degree of similarity between separate risk taking groups may have effectively suppressed *F* values, and masked less robust differences. For example, low risk controls were highest in Neuroticism, and the elite risk takers (alpinists) were lowest in Neuroticism. In this study then, the participation in high risk sports was associated with a form of Venturesomeness (Eysenck & Eysenck, 1996) that is the more socially acceptable side of Sensation Seeking (Zuckerman, 1994).

Children and adolescents high in antisocial behaviour are predicted by Eysenck (1987) to be especially high in Psychoticism, Extraversion and Neuroticism, and low in social desirability (Lie scale). Antisocial or delinquent behaviour often contains a large degree of physical, social and/or criminal risk, and is therefore of direct relevance to the study of risk taking behaviour in general. Psychoticism emerges as the primary predisposing factor and in the majority of studies, including those based upon self-reported antisocial behaviour (e.g. Eysenck, 1981) and those based upon legal or clinical criteria (e.g. Ma, Shek, Cheung, & Lee, 1996). The association between Psychoticism and antisocial or delinquent behaviours is almost invariably positive, moderate in size and statistically significant ($r = .3$ to $.6$, $p < .01$). No studies reporting contradictory findings (a negative relationship between antisocial behaviour and Psychoticism) were found, and the few studies that did not find a statistically significant relationship with Psychoticism (e.g. Fonseca & Yule, 1995) were found to incorporate small samples (< 55 subjects), and by implication may have suffered from a lack of statistical power. Social desirability (Lie scale) emerged as the second most important predictor of antisocial behaviours, and links were found in studies incorporating self-report measures of antisocial behaviour (e.g. Jamison, 1980), and those based upon external criteria (e.g. Gabrys, 1983). Associations between social desirability (Lie) and antisocial behaviour are generally negative, moderately sized and statistically significant ($r = .30$ to $.60$, $p < .01$). Only

one study was found in which the relationship between social desirability and antisocial behaviour was counter to prediction (Silva, Martorell, & Clemente, 1986), which incorporated a Spanish sample that may have encountered connotational difficulties. Extraversion and Neuroticism have also generally been found to be associated with antisocial risk taking in the expected direction, although in the majority of studies the degree of association is small (r = .2 to .4) and/or non-significant ($p > .05$). In short we can say that antisocial behaviour appears to be robustly associated with high Psychoticism and low social desirability (Lie scores), and also to a lesser degree high Extraversion and Neuroticism. The participation in high risk sports appears to relate to high Psychoticism and Extraversion, and with low Neuroticism and social desirability (Lie). The major difference between the personality profiles associated with these types of risk taking behaviour appears to be with Neuroticism, with which a positive association is expected with antisocial behaviours and negative with the participation in high risk sports.

Nicholson, Fenton-O'Creevy, Soane and Willman (2002) conducted a study in which the participation in a range of risk taking behaviours were assessed along with a five-factor model of personality as assessed by the NEO-PI-R. The methodology adopted in this study has previously been reviewed, and in short they included a very large sample of business related subjects who were asked to rate the frequency of their own past and present risk taking behaviours in six areas. A general five-factor profile of risk taking behaviour emerged in their study associated with high Extraversion and Openness to experience, low Neuroticism, Agreeableness, and Conscientiousness. Exceptions included a *positive* association between Health risk behaviour and Neuroticism ($p < .01$), negligible associations between Extraversion and Career and Financial risk behaviours ($p > .01$), between Openness to experience and safety related risk behaviours ($p > .05$), and between Conscientiousness and social risk behaviours ($p > .05$). Table 7 below illustrates the standardised regression coefficients between risk taking behaviours and each of the NEO-PI-R scales.

Table 7

The Relationship Between Risk Taking Behaviours And Broad Dimensions Of Personality

	Recreate	Health	Career	Finance	Safety	Social	Total
Neuroticism	-.152***	.089**	-.104***	-.146***	-.083**	-.091**	-.170***
Extraversion	.177***	.157***	.021	.092*	.241***	.233***	.283***
Openness	.200***	.070**	.321***	.113***	.051	.327***	.362***
Agreeableness	-.113***	-.163***	-.167***	-.196***	-.197***	-.170***	-.299***
Conscientiousness	-.089**	-.143***	-.082**	-.170***	-.152***	-.048	-.189***

* = P < .05; ** = p < .01; *** = p < .001.

The data suggest that risk taking behaviour is fairly strongly rooted in personality. Sex and Age emerged as the most important demographic variables with men more likely to take recreational, health, financial and safety risks ($p < .001$), and younger people more likely to take risks in all areas ($p < .01$). No relationship was found between risk taking behaviours and level of job ($p > .05$), people in large organisations were less likely to take health risks ($p < .001$), and people who took career risks were more likely to have a large number of previous employers and business start-ups ($p < .001$). In short we might say that this study implies there to be both significant similarities and differences in the psychological profiles associated with different types of risk taking behaviour.

Few other studies have examined the relationship between a Costa and McCrae's five factor model of personality and risk taking behaviour, although Zuckerman (1994) gives details about a study conducted by Costa and McCrae (1990) in which the relationship between the NEO-PI-R and the Sensation Seeking Scale V (SSS V) was investigated with 217 male and female subjects. Although not a direct study of risk taking behaviour it is of interest because of the close relationship between the constructs of Sensation Seeking and risk taking. The scales were administered a year apart, and the resulting correlations may therefore have been attenuated due to the

lower reliabilities of these measures over time. The correlation matrix is presented in Table 8 below:

Table 8

The Associations Between Zuckerman's Sensation Seeking Scale V And Costa And McCrae's NEO-PI-R

	TAS	ES	Dis	BS	Total
Neuroticism	.01	-.07	.19**	.22**	.10
Extraversion	.13	.17*	.19**	.16*	.22**
Openness to experience	.30**	.54**	.25**	.17*	.45**
Agreeableness	-.16*	-.07	-.37**	-.32**	-.31**
Conscientiousness	-.10	-.11	-.24**	-.20**	-.21**

* = p < .05, ** = p < .01.

Neuroticism was associated with Disinhibition and Boredom Susceptibility but not with the total scale or the two remaining subscales. There was a significant correlation between the SSS V total and the hostility and impulsiveness facet scales however. The associations between Extraversion and the Experience Seeking, Disinhibition and Boredom Susceptibility SSS V subscales (r = .16 to .19) were largely due to the excitement seeking, activity and positive emotions facet scales, and negligible relationships were found with warmth, gregariousness and assertiveness. All of the SSS V subscales and the total scale were associated with Openness to experience, and the highest degree of association was with Experience Seeking (r = .54). The total scale was associated with all Openness facet scales, but most strongly with values (r = .45), followed by fantasy and actions (r = .34 and 31 respectively). Agreeableness was clearly associated to the greatest degree with Disinhibition and Boredom Susceptibility, to a lesser degree Thrill and Adventure Seeking, and to no degree with Experience Seeking. These associations were largely due to negative associations with the straightforwardness, altruism, compliance and modesty facet scales, and there was little degree of association with trust or

tendermindedness. Conscientiousness was also related to the Disinhibition and Boredom Susceptibility SSS V subscales, and there was no relationship with Thrill and Adventure Seeking or Experience Seeking. The negative correlations with Sensation Seeking were largely due to the dutifulness and deliberation facet scales, which indicates that disinhibited behaviour may be associated with an unwillingness to follow strict standards of conduct (dutifulness), and a lack of planning caution and thoughtfulness (deliberation).

But how do the results obtained by Costa and McCrae (1990) relate to those found by Nicholson et al. (2002)? The Thrill and Adventure Seeking and Experience Seeking subscales of the SSS V have been consistently found to predict the participation in high risk sports (Zuckerman, 1994), we would therefore expect the personality profile associated with these subscales to closely correspond to the one linked with "recreational" risk taking behaviours. From the results of Nicholson et al.'s (2002) study we would predict a negative association with Neuroticism, Agreeableness and Conscientiousness, and a positive association with Extraversion and Openness to experience. These predictions predict the direction of association in all but one case (an non-significant unexpected positive association between Thrill and Adventure Seeking and Neuroticism), however only 4 out of 10 of these associations reached statistical significance ($p > .05$). Nicholson et al.'s study included a far larger sample (1512 subjects) that may provide a partial explanation for this discrepancy, although Costa and McCrae's sample would still be considered to be large (217 subjects). These differences are also likely to reflect the fact that different measures were used to quantify risk related constructs, and that behaviours rather than intentions and preferences were assessed in Nicholson et al.'s study. The most consistent links between health behaviours (such as alcohol consumption and drug use) and Sensation Seeking have been with the Experience Seeking and Disinhibition subscales (Zuckerman, 1994). We would therefore predict from Nicholson et al.'s (2002) study that Experience Seeking and Disinhibition would be negatively related to Agreeableness and Conscientiousness, and positively associated with Extraversion, Neuroticism and Openness to experience. This was indeed the case in all but one correlation (an unexpected non-significant negative

association between Experience Seeking and Neuroticism), and 7 out of 10 associations were both in the expected direction and statistically significant ($p < .05$). In Nicholson et al.'s study the strongest link with risk taking was with Openness to experience, followed by Agreeableness, then Extraversion, then Conscientiousness, and the weakest association being with Neuroticism (all $p < .001$). Interestingly the results of Costa and McCrae's study follow exactly the same pattern, with the link between Sensation Seeking and Openness to experience being the strongest association, then Agreeableness, then Extraversion, then Conscientiousness, and the weakest association was with Neuroticism (all $p < .01$, except with Neuroticism which was not significant and in the opposite direction to that in Nicholson et al.'s study). In brief we can conclude that there is a high degree of similarity between the results of these studies, and risk taking (in general) appears to be associated with high Openness to experience and Extraversion, and low Agreeableness and Conscientiousness, as measured by the NEO-PI-R. The role of Neuroticism appears to be more complicated, and the results are similar to those gained using the EPQ-R. While Neuroticism is negatively associated with most risk taking behaviours, it is positively associated with health related risk taking.

Zuckerman, Kuhlman, Joireman, Teta and Kraft (1993) conducted a study that examined the relationship between the SSS V and a number of personality measures including the NEO-PI-R, the EPQ-R and the ZKPQ. The main aim of this study was to compare competing models of personality using factor analytic techniques, however it also provides important information about the relationship between Sensation Seeking and the main dimensions of personality. The correlations between measures are based upon a sample of 135 to 177 undergraduate psychology students; tests were administered over a total period of several weeks (≥ 5). Zuckerman et al. found that Agreeableness appears to be associated with Disinhibition and Boredom Susceptibility ($r = .33$ to $.48$, $p < .01$), whereas no relationship was found with Thrill and Adventure Seeking or Experience Seeking. Extraversion was linked with Thrill and Adventure Seeking ($r = .21$ to $.31$, $p < .05$), and although the other aspects of Sensation Seeking also tended to be positively associated with Extraversion ($r = .05$ to $.23$) these results were not consistently significant across measures. Neuroticism

appeared to be unrelated to Sensation Seeking except the Thrill and Adventure Seeking subscale, which was negatively and significantly related to all measures of Neuroticism (r = -.19 to -.24, $p < .05$), and a relationship between Neuroticism and Disinhibition that was specific to the NEO-PI-R (r = .21, $P < .05$). Impulsive-Sensation Seeking was positively related to all SSS V subscales and the total scale (r = .37 to .66, $p < .01$), the smallest association being with the Boredom Susceptibility subscale and the strongest being with the total scale. Activity was unrelated to Sensation Seeking except for a small positive correlation with Thrill and Adventure Seeking (r = .17, $p < .05$). Openness to experience was positively associated with Experience Seeking (r = .43, $p < .01$), but none of the other aspects of Sensation Seeking appeared to be related. Conscientiousness was negatively related to all aspects of Sensation Seeking (r = -.23 to -.41, $p < .01$), the strongest link being with Disinhibition (beware of misprint in Table 3.12., Zuckerman, 1994: p.94). Psychoticism was positively associated with Sensation Seeking (r = .21 to .55, $p < .01$) although the correlation with Thrill and Adventure Seeking (r = .21) was clearly smaller than that with the other subscales and the total scale ($r \geq .43$). The correlations between these personality factors and Sensation Seeking are presented in Table 9 below:

Table 9

The Relationship Between Sensation Seeking And The Broad Personality Factors As Measured By The ZKPQ, NEO-PI-R And EPQ-R

	Sensation Seeking Scale V				
	Total	TAS	ES	Dis	BS
Neuroticism (NEO-PI-R)	.05	-.24**	.09	.21*	.07
Neuroticism-Anxiety (ZKPQ)	-.10	-.24**	.00	.05	-.08
Neuroticism (EPQ-R)	-.06	-.19*	-.05	.10	-.01
Extraversion (NEO-PI-R)	.21*	.30**	.07	.13	.07
Sociability (ZKPQ)	.20*	.21*	-.05	.23**	.15
Extraversion (EPQ-R)	.31**	.33**	.17*	.13	.23**
Conscientiousness (NEO-PI-R)	-.47**	-.26**	-.36**	-.41**	-.23**
Impulsive-Sensation Seeking (ZKPQ)	.66**	.49**	.46**	.48**	.37**
Psychoticism (EPQ-R)	.55**	.21**	.45**	.43**	.43**
Agreeableness (NEO-PI-R)	-.37**	-.09	-.04	-.40**	-.48**
Aggression-Hostility (ZKPQ)	.31**	.11	.07	.36**	.33**
Openness (NEO-PI-R)	.13	.02	.43**	.02	-.14
Activity (ZKPQ)	.01	.17*	-.12	-.09	.08

* = $p < .05$, ** = $p < .01$ (two tailed test).

In short, Zuckerman et al. (1993) found that Thrill and Adventure Seeking was associated with low Neuroticism and Conscientiousness, and high Extraversion, Psychoticism and Activity. Experience Seeking was associated with high Psychoticism and Openness to experience, and low Conscientiousness. And both Disinhibition and Boredom Susceptibility were associated with low Conscientiousness and Agreeableness, and high Psychoticism. This implies that the participation in high risk sports (e.g. parachuting) and health risk behaviours (e.g. drug use) are both likely to be associated with low Conscientiousness and high Psychoticism. This study also suggests that sporting risk takers in comparison with health risk takers are more likely to be lower in Neuroticism and Psychoticism, and higher in Agreeableness and Conscientiousness.

O'Sullivan, Zuckerman and Kraft (1996) were interested to investigate the personality of 32 female prostitutes in comparison with 32 controls (food service workers), as measured by the ZKPQ. Semi-structured interviews revealed that 69% of prostitutes admitted to using drugs, and in 53% one of those drugs was cocaine. The prostitutes were significantly higher in Impulsive-Sensation Seeking ($p < .0001$), Neuroticism-Anxiety ($p < .05$), and Aggression-Hostility ($p < .007$), as predicted. However attempts to match prostitutes and controls for both age and years of education were not entirely successful, and the prostitutes were found to be younger, and less educated (both $p < .01$). Age and education may therefore have acted as confounding variables in this study, and further analyses suggested that age was negatively associated with Aggression-Hostility ($r = -.34$, $p < .006$), and education was negatively associated with Neuroticism-Anxiety ($r = -.27$, $p = .03$). The influence of age and education was therefore statistically controlled by ANCOVA in order to examine whether these differences would endure, and in this case only the differences in Impulsive-Sensation Seeking remained statistically significant ($p < .001$). That said the F value for Aggression-Hostility did approach significance ($p = .083$), and may well have been significant with a larger sample or better-matched controls. In short we might conclude that this study provides strong support for a link between health risk taking and high Impulsive-Sensation Seeking, and a small amount of support for a link with high Aggression-Hostility and Neuroticism-Anxiety.

4.5. Summary

The participation in high risk sports is strongly associated with high Sensation Seeking (Thrill and Adventure Seeking and Experience Seeking), and to a lesser extent with low Neuroticism and Agreeableness, and high Extraversion and Openness to experience. The participation in antisocial or health risk behaviours is strongly associated with high Sensation Seeking (Experience Seeking and Disinhibition), Impulsivity, Psychoticism, Neuroticism, Openness to Experience, Extraversion, and to low and Conscientiousness and social desirability (EPQ-R Lie). Personality traits that were associated with both the participation in high risk sports

and antisocial/health risk behaviours were high Sensation Seeking (Experience Seeking), Extraversion and Openness to Experience, and low Agreeableness. Personality traits that clearly differentiated between the participation in these behaviours were facets of Sensation Seeking (TAS higher and Dis lower for the participation in high risk sports), Neuroticism (lower for the participation in high risk sports), Psychoticism (lower for the participation in high risk sports), Lie (higher for the participation in high risk sports), and Agreeableness (higher for the participation in high risk sports). While there was evidence for the existence of a general "risk taking personality" there was also a great deal of specificity in the personality profiles associated with these different kinds of risk taking behaviour. The degree of association between the participation in high risk sports and personality traits appears to be fairly small (excluding a strong association with Sensation Seeking), especially in comparison with that of other risk taking behaviours. Sporting risk takers may therefore be especially influenced by factors other than personality, and it is to these additional variables that we turn in the next chapter.

Chapter 5.
ADDITIONAL INFLUENCES

5.1. Introduction

In the previous chapter it was argued that there appear to be reasonably robust relationships between risk taking behaviours and various first and second order dimensions of personality. However it should not be assumed that because personality traits influence risk taking behaviour that they are the only relevant factors. Indeed there is a danger that other important influences are overlooked, and even worse that all risk taking is considered to be the result of a "risk taking personality" or even simply a "thrill seeking" temperament, as this is to oversimplify. This leads us to consider the role of other variables, including individual differences and demographics, which may explain unique variance that is not accounted for by personality traits. The primary goal here is to explain risk taking behaviour as fully as possible, and it is in this context that this chapter should be considered.

5.2. Additional Influences

Perceived self-efficacy has been proposed as a major disinhibiting factor in risk taking behaviours, and has evolved from Bandura's early work with phobic patients. People who have high levels of perceived self-efficacy believe themselves to be capable to mobilise the motivation, cognitive resources and courses of action needed to exercise control over given events (Bandura, 1997). The theory is that people are more likely to engage in high risk activities if they perceive themselves capable of mastering the situation, and if they anticipate positive outcomes. Self-efficacy beliefs are thought to affect how well a person can perform a task, how committed a person is to a specific goal, the challenges people undertake and how much hardship they will endure in the face of difficulties (Bandura, 1997; Franken, 1998; Wade & Tavris, 1993). Although a dearth of information exists about self-efficacy and the

participation in high risk sports specifically, a consistent link has been established between state anxiety and fear and degree of self-efficacy in other situations such as medium or low risk sports (Bandura, 1997). This also helps to explain why risk takers tend to assess risks to be greater in situations when they have no feeling of personal control (Slanger & Rudestam, 1997). This may also explain why some people are willing to take risks in certain areas of their lives and not others. Where limits exist on how much control can be exercised over potential threats, even people high in self-efficacy will experience anxiety, unless their own situational assessments are illusory.

> "Although perceived self-efficacy emboldens Venturesomeness, it does not incite recklessness. With a low sense of efficacy, both safe and risky aspects of the environment are seen as fraught with danger, whereas assurance in one's coping capabilities increases ability to judge the potential riskiness of situations." (Bandura, 1997: p.145)

The incorporation of self-efficacy theory helps to understand many of the comments made by risk takers themselves. For example, Seb Grieves is widely acknowledged to be an elite rock climber and he has made ascents of many new British routes that have gained a reputation for being both technically difficult and extremely dangerous. He describes his own thoughts when climbing a dangerous route, and the way in which the experience only becomes exciting or enjoyable if he can control his own deep routed fears:

> "...Its all about trying to get over your fear or keep the fear at a level that enables you to climb. When I'm climbing what goes through my mind is, I just really sort of concentrate on the moves. I'm not really thinking about the danger. I'm not scared, its like being in a vacuum. You have to sort of blink and think twice, think oh hang on, I'm not on a top rope anymore. Shit! I'm actually on the lead, I mean it doesn't, it actually feels OK. And then you start feeling good about it because it isn't scary and it starts to be a bit more enjoyable or exhilarating." (Heap & Turnbull, 1998)

Connoly (1981), interviewed 10 skiers, and all mentioned the need to be in control of the risks involved. One skier (p.53) commented "...I don't believe that these have to be high risk endeavours ... learn how to do things properly ... I'm the kind of skier that doesn't take a lot of risk. I like to be in control." Another skier (p.54) stated "...when I'm out of control, going too fast, and the fear gets going, there's a point when the excitement stops and fear takes over ... I stop, catch my breath, relax a bit. Always had the attitude if worse came to worse I could always stop and take off my skis and slide down on my bottom. That's always been my way out, my safety valve." Basically Connoly argues that the skiers own confidence in their own abilities and their equipment acts as a disinhibiting factor, allowing anxiety to be overcome, and making the experience more enjoyable.

Slanger and Rudestam (1997) conducted a study with 20 "extreme", 20 "high" and 20 "low" risk sports participants, and found that the key disinhibiting factor associated with risk taking was perceptions of self-efficacy. In there study they included three separate measures of self-efficacy, Sherer's "Generalised Self-Efficacy Scale", Ryckman's "Physical Self-Efficacy Scale", and a measure developed by Slanger and Rudestam that was specific to risk taking sports, also called the "Physical Self-Efficacy Scale". They suggest that there are 6 key elements of self-efficacy as it relates to the participation in high risk sport, and these themes form the basis for their self-efficacy measure:

1. Confidence in one's own judgement.
2. Confidence in the ability to handle fear.
3. Confidence that no mistake will be made.
4. Belief that one can do anything anyone else with like experience can do.
5. Confidence that unexpected events can be managed.
6. Confidence that one can do what one sets out to do.

The greatest differences between the groups were with their own measure which was more narrow in scope ($p < .001$), which suggests that perceptions of self-efficacy

may be largely situationally specific, and do not necessarily generalise beyond a narrow range of activities. All three self-efficacy measures were also positively correlated with the Thrill and Adventure Seeking subscale of the Sensation Seeking Scale V (r = .25 to .35, significance levels not stated), which suggests that perceptions of self-efficacy are also linked with the willingness to participate in high risk sports. 68% of the participants in the higher risk groups recognised the inherent risk, but viewed it as a calculated risk. 68% of the participants specifically named confidence as the most important disinhibiting factor, "confidence in your ability to pull it off every time" said one risk taker (Slanger & Rudestam, 1997, p.366). Many risk takers also specifically described the building of confidence through experience of successful performance in the high risk sports, a finding which is congruent with Bandura's (1997) theory that enactive mastery experiences are generally the most important influence on perceptions of self-efficacy. This contention also gains support from Norris and Weinman's (1996) study, in which they found that the participation in outdoor activities (in this case a transatlantic sailing voyage) generally leads to increases in generalised self-efficacy and selected coping strategies.

Bandura (1997: p.148) argues that risk takers may actually become more discerning in their assessments of risk, and that the perception of control is often a key variable in the formulation of these beliefs and in the direction of risk taking behaviours in general:

> "In transactions involving the exercise of personal competences, estimations of risk require a relational judgement between perceived coping abilities and environmental challenges. Perceived efficacy operates as a key factors in judgements of the riskiness of environmental situations and personal vulnerability to social threats. In the absence of self-protective efficacy, most situations appear scary and risky. But after a strong sense of efficacy is acquired, people are better able to distinguish between risky and safe situations and regulate their behaviour with realistically based precaution."

Dougal Haston (quoted in Wilson, 1986: p.219) describes a particularly difficult and dangerous section of climbing high on the Eiger north face, and of particular interest here is the perception of control, the management of negative emotions and the enjoyment of the challenge that the demands of the situation presented:

> "The next hour was one of the most testing of my climbing career. It was 60° water-ice. The steps of the previous rope had been wiped out. I had no axe or hammer. My left crampon was widely askew on my boot. The right one was loose. Armed with one dagger ice-peg, I moved off the stance. The wind was crashing the snow into my face with such force that it stuck in huge masses on my eyelids, making it impossible to see ahead. My movements were cautious and groping. I would search around for traces of a step, scrape it out, then take a breath-holding move up on my wobbly crampons. The pitch went on and on and I became increasingly aware of the extremeness of the situation. Sigi and Rowland were on a very poor belay. There just could not be any question of falling. Yet in a strange way I was enjoying this test. I new the odds were stacked with the house, but I felt in perfect control. There was no panic, only well-planned movement."

Breivik, Roth and Jørgensen (1998) conducted a study in which the heart rate of 14 novice and 21 expert parachutists at exit from the plane were predicted by a number of independent variables including age, number of jumps, psychological traits (including Eysenck's dimensions and Sensation Seeking), state variables related to the jump and fitness measures. The stepwise multiple regression method was used, and the solution gave one step, number of jumps was the only independent variable in the model, which accounted for approximately 40% of the variance (r^2 = -.630, F = 15.16). They conclude that heart rate was less influenced by psychological states and traits than by direct experience of the activity itself, which leads us to speculate that perceived self-efficacy may have been a mediating factor here. It should be noted, however, that the use of stepwise multiple regression techniques is controversial with such a small sample size and this result may be somewhat misleading. Tabachnick and Fidell (2001) recommend a rule of thumb ratio of cases to variables of $N \geq 104 + m$ for testing individual predictors, where m is the number

of independent variables. The total sample size in this study (35 subjects) is clearly far less than would be preferred, and replication of the result with a larger separate sample would be preferable.

Robinson (1985) conducted a study involving 30 "elite" rock climbers and found that they scored lower on Speilberger, Gorsuch and Lushene's (1970) Trait Anxiety Inventory when compared against normative data ($p < .01$). All respondents reported feeling some degree of state anxiety just prior to the start of a hard climb and at certain difficult sections on the route, but their responses indicated that they were able to cope with these emotions. This lends weight to the argument that sporting risk takers are likely to be low in Anxiety/Neuroticism and also high in confidence which appears to act as an additional disinhibiting factor. Further research is necessary to determine whether this confidence is situationally specific, or alternatively, whether this confidence simply mediates low levels of underlying trait Anxiety/Neuroticism.

Slanger and Rudestam (1997) also found that sporting risk takers scored lower on Byrne's "Repression-Sensitisation Scale" ($p < .05$), suggesting that risk takers are more likely to remember successes than failures, and are less susceptible to negative feedback and self doubt. They speculate that this may enhance perceptions of self-efficacy, and there was a reasonably strong negative association found between the repression scale and the self-efficacy measures (r = -.48 to -.65, significance levels not given). 85% of the participants also mentioned the desire for mastery, "rising to the challenge" one risk taker suggested, and "doing the best I can do" said another (p.366). Slanger and Rudestam suggest a social cognitive explanation for the desire for mastery, and in this understanding a risk taker may seek greater challenges (and by implication take greater risks) once a situation is seen to be mastered and under control. As a result perceptions of control and the motivation to take sporting risks may be inextricably linked:

> "Personal goal setting is influenced by self-appraisal of capabilities. The stronger the perceived self-efficacy, the higher the goals people set for

themselves and the firmer their commitment to them." (Bandura, 1997: p.116)

In other prior studies the desire for mastery has also been cited as a motive for risk taking. For example, Robinson (1985) interviewed 30 "elite" rock climbers and found that all but one (97%) consciously set themselves climbing goals to achieve, and 90% considered themselves to be still improving their technique. The desire to exert control over one's life has also been linked with the willingness to take risks (Trimpop, Kerr & Kirkcaldy, 1999), gambling behaviour (Burger, 1986; Burger & Schnerring, 1982; Burger & Smith, 1985; Strickland, Lewicki, & Katz, 1966), and driving related risk taking (Montag & Comrey, 1987).

Piët (1987) sought to answer the question why some people are motivated to seek confrontations with danger, and she conducted semi-structured interviews of 6 elite professional stunt men (5 males and 1 female). The interviews were guided by six main questions: (1.) Information about the subject's background, such as childhood interests; (2.) the initial motivation to participate in stunts, and what they consider the major rewards to be; (3.) the assessment of the risks involved, and how they view the management of these risks; (4.) the process of preparing for these risks prior to a major stunt, and the emotions it gives rise; (5.) the experiences before, during, and after a major performance, and how they handle these emotions; and (6.) whether the subject experiences anxiety within or outside the professional setting, and ways of coping with the risks and emotional impact of stunts. The results provide partial support for Zuckerman's Sensation Seeking theory (1994) in that the subjects appeared to be eager for new and varied experiences. However, the ability to stand the strains and concentrate in dangerous situations emerged as a further important characteristic of stunt men, and the major reward for the participation in high risk stunts appeared to be the ability to meet the challenge involved challenge involved (what Bandura (1997) would call the exercise of perceived self-efficacy through enactive mastery experiences). One subject (Piët, 1987, p.202) commented regarding motivation for stunting "we need the challenge. We have to stimulate the brain. I can't bear it when it sleeps." Another subject (ibid.) said "I like this work.

The more difficult it is, the more I like it. I love the unknown. I am antiroutine." This leads Piët to conclude that ability and motivation are thus inextricably linked, and this adds support to the contention that many risk takers may deliberately increase the level of risk as their skills improve and their confidence increases. Increases in self-esteem, receiving acclaim, and monetary profit were also identified as secondary motivations. Subject's responses to the perception and management of risk were somewhat ambiguous, and they stressed the risks inherent to everyday life, and the fact that they were able to reduce the risks involved because of their skills and effort. The perception of considerable risk is implicit in the subjects' careful preparation and consideration of the problems involved, but although the subjects appeared to be fully aware of the risks involved, it appeared to be in what Piët (ibid.) called a *"detached, intellectualising manner."* The issue of risk controllability appeared to be important, with one subject (ibid.) stating "I am more afraid on the road than during a stunt. Fellow drivers act strangely and most of the time you cannot foretell it."

Leo Holding (Heap & Turnbull, 1998) describes the psychological challenge in trying to lead the climb "the end of the affair", a gritstone test piece that has been described as "death from the top floor". Graded E8 (Extremely Severe 8) the climb nears the limit of what is currently possible, with insecure holds and very little protection. He first practised the route on a 'top rope' (where a fall would have little or no consequence), but to claim what is generally considered to be a legitimate ascent Leo had to 'lead' the climb. The only difference between the top roped ascents and a lead ascent is basically the consequence of a fall. If a climber is able to do the moves on a top rope then the additional challenge of the lead experience largely lies in being able to control feelings of apprehension so that they are able to perform as before. Within an hour of being able to top rope the climb without a fall, Holding's confidence guides him to successfully attempt the climb:

> "Just get it into your head that it isn't any harder than when you're on a top rope, and in some ways it's easier, you know, you haven't got the rope in the way 'n' that sort of thing. You've just got to be really confident, more than anything. You become akin to it, you know, you concentrate on

staying relaxed which is a contradiction, but at the end of it you don't need to concentrate on relaxing, you just relax. And then you just get on with it... just relax like you've never relaxed before... nothing more to it really. And once you've got you're head round the other end of the rope thing, everything else just, you know, just falls into place."

Horvath and Zuckerman (1993) conducted an unusual study in which they examined the relationship between risk taking behaviours in different areas (crime, financial, social violations, sports and AIDS risk) and a number of individual differences, including, crucially, the appraisal of risk. A General Risk Appraisal Scale (GRAS) was developed using factor analysis and included 30 risky activities, and incorporates four subscales: (1) "Own Risk" appraisal, (2) "Own Behaviour" (the number of times Ss engaged in the risky activity), (3) "Peer Risk" appraisal, and (4) "Peer Behaviour" (an estimate of the number of friends who engage in the activity). Zuckerman's Sensation Seeking Scale V (SSS V), Eysenck and Eysenck's Narrow Impulsivity scale and a number of sexual behaviour related items were also administered to a large sample of 447 undergraduate students. The correlations between variables are given in Table 10 below:

Table 10

Correlations Between Risk Appraisal, Personality And Risk Taking Behaviour

	Area Of Risk			
	Crime	Financial	Violations	Sports
Own Risk with Peer Risk	.91***	.85***	.89***	.80***
Own Behaviour with Peer Beh.	.59***	.52***	.62***	.41***
SS with Own Risk	-.32***	-.05	-.23***	-.18***
SS with Own Behaviour	.53***	.22***	.43***	.24***
SS with Peer Behaviour	.36***	.14**	.26**	.16**
Imp with Own Risk	-.15**	-.10	-.13**	.07
Imp with Own Behaviour	.36***	.13**	.30***	.10
Own Risk with Own Beh.	-.35***	-.24***	-.27***	-.18***

** = $p < .01$, *** = $p < .001$, (2-tailed tests).

The highest correlations were observed between Own Risks and Peer Risks (r = .80 to .91, $p < .001$). It is interesting that the correlation was smallest in the area of risk taking sports, and we might speculate that the risks in this area may be seen to be more dependent upon the risk takers own abilities. Conversely it could be argued that the risks involved in criminal activities and minor violations may be less susceptible to the influence of individual abilities, with financial risks lying between the two. The associations between Own Risk and Own Behaviour were small but negative and statistically significant across all areas of risk (r = -.18 to -.35, $p <$ .001), suggesting that people may take risks because they perceive the risks involved to be lower for themselves. Multiple regression analyses showed that peer behaviours and Sensation Seeking were the strongest predictors of risk taking behaviour. Table 11 shows the relationship between the GRAS subscales and selected independent variables as estimated by stepwise multiple regression:

Table 11

The Prediction Of Risk Taking Behaviours By Multiple Regression

	Area Of Risk			
	Crime	Violations	Financial	Sports
Peer Behaviour	.43	.54	.49	.39
Sensation Seek.	.27	.23	.15	.15
Impulsivity	.13	.11	-	-
Risk Appraisal	-.15	-.14	-.18	-.14
Multiple *r*	.71	.72	.59	.47
r^2	.50	.51	.34	.21

"-" = Did not enter into regression equation.

The amount of variance predicted varied widely from around 50% for criminal risks and minor violations, to 21% for the participation in high risk sports. Impulsivity was clearly the weakest predictor and did not enter the regression equation for financial and sports risks. Peer behaviour was the best predictor across all areas of risk, followed by Sensation Seeking and then Risk Appraisals. This indicates that whilst risk taking behaviours may be predicted more efficiently by other variables (in this case Peer Behaviour and Sensation Seeking) the appraisal of risk may influence the decision to participate in high risk sports to a small degree. Horvarth and Zuckerman (1993) also used structural equation modelling with LISREL software to test whether risk appraisals is a direct consequence of risky behaviour (Model 2), or whether risk appraisals mediate the relationship between Sensation Seeking and risk taking behaviours (Model 1). Table 12 shows different goodness of fit indices and was used to select which model was most appropriate:

Table 12

Structural Equation Modelling Goodness Of Fit Indices

	Goodness Of Fit Indices				
	Chi-Square	Degrees of Freedom	Adjusted Goodness-of-Fit Index	Root Mean Square Residual	Akaiki Information Criterion
Model 1: Males	192.47*	53	0.794	0.091	66.47
Model 1: Females	177.65*	53	0.820	0.113	51.63
Model 2: Males	151.42*	53	0.837	0.080	25.42
Model 2: Females	125.71*	53	0.872	0.066	-0.29

* = $p < .05$

The chi-square tests indicate that both models provide a poor fit, however all other indices of fit suggest that Model 2 is superior for both sexes, especially the measure of predictive validity (Akaiki information criterion). This suggests although the appraisal of risk may be associated to the participation in risk taking behaviours to a small but significant degree, this is not likely to be a predisposing factor which lead them to take risks in the first place. Rather it is more likely to be a consequence of their continued participation in these behaviours.

Zuckerman (1979) also details another study in which the relationship between the experience of risk and the assessment of risk was examined in college students. A diverse range of activities were rated in terms of the level of risk involved, and a reasonably strong negative correlation was found (r = -.56). An examination of the corresponding scatterplot revealed that this was largely due to the high experience end of the scale where activities were generally rated to involve low levels of risk. In contrast novel situations produced very variable ratings, and factors other than novelty appeared to be determining the assessed level of risk. The 50 most infrequently experienced situations were therefore selected and administered with

the SSS V and EPQ. The correlations between Sensation Seeking and total risk assessments ranged from r = -.42 for males to r = -.40 for females. Risk assessments were also grouped into the related themes of "physical", "mental" and "punishment" risks, and the associations with Sensation Seeking and these subscales ranged from r = -.27 to -.40. All of the SSS V subscales were associated with these different types of risk assessment except Boredom Susceptibility. There were also no associations between the EPQ and risk assessments, leading Zuckerman to conclude that these broad dimensions of personality are unlikely to be associated with risk assessments.

Franken, Gibson and Rowland (1992) also conducted a study in which the associations between risk assessments and a number of individual differences were assessed, although, unfortunately, in this case a measure of risk taking behaviours was not included. However the well-known and understood Sensation Seeking Scale V (SSS V) was included alongside measures of demographics, the amount of fear elicited by situations, and the willingness to take risks. As a result this study is an important one, especially when considering the general lack of information regarding risk assessments. They administered these measures to 98 male and 247 female North American undergraduate psychology students, and the partial correlations when statistically controlled for age are given in Table 13 below:

Table 13

The Associations Between Selected Individual Differences And Risk Assessments

	Risk Assessments	Sensation Seeking	Fearfulness	Willingness To Take Risks
Risk Assessments	.	-0.65**	0.35**	-0.31**
Sensation Seeking	-0.60**	.	-0.18	0.64**
Fearfulness	0.47**	-0.45**	.	-0.15
Willingness To Take Risks	-0.46**	0.70**	-0.22**	.

(Male correlations above the diagonal, and females below the diagonal)

** = $p < 0.01$

Risk assessments were clearly associated with Sensation Seeking, fearfulness and the willingness to take risks in both males and females ($p < 0.01$), although the size of these associations was variable (r = -0.31 to -0.65). The strongest associations for both males and females were with Sensation Seeking (r = -0.60 to –0.65) that replicates Horvath and Zuckerman's finding that risk appraisals were associated with Sensation Seeking in all but financial areas of risk (r = -0.18 to –0.32, $p < 0.001$). The size of the correlations in Franken et al.'s study was larger than in Horvath and Zuckerman's, although different measures of risk assessment were used, and in Franken et al.'s study the influence of age was statistically controlled. A series of t-tests also revealed that females were lower in Sensation Seeking, higher in fearfulness, and less willing to take risks than males ($p < 0.01$), whereas no significant differences were found between sexes in age or risk assessments. This suggests that people high in Sensation Seeking are less likely to view the world as threatening, perhaps because they are inclined to disregard or ignore information that is inconsistent with their behaviours (cognitive dissonance theory), or as a direct result of their experiences with risk related behaviours as Horvarth and Zuckerman (1993) suggest.

Stewart and Hemsley (1984) investigated the role of risk perceptions and personality factors in the taking of criminal risks. They administered an inventory of 18 criminal risk related situations, and expectancy of gain (Egn), the inverse of risk assessments, was measured by asking what the chances of "getting away with it" were, and likelihood of action (L/A) was measured by asking how likely subjects were to choose the risky option. There were a total of 32 subjects (16 convicted male adult offenders, and 16 controls), and the EPQ and Interest and Preference Inventory (an early Sensation Seeking Scale) were also administered. The correlations between variables are presented in Table 14 below:

Table 14

The Relationship Between Personality, Willingness To Take Criminal Risks And Risk Perceptions

		Experimental group	Control group	All S's
Expectancy of gain	Psychoticism	.48*	.43*	.45***
	Extraversion	.35	-.44*	.01
	Neuroticism	-.52**	-.12	-.29
	Sensation Seek.	-.05	-.10	-.07
Likelihood of action	Psychoticism	.23	.17	.19
	Extraversion	.36	-.08	.03
	Neuroticism	-.56**	-.20	-.04
	Sensation Seek.	.06	.01	.06

* = P < .1, ** = p < .05, *** = p < .01.

Due to the small number of subjects in this study, the correlations with all subjects are of most interest here, and Psychoticism emerges as the variable most clearly associated with expectancy of gain ($r = .45$, $p < .01$). In other words there appears to be a moderately strong negative relationship between Psychoticism and criminal risk perceptions, which Stewart and Hemsley suggest may be due to a failure to identify risk cues through a process of selective attention, or a failure to acknowledge that these cues present a 'threat' to them. There was also a small negative correlation

with Neuroticism (r = -.29, p > .1), however this failed to reach significance. This is consistent with Jamison's (1978) findings in which the perception of criminal risks was negatively related to risk perceptions, and positively related to Neuroticism, with a large sample of school children. Although no relationship was found with Sensation Seeking we might question whether this is, in part at least, due to the early version of the Sensation Seeking Scale used and the small number of subjects incorporated in the study.

Stöber (1997) investigated the relationship between risk appraisals and trait Anxiety, state Anxiety, depression and social desirability. Subjects were 68 (47 female) German undergraduate psychology students in the first study, and 60 (42 women) in the second study. Participants were asked to rate the probability of a threatening event, and the utility of this event (the magnitude of positive or negative consequences), for 20 first person narrative text-completion tasks. State Anxiety was independently manipulated by musical mood induction, and a cover story was used to disguise the research hypotheses. In both studies trait anxiety was associated with the probability and magnitude of risks and overall risk assessments (r = .21, p < .05 to r = .38, p < .001), whereas state anxiety, depression or social desirability did not explain a significant degree of variance in the appraisal of risk and chance (p > .05). Stöber therefore concludes that inflated subjective risks assessments are due, in part, to trait anxiety; a finding that appeared to generalise to both the assessment of risk probability and utility, perhaps due to a general pessimistic bias.

Rutter, Quine and Albery (1998) conducted a study in which they examined the risk perceptions, behaviours and accident histories of 723 motorcyclists. They found evidence that motorcyclists demonstrated evidence of unrealistic optimism, that is the sample as a whole believed themselves to be at less risk than other motorcyclists of an accident needing hospital treatment in the next year (t = -25.2, p < .001). This, Rutter et al. argue, reflects the popular belief that people tend to think that they are invulnerable, and the same effect or cognitive bias has been found for health and safety judgements generally (Hoorens, 1994; Weinstein & Klein, 1996). However, they also found evidence of relative realism, in that younger (r = -.13, p < .001) and

less experienced riders (r = -.13, $p < .001$) rated the comparative risk for themselves to be higher than other riders, as did riders who reported risky behaviour on the road (r = .11 to .14, $p < .01$). Similar findings have also been reported in other studies (e.g. Cohn, Macfarlane, Yanez & Imai, 1995; Langley & Williams, 1992). Motorcyclists who had had accidents, or had a friend or relative that had been killed, perceived the absolute risks involved to be greater (t = 2.3 to 3.7, $p < .05$), however there was no relationship with comparative risk ($p > .05$). This finding therefore suggests that accidents may lead to increases in the absolute level of risk perceived by a motorcyclist, although their perceptions of the risks involved for themselves are likely to remain unchanged.

Moore (1983: p.152) discusses the relationship between individual risk assessments and that of expert's assessments, and in Table 15 below the estimated number of deaths per year in the USA for 30 hazards are compared with the subjective risk perceptions of three groups:

Table 15

A Comparison Of Estimated Deaths And Perceived Risks

Sources of risk	Actuarial estimated deaths	Rank orderings		
		League of women voters	College students	Business club members
1. Smoking	150000	4	3	4
2. Alcoholic beverage	100000	6	7	5
3. Motor vehicles	50000	2	5	3
4. Handguns	17000	3	2	1
5. Electric power	14000	18	19	19
6. Motorcycles	3000	5	6	2
7. Swimming	3000	19	30	17
8. Surgery	2800	10	11	9

9. X rays	2300	22	17	24
10. Railroads	1950	24	23	20
11. Central aviation	1300	7	15	11
12. Large construction	1000	12	14	13
13. Bicycles	1000	16	24	14
14. Hunting	800	13	18	10
15. Home appliances	200	29	27	27
16. Fire fighting	195	11	10	6
17. Police work	160	8	8	7
18. Contraceptives	150	20	9	22
19. Commercial aviation	130	17	16	18
20. Nuclear power	100	1	1	8
21 Mountain climbing	30	15	22	12
22. Power mowers	24	27	28	25
23. Scholastic football	23	23	26	21
24. Skiing	18	21	25	16
25. Vaccinations	10	30	29	29
26. Food colouring	-	26	20	30
27. Food preservatives	-	25	12	28
28. Pesticides	-	9	4	15
29. Prescription antibiotics	-	28	21	26
30. Spray cans	-	14	13	23

A number of discrepancies can be observed in table 13, in that electric power, surgery, swimming and X-rays were viewed to be less risky to 'US society', whereas nuclear power, police work and mountaineering were seen to be more dangerous. Moore (1983) proposes that the reasons for these differences may lie in considerations other than fatalities (e.g. serious injury), the potential for large-scale disaster (e.g. a nuclear explosion), a lack of information regarding the risks, and beliefs about the controllability of the risks involved. The media may also exert an influence, and Combs and Slovic (1979) report a strong correlation (r = .70) between public estimates of the frequency of death related to various activities and the number of associated deaths reported in the newspapers. The newspapers tended to downplay the number of deaths due to common causes, and people tend to overestimate the risks involved with relatively infrequent activities. It is tempting to conclude therefore that the media influences public risk perceptions, however, as

Moore (1983) points out, the media may in turn be influenced by public perceptions of what is newsworthy.

Piët (1987) also reports finding a link between the assessment of risks, and perceptions of control in stuntmen. An idea that gains support from the elevated levels of perceived self-efficacy found in high risk sportsmen (Slanger & Rudestam, 1997), and the broader field of perceived self-efficacy which is inextricably linked with the assessment of situational demands and the risks involved:

> "Threat is not a fixed property of situational events. Nor does appraisal of the likelihood of aversive happenings rely solely on reading external signs of danger or safety. Rather, threat is a relational matter concerning the match between perceived coping abilities and potentially hurtful aspects of the environment. Therefore, to understand people's appraisals of external threats and their affective reactions to them, it is necessary to analyse their judgements of their coping abilities. Efficacy beliefs determine, in large part, the subjective perilousness of environmental events." (Bandura, 1997: p.140)

Robinson (1985) interviewed 30 "elite" climbers and found that while 57% stated that they were not originally attracted to climbing for affiliate reasons, 97% referred to an affiliate advantage gained through their participation. Interestingly 70% mentioned friendships made through climbing as an important reason for their continued participation, suggesting that the need for affiliation may become a more important reason to participate with experience. Slanger and Rudestam (1997) also point out that the participation in specific behaviours is firstly dependent upon the opportunity to do so, and in their study expense was found to be a major barrier to the participation in low-level stunt flying. Chirivella and Martinez (1994) suggest that sex differences in the participation in certain high risk activities may in part be due to the role of social stereotypes, and this may also constitute a barrier to participation, for some women at least. Risk taking behaviours have also been linked with the demographic variables of age and to a lesser degree sex, and this may reflect the fact that these have been found to be consistently linked with Sensation

Seeking (Nicholson, Fenton-O'Creevy, Soane and Willman, 2002; Zuckerman, 1994).

5.3. Summary

Less information exists as to the associations between variables other than personality traits and risk taking behaviour. That said, the link between the participation in high risk sports and high perceived self-efficacy, confidence in the ability to cope with the situation, and age appear reasonably robust. More speculative associations with experience, sex, the opportunity to participate, peer behaviour, the desire for mastery or challenge, risk assessments and the intellectualisation of risk are also implicated. The participation in antisocial health risk behaviours have been linked with peer behaviours, the opportunity to participate, age, sex, risk appraisals and unrealistic optimism. The opportunity to participate, peer behaviour, and risk assessments have therefore been linked with both types of risk taking behaviour, and they may therefore predispose individuals to take risks generally. Of course the influence of these variables should be considered in tandem with the personality traits discussed in the previous chapter, and in combination they can be used to explain a large degree of variance in these risk taking behaviours, and may even be used to predict future occurrences of them.

Chapter 6.
STAGE 1 METHODOLOGY

6.1. Introduction

This chapter contains a detailed description of the methodological approach adopted in the first main stage of the present study. After reviewing the literature it became clear that physical risk assessments might influence risk taking behaviours. However several limitations were identified with existing psychometric measures, and the formulation of a new scale would therefore represent an important addition to the existing body of literature. This section concerns the development and piloting of a new measure, the Physical Risk Assessment Inventory (PRAI), which was designed to address this need. The research design in the first main stage was cross-sectional, and took the form of a small-scale pilot study (concerned with the initial development of the PRAI), and a large-scale survey. A number of specific hypotheses were made, and yet an important part of the study concerned the investigation of the latent structure of physical risk assessments (via factor analysis) that is better described as an exploratory approach. The study can be described as inductive and problem orientated, aiming to bring about a better understanding of the area through the empirical analysis of phenomena already in existence. The study complements existing research by producing a more refined measure, by exploring the factor structure of physical risk assessments, and by testing the hypothesis that people take risks because they assess risks differently.

6.2. Physical Risk Assessments And Its Measurement

Many researchers have speculated that risk takers may underestimate the risks involved because they are relatively fearless (e.g. Lykken, 1982). However few researchers have attempted to test this hypothesis empirically, and even fewer have tested for a direct link with risk taking behaviours (rather than the *willingness* to participate in such behaviours). For example, Franken et al. (1992) demonstrated a

link between danger assessments and a willingness to take risks (r = -.47 females, r = -.31 males, both $p<.01$). However this does not show a direct link between danger assessments and risk taking behaviour. Also the exclusive use of total scales (incorporating 'social' risk items in addition to 'physical' risk items) means that a link between physical risk assessments and a willingness to take physical risks is only inferred. Horvarth and Zuckerman (1993) conducted one of the few studies to test for a direct link between risk taking behaviours and risk perceptions; in their study they found that small but significant multiple regression beta weights linked risk appraisals and risky behaviours (-.14 to -.18). LISREL analyses suggested that risk taking behaviours were most closely linked to criminal risk appraisals, and least associated with sporting risk appraisals. Taken together these results suggest that a measure of physical risk assessments should be included. A new measure would allow the evaluation of the hypothesis that people engage in risk taking behaviours because they assess risks differently. For example, do rock climbers take risks because they underestimate the risks? Or do rock climbers know the risks involved but accept them? Alternatively, do antisocial risk takers underestimate risks?

The few existing risk assessment instruments were evaluated using Loewenthal's (1996) criteria for the evaluation of existing measures, namely that a measure is:

- Easy and cheap to obtain
- Does not require expensive or time consuming training
- Does not exclude the administrator from its use
- Does not contain outdated or meaningless language
- Measures the appropriate variable
- Is reliable
- Is valid
- Provides relevant norms
- Enables useful comparisons (e.g. with criterion groups)
- Does not offend or distress people

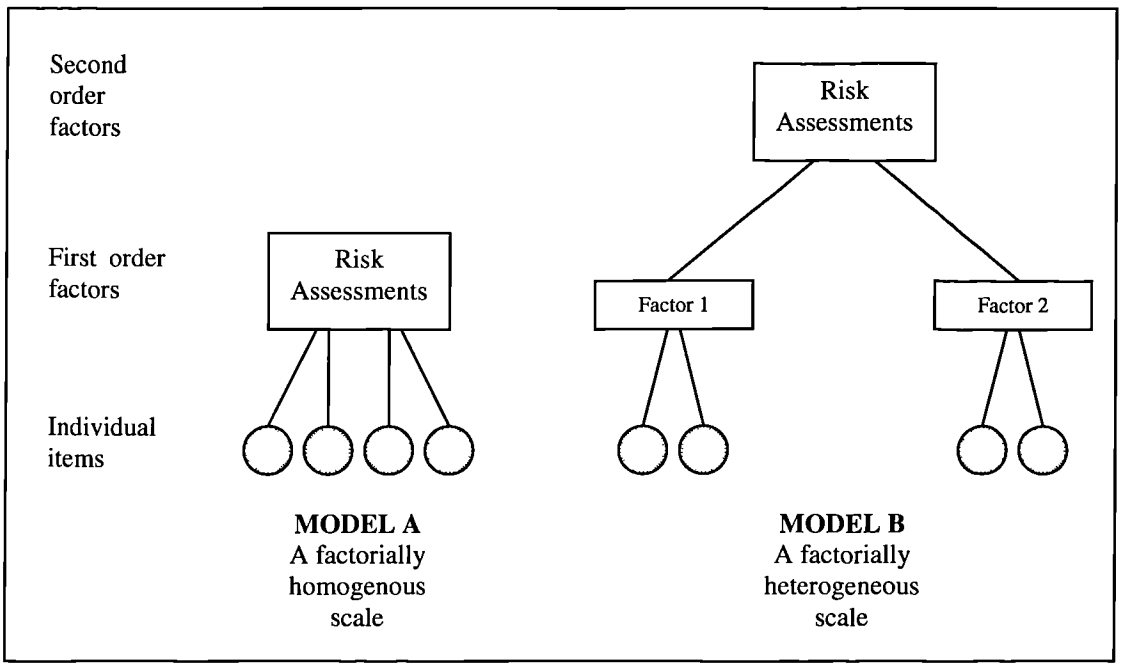
According to these criteria no existing measure was perfectly suitable for use in the present study. Franken et al.'s (1992) "Danger Assessment Questionnaire" was perhaps the most promising possibility (See Appendix A). The 23-item Danger Assessment Questionnaire asks subjects to rate a number of activities in terms of their level of danger using a 5-point Likert style scale. In terms of the tests appearance it appears to contain three different groups of items: 7 items that relate to physical risk in outdoor sports, 8 items that relate to general health risks, and 8 items that seem to relate to social risk taking. Characteristic items include item 5 "water skiing", item 14 "smoking cigarettes", and item 7 "going to a singles bar". The Danger Assessment Scale's internal reliability proved to be very good (alpha coefficients of .86 males and .86 females) when used with North American undergraduate psychology students. In Franken et al.'s (1992) study correlations with other scales measuring related constructs suggested concurrent validity, notably a strong negative correlation with Zuckerman's SSS-V (r = -0.65 males, -0.60 females, both $p<0.001$) when the influence of age was statistically controlled. This suggests that people who seek new experiences and are relatively uninhibited may perceive a range of activities to be less dangerous. No significant sex differences were found although this finding needs to be replicated, especially as it runs contrary to some theorist's expectations.

The first potential limitation of the Danger Assessment Questionnaire relates to the way the initial item pool was drawn up. Items were directly adopted from the 1979 version of Zuckerman's Sensation Seeking Scale V (SSS V). However, Zuckerman found it necessary to alter the SSS-V as several of the items were outdated or culturally loaded (for example "associating with swingers"). When reviewing the SSS V, Rowland and Franken (1986, p.239) suggested themselves that "the connotation of key words in these items may have changed since the standardisation of the test." In the light of these revisions and the empirical evidence available to suggest their inappropriateness in the early form of the SSS-V, it seems likely that the corresponding items effectively constitute a weakness of the Danger Assessment Questionnaire.

Perhaps the most serious limitation of the Danger Assessment Questionnaire is that it was not constructed using factor analytic methods. Horvarth and Zuckerman (1993) found that risk perceptions were fundamentally multivariate and this directly implies that the Danger Assessment Questionnaire may measure more than one correlated variable. (Note the relatively high internal reliability of the Danger Assessment Questionnaire as measured by alpha coefficient means that if the Danger Assessment Questionnaire measures more than one variable then they must be correlated variables.) This means that we have no way of knowing whether the scale measures one homogenous first order factor, or multiple oblique first order factors and a general second order factor (see Figure 4 below). This leads us to question the validity of the Danger Assessment Questionnaire as a univariate measure, and provides a partial rationale for the development of a new measure.

Figure 4

Two Models Representing The Possible Factor Structure Of The Danger Assessment Questionnaire



By investigating the factor structure of the PRAI empirically, competing conceptual models (detailed above) can be evaluated and the factorial validity of the scale examined. Further limitations with the Danger Assessment Questionnaire include a lack of British norms (the only comparison group being a group of North American students), and the inclusion of items that may be offensive. Other researchers have also argued that there is a need for a new scale to measure physical risk assessment (Kontos, A.P., personal communication, February 6, 2001; Wilde, G., personal communication, February 8, 2001). For example Kontos, A.P. (personal communication, February 6, 2001) states:

> "Based on my discussions with other researchers, there is a definite need for a perceived physical risk questionnaire."

6.3. Developing The Physical Risk Assessment Inventory

In the light of these limitations, and the otherwise promising nature of the Danger Assessment questionnaire, the decision was made to develop a new scale along similar lines. The item content of the Danger Assessment Questionnaire was revised, new items were added, and all of the 'social risk taking' items were removed to produce a more specific test of physical risk assessment and avoid many of the connotational difficulties. The PRAI contains 27 items, 14 of which refer to the risks involved in outdoor activities, and 13 of which relate to general health risks. A more detailed breakdown of category content is given in Table 14 below:

Table 16

The Balance Of PRAI Items

Category	Item
Outdoor activities (land)	1. Mountain climbing*
	6. Skiing fast down a mountain*
	11. Rock climbing
	17. Mountain biking

	24. Horse riding
Outdoor activities (water)	3. Water skiing*
	8. Scuba diving*
	14. White water kayaking
	21. Surfing
	25. Ocean sailing*
	27. Diving off a high board*
Outdoor activities (air)	5. Parachute jumping*
	12. Hang gliding
	19. Piloting a small plane
Health activities (sexual)	7. Being sexually promiscuous*
	18. Having unprotected sex
Health activities (illegal drugs)	2. Smoking marijuana*
	13. Using hallucinogenic drugs*
	15. Using illegal stimulants*
	20. Using cocaine*
	26. Using heroine
Health activities (miscellaneous)	4. Eating fatty foods*
	9. Driving recklessly
	10. Heavy drinking*
	16. Smoking cigarettes*
	22. Not exercising regularly
	23. Driving after drinking alcohol

Note: Asterisks denote items adapted from Franken et al.'s (1992) Danger Assessment Questionnaire.

The aim at this stage was to produce a clearer scale with items that were less culturally loaded or potentially offensive. Items that were deleted or adapted from the Danger Assessment Questionnaire are detailed below:

Items in the Danger Assessment Questionnaire that were not included in the PRAI at all:

2. Exploring a strange city by yourself

7. Going into a singles bar

9. Going on a blind date

11. Associating with the jet set

13. Having homosexual friends

19. Travelling in a strange country with no preplanned itinerary

22. Watching pornographic movies

23. Associating with swingers

Items in the Danger Assessment Questionnaire that were adapted for use in the PRAI:

12. Sailing across the ocean (Changed to: "Ocean sailing")

17. Jumping or diving off a high board (Changed to: "Diving off a high board")

18. Using stimulants (Changed to: "Using illegal stimulants")

Items were also included in an attempt to ensure a more representative balance of items in each subcategory and to improve the content validity of the PRAI. More specifically the proportion of land and air based activities was increased in proportion to the number of water based items. Also, the proportion of items relating to sexual and miscellaneous activities was increased in relation to the number of items related to illegal drugs (See tables 17 and 18 below). Some apparently "less extreme" items were also included in an attempt to guard against a possible ceiling effect, produce a normally distributed range of scores, and improve the range of activities included to maximise the scale's content validity.

Table 17

The Proportion of Outdoor Activity Items In The DAQ And PRAI

Type of item	No. of items in DAQ	No. of items in PRAI	% of DAQ subscale	% of PRAI subscale	% Change
Land based	2	5	28	36	+8
Air based	1	3	14	21	+7
Water based	4	6	57	43	-14

Table 18

The Proportion of Health Activity Items In The DAQ And PRAI

Type of item	No. of items in DAQ	No. of items in PRAI	% of DAQ subscale	% of PRAI subscale	% Change
Sexual	1	2	12	15	+3
Illegal drugs	4	5	50	38	-12
Miscellaneous	3	6	37	46	+9

A peer review focus group was conducted at this stage and both health and sport psychologists were consulted regarding the specific item content. The Danger Assessment Questionnaire's 5-point scale was changed in favour of a 7-point scale ranging from 0 ("No physical risk") to 6 ("Extreme physical risk"). This decision was made in an attempt to improve the reliability of the scale as Kline (2000a, 2000b) recommends. Including a greater number of physical risk related items may also have lead to increases in reliability.

A trial version of the PRAI was then administered to 4 British females and 6 British males (a convenience sample of postgraduate psychology and sports science students) who were asked to complete the PRAI and describe the way in which they answered, the reasons for their answers, and their own understanding of what they

were being asked to do. This piloting stage helped to identify initial flaws, develop the test format, estimate how long the test takes to complete, check for demand characteristics, and explore the usefulness of the test items and instructions (Clark-Carter, 1997). The problems identified with this early draft included ambiguity in the instructions and a confusing layout that led to missing values where respondents simply missed out questions. Respondents also provided suggestions how the PRAI could be improved, and a revised version was constructed in the light of this feedback (See Appendix B). Once the PRAI had been piloted it became a priority to administer the new scale to a large number of subjects in order to assess its reliability and validity. In addition it was interesting to explore the factor structure of the PRAI and investigate the possibility of a link with risk taking behaviours.

6.4. Aim

To investigate the psychometric properties of the Physical Risk Assessment Inventory (PRAI), and its relationship with risk taking behaviours.

6.5. Objectives

1. To investigate the factor structure of physical risk assessments.
2. To investigate the psychometric qualities of the PRAI in terms of reliability and validity.
3. To test the idea that people who engage in risk taking behaviours are likely to rate the risks involved differently.

6.6. Hypotheses

1. The items in the PRAI will cluster together to form one factor (H_a1a), or more than one oblique factors (H_a1b). The null hypothesis being that PRAI items do not produce any meaningful factors (H_01).

2. Physical risk assessments are expected to increase with age (H_a2). The null hypothesis here is that no relationship between age and physical risk assessments is found ($H_0 2$).
3. The participation in high risk sports will be negatively associated with physical risk assessments (H_a3). Alternatively the null hypothesis is that there will be no relationship between high risk sports behaviour and physical risk assessments ($H_0 3$).
4. Physical risk assessments will be negatively associated with social desirability (H_a4). The null hypothesis is that there will be no association between physical risk assessments and social desirability.
5. Knowledge of physical risk taking activities will be negatively associated with physical risk assessments (H_a5). Alternatively the null hypothesis is that there will be no association between physical risk assessments and knowledge of physical risk taking activities ($H_0 5$).
6. Occupation will be positively associated with physical risk assessments (H_a6). The null hypothesis is that physical risk assessments will be unrelated to occupation ($H_0 6$).
7. Females will in general assess physical risks to be higher than males (H_a7). The null hypothesis being that there is no relationship between sex (gender) and physical risk assessments.

6.7. Sample And Procedures

The respondents were 407 adults (378 of whom were British – 93%), aged between 16 and 78 (Mean = 33.5, SD = 13.5). 209 subjects were males aged between 16 and 76 (Mean = 31.9, SD = 12.9) and 198 were females aged between 16 and 78 (Mean = 35.3, SD = 13.9). Subjects were recruited from a riding school, three secondary schools, a basketball team, a small IT company, a car manufacturer, a Women's Institute group, three universities, an unemployment office, a college of further education, a police station, a multinational communications company, a hockey team, and a hospital. Questionnaires were administered in small groups although some subjects were allowed to take the questionnaires away for later return (158

subjects). Subjects were briefly told of the nature of the questions to be asked and that participation was confidential and entirely anonymous. 407 of 438 subjects approached agreed to participate, and a response rate of 93% was obtained.

6.8. Measures

6.8.1. The Physical Risk Assessment Inventory

The 27-item Physical Risk Assessment Inventory (PRAI) provides a measure of how individuals assess a range of sporting and health activities in terms of their level of risk to the average participant. The PRAI is developed from the Franken et al. (1992) 'Danger Assessment Questionnaire' which also included a number of social activities. The PRAI is scored using a 7 point Likert style scale ranging from 0 "No Physical Risk" to 6 "Extreme Physical Risk". As the PRAI is a new measure no validity evidence was available (other than arguably content validity), and this constitutes part of the present study.

6.8.2. The Kuhlman-Zuckerman Personality Questionnaire Infrequency scale

The 10 item Infrequency scale of the Kuhlman-Zuckerman (2001) Personality Questionnaire (ZKPQ) was incorporated to check for careless answering and a disregard for the truth. The content of three items was changed to reverse the scoring of the item in order to guard against possible acquiescence effects, as all 10 items were originally scored in the same direction. Three filler or dummy personality questionnaire items were also included here (e.g. "I am a very sociable person") in an attempt to make the nature of the scale more difficult to interpret in terms of face validity, and give this section of the questionnaire a less negative or threatening tone.

6.8.3. Additional Items

Items were included to assess demographic variables (age, sex, nationality, and occupation) because these are thought to interact with physical risk assessments and/or they also allow detailed description of the sample. Occupation was quantified using a scale of 0 to 6 where 0 = unemployed, 1 = unskilled manual, 2= skilled manual, 3= clerical/administrative, 4 = junior professional, 5 = professional, and 6 = senior professional. Subjects were also asked whether they considered themselves to be knowledgeable of the activities mentioned in the PRAI (scored dichotomously as "yes" or "no"), and whether they participate in any high risk outdoor activities (again dichotomously scored).

6.9. Data Analyses

The data analysis in this study is comprised of 3 stages: (1.) Investigating the factor structure of the PRAI. (2.) Descriptive and reliability statistics were calculated for the quantitative Variables. And (3.) bivariate statistics were calculated to examine any relationships between the PRAI and various measures of individual difference. S.P.S.S. version 9 was used for all stages of the quantitative data analysis. One-tailed statistical tests were used, as the alternative hypotheses were directional (Coolican, 1999). Analyses were conducted separately for males and females in order to control for sex differences, as Kline (2000a, 2000b) suggests. Prior to the analysis all quantitative variables were examined for the accuracy of data entry, missing values and the degree to which they satisfied the assumptions of multivariate analysis. There were 25 missing values, which appeared to be randomly distributed. No single variables exhibited a large number of missing values (>1%). Missing values were replaced using expectation maximization (EM) method with multiple imputations (as recommended by Tabachnick & Fidell, 2001). Analyses were repeated without missing values and the results were found to be virtually identical. No cases were identified through extreme z scores as being univariate outliers ($z > 3.2$), and no cases were identified through Manahoblis distance as multivariate outliers ($p < .001$).

6.10. Limitations

Because the participation in this study was voluntary subjects were self-selecting, as a result there may be volunteer characteristics, e.g. subjects may be high in social desirability (Banister, Burman, Parker, Taylor, & Tindall, 1994). The high response rate of 93% restricts the degree to which this can be considered to be a major limitation in the present study. The research did not address the possibility that risk assessments might vary over time; future longitudinal research is needed to test whether risk assessments are stable and whether or not the PRAI demonstrates adequate test-retest reliability. The fact that directional hypotheses were made may have introduced demand characteristics to the measurement process (Orne, 1962; Banister, et al., 1994). One exception however concerns the investigation of the factor structure of physical risk assessments where a more exploratory focus was adopted. Further research is needed to investigate how physical risk assessments (as measured by the PRAI) are associated with a wider range of individual differences (e.g. personality traits). Further research is needed to replicate any significant findings made in the present study. Although this study examines a possible link between high risk sporting behaviours and physical risk assessments, other forms of risk taking (e.g. drug use or criminal behaviour) were not incorporated. Further research is needed to investigate how physical risk assessments are linked with a variety of risk taking behaviours. Participants were largely though not exclusively British (93%), and as such it is difficult to estimate the degree to which the findings will generalise to other cultures. Further research is needed to test whether the same results are found in different countries.

6.11. Ethical Considerations

During the planning stage of the research it was necessary to assess the potential risks and benefits involved for the subjects, in this case psychological and social (Banister, et al., 1994; Marshall & Rossman, 1999). An awareness of the literature in this particular area revealed ethical issues and problems identified by previous

researchers (Clark-Carter, 1997). Potential participants were informed that they had the right to refuse to be involved. Informed consent was obtained, that is the agreement of each person who took part, with the full knowledge of any risk the research contained (Banister et al., 1994; Clark-Carter, 1997). No undue pressure to participate was applied, and participants were assured of their confidentiality. It was made clear that subjects had the right to withdraw from the study at any time and refuse any information divulged up to this point (Banister et al., 1994; Clark-Carter, 1997; Marshall & Rossman, 1999). Participants were thanked and debriefed in full immediately as there was no danger of introducing bias due to the cross sectional nature of the research (Wade & Tavris, 1993). A summary of the research and its findings was also made available on the internet. A detailed research proposal was submitted to the Scottish School of Sport Studies ethics committee at the University of Strathclyde, and approval was granted to undertake the current study.

12. Summary

Little research has directly investigated the relationship between risk assessments and risk taking behaviour. The negative association between risk assessments and Sensation Seeking is better understood however, and this indirectly implies that people who take significant risks may assess the risks involved to be low. A review of the available psychometric measures of risk assessments indicated that existing measures suffer from a number of limitations, and that the development of a new measure would constitute a significant contribution to the literature. The Physical Risk Assessment Inventory (PRAI) was therefore developed in an attempt to build upon the strengths of previous scales. An early version of the PRAI was piloted with a convenience sample of 10 postgraduate students, and a number of improvements were subsequently made regarding the instructions and layout. The priority then became to administer the PRAI to a large number of subjects in order to investigate its psychometric properties and its relationship with risk taking behaviours. 407 adults were therefore administered the PRAI, the ZKPQ Infrequency scale and a number of additional items relating to demographic variables, self-rated knowledge of the activities in the PRAI, and the participation in high risk outdoor activities. The

data analyses centred around the use of factor analyses, descriptive and reliability statistics, bivariate correlations, and multiple regression. Several limitations of this stage were raised, and an overview of the relevant ethical considerations was presented.

Chapter 7.
STAGE 1 RESULTS AND DISCUSSION OF RESULTS

7.1. Introduction

The aim of this chapter is to provide information about the psychometric properties of the Physical Risk Assessment Inventory and its relationship with other variables. The results are divided into three sections: (1.) Firstly, the latent structure of the PRAI is investigated using factor analytic procedures, (2.) secondly, descriptive and reliability statistics are presented, (3.) and lastly, interscale correlations were calculated to investigate the relationships between the PRAI and other variables. A detailed discussion of these results is presented, especially in relation to the previously formulated hypotheses. Each hypothesis is addressed separately, and evaluated in terms of whether the data lends more support to the null or alternative hypothesis. In the case where more than one alternative was suggested the data is evaluated in terms of which of these options appears the more credible. Following a discussion of specific hypotheses the results are discussed in more general terms, and a summary section provides an overview of the main points.

7.2. Factor Analytic Results

In order to control for possible sex differences, and to ensure the robustness of any factor solution, factor analyses were conducted separately for each sex as Kline (2000a, 2000b) recommends. Franken et al.'s (1992) study with the Danger Assessment Questionnaire demonstrated very good reliability (alpha coefficients of .86 for both males and females) which suggests that physical and social risks are accounted for by a single factor, or more than one oblique factor. A principal factors approach was adopted (rather than principal components) because it has the advantage of not compounding unique or error variance with the factors. Because arguments can be made that the activities included in the PRAI differ in the levels of

risk they represent, it was important to attempt to exclude unique variance from the analysis.

How many factors should be extracted? For males the number of eigenvalues >1 was 6 although this could be too many factors as there were only 27 variables included in the analysis. A scree test suggested the appropriateness of a 2-factor solution (depending upon which criteria are applied). Some confusion exists as to how the number of factors should be decided using a Scree test. This confusion may stem from the fact that Cattell (1966) originally suggested that the number of factors above the scree line plus one should be included, but subsequently (Cattell & Vogelman, 1977) revised his recommendations suggesting that the last real factor is before the scree line begins. Regardless of where this confusion originates it is clear that there are proponents of both methods, with Bryman and Cramer (1999), Cooper (1998), Tabachnick and Fidell (2001) and Gorsuch (1983) recommending Cattell's revised criterion, and Kline (1994) recommending Cattell's original criterion. It should be noted at this point that Cattell's original criterion has the disadvantage of being incapable of suggesting the appropriateness of a single factor solution, even if the other factors were to be entirely trivial. This appears to be a peculiarity of this algorithmic approach, and is a source of possible error. In this study Cattell's revised criterion are applied. One overall objection to the scree test is that it is subjective, however there is usually high inter-scorer reliability with practice and where disagreement occurs it can be compared with other criteria (Kline, 1994). In this case none of the scree plots were especially difficult to interpret, and alternative extraction criteria are also applied. A maximum likelihood statistical test of significance was also used to give an upper bound estimate of the number of significant factors (8 factors, 163 *df*, X^2 = 198.935, sig. = .029; 9 factors, 144 *df*, X^2 = 169.496, sig. = .072), the results of which indicated that up to 9 factors could be legitimately extracted from a statistical basis. Two factors accounted for >10% of the total variance, and the third factor only accounted for 6.4% of the variance. Taken together these results seem to suggest the appropriateness of a 2 to 6 factor solution. However we are only concerned with the replicable factors, and as a result different factor solutions were compared with the results for females in order to

provide additional evidence for their robustness. Factors must be robust and replicable if they are psychologically meaningful, and many theorists (e.g. Kline, 2000a) suggest it to be an essential part of test development when using factor analysis.

For females the number of eigenvalues >1 was 5 although this could also be too many factors as there were only 27 variables included in the analysis. A scree test suggested the appropriateness of a 2-factor solution. A maximum likelihood statistical test of significance was also used to give an upper bound estimate of the number of significant factors (7 factors, 183 *df*, X^2 = 218.159, sig. = .039; 8 factors, 163 *df*, X^2 = 173.422, sig. = .274), the results of which indicated that up to 8 factors could be legitimately extracted from a statistical basis. Two factors accounted for >10% of the total variance, and the third factor only accounted for 5.7% of the variance. Taken together with the results for males it became clear that a 2-6 factor solution appeared to be most viable. However the scree test results and the number of factors accounting for >10% of the variance suggested a 2-factor solution for both males and females implying that this could represent the number of robust factors accounting for the majority of variance. 2, 3, 4, 5 and 6 factor solutions were all extracted and rotated using both oblique and orthogonal techniques for pragmatic reasons, although only a 2-factor solution appeared to equate to simple structure and give meaningful and robust results. A 2-factor solution produced virtually identical results that were highly comparable between sexes (accounting for 42% of the variance in males and 49% in females), and as a result the data for the 2-factor solution are presented here. This is significant because it provides us with new and original information about the latent structure of physical risk assessments, an important finding in itself and a topic that certainly warrants further investigation. Indeed the further investigation and possible replication of the factor structure of physical risk assessments as outlined here would certainly help in the conceptualisation of physical risk assessments, and the validation of the PRAI.

What type of rotation should be used? From previous research findings oblique factors were expected, however the degree of association between factors could be

relatively small, in which case the greater simplicity of an orthogonal solution would be preferred. The 2-factor solution was subjected to a Direct Oblimin rotation with the default Delta (0) which allows highly correlated factors (Tabachnick & Fidell, 2001). The correlation between factors was .368 for all subjects, which exceeded Tabachnick and Fidell's (2001) recommended minimum of about 10% (correlations of .320 and above) overlap between factors to warrant oblique rotation. As an oblique rotational procedure has the advantage of preserving the natural overlap between factors, an oblique solution was selected. No variables failed to load on any factor, and as a result no variables were excluded as outliers. Two comparable factors could be identified in both male and female analyses by their highest loadings, namely a "Sports" risk factor and a "Health" risk factor. These were used as the basis to develop preliminary PRAI subscales, as a suitable number of items loaded on each factor (14 for the "Sports" subscale, and 13 for the "Health" subscale), and the estimated alpha coefficients were excellent (>.85 on both subscales for both males and females – exact figures given in section 7.3.).

Factor Analytic Results For Male Subjects

The rotated pattern matrix is shown in Table 19, which indicates the loadings of variables on factors, communalities, eigenvalues and percents of total variance accounted for. For ease of interpretation the variables are sorted by the size of their loadings, and significant loadings (>.3) are shown in bold. Interpretative labels are suggested for each factor and are further addressed in the discussion section.

TABLE 19

Pattern Matrix Showing The Structure Of Physical Risk Assessments For Male Subjects

Item number	Factor		Communalities
	1	**2**	
	"Sports" Risk Assessments	"Health" Risk Assessments	
24	**.708**	-.152	.448
21	**.704**	-.220	.435
8	**.703**	.014	.501
25	**.692**	-.040	.461
12	**.677**	.079	.503
19	**.640**	-.190	.360
27	**.623**	-.002	.387
14	**.622**	.140	.467
11	**.621**	.031	.400
5	**.615**	.048	.401
3	**.607**	.095	.417
17	**.605**	-.013	.360
6	**.553**	.129	.373
1	**.394**	.080	.183
20	-.168	**.774**	.536
26	-.189	**.690**	.421
13	-.101	**.690**	.438
15	.049	**.655**	.455
10	.059	**.653**	.456
16	-.013	**.589**	.341
23	-.177	**.564**	.280
7	.005	**.523**	.275
18	.156	**.492**	.320
9	.230	**.425**	.302
2	.144	**.419**	.238
4	.216	**.341**	.214

22	.195	**.330**	.192
Eigenvalue	7.564	3.797	
% of total variance accounted for	28.014	14.063	

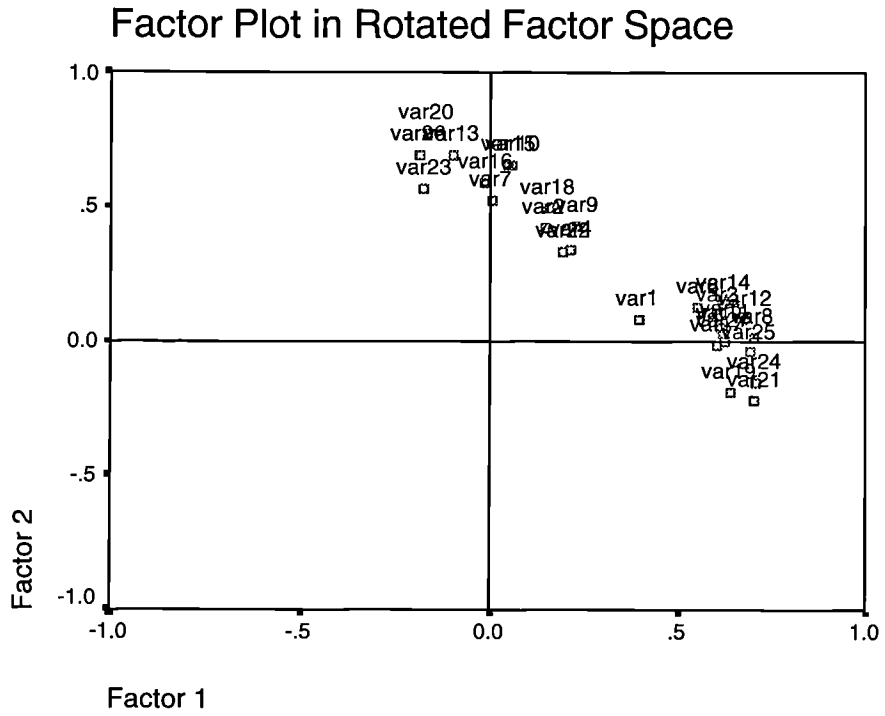
Notes: Extraction Method: Principal Axis Factoring.

Rotation Method: Direct Oblimin (Delta=0.3) with Kaiser Normalization.

The degree of association between factors was r = .351 when factors when allowed to correlate highly (Delta=0.3). In Figure 5 below a factor plot in rotated factor space is presented, in which the factor loadings are graphically represented in an attempt to aid interpretation. Two clusters of variables can be discerned, which when taken together with the even clearer results with females suggests the validity of a 2-factor solution. The apparent line of variables should not be confused with a negative correlation, and unfamiliar readers should refer to introductory texts on the subject of factor analysis such as that by Kline (1994). The numbers of many PRAI items are unfortunately unreadable due to their close proximity to other items. However this does not matter, as the important point to note is the presence of two clusters, not the specific location of individual items.

Figure 5

A Graphical Representation Of Factor Loadings



Factor Analytic Results For Females

The rotated factor matrix is shown in Table 20, which indicates the loadings of variables on factors, communalities, eigenvalues and percents of total variance accounted for. For ease of interpretation the variables are sorted by the size of their loadings, and significant loadings (>.3) are shown in bold. Interpretative labels are suggested for each factor and are further addressed later.

TABLE 20

Pattern Matrix Showing The Structure Of Physical Risk Assessments For Female Subjects

Item number	Factor		Communalities
	1	**2**	
	"Health" Risk Assessments	"Sports" Risk Assessments	
18	**.808**	-.091	.594
10	**.786**	-.067	.575
20	**.782**	-.027	.593
13	**.772**	-.007	.591
15	**.768**	-.029	.570
26	**.742**	-.051	.518
7	**.693**	.028	.498
16	**.687**	-.019	.461
23	**.649**	.009	.427
9	**.634**	.206	.563
4	**.542**	-.013	.288
22	**.516**	-.022	.256
2	**.438**	.123	.256
12	.058	**.765**	.628
11	.042	**.744**	.583
3	-.052	**.711**	.475
5	.098	**.692**	.549
8	.026	**.684**	.484
14	.118	**.669**	.533
6	.088	**.658**	.493
19	-.148	**.649**	.356
17	-.111	**.642**	.360
21	-.020	**.631**	.386
25	.002	**.585**	.343
24	-.060	**.518**	.244

1	.120	**.483**	.300
27	.000	**.434**	.189
Eigenvalue	9.359	3.795	
% of total variance accounted for	34.662	14.054	

Notes: Extraction Method: Principal Axis Factoring.

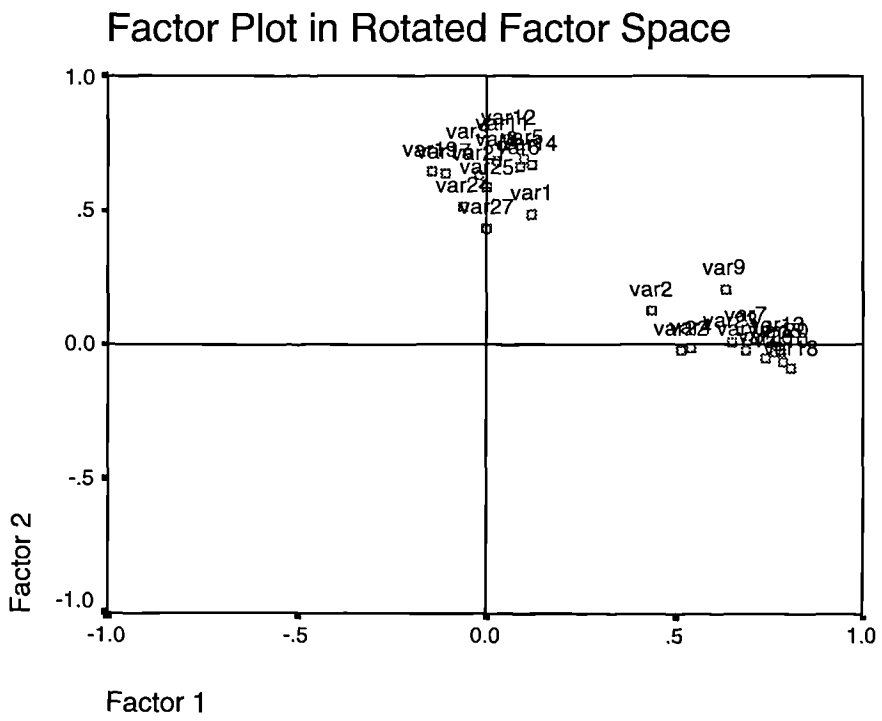
Rotation Method: Direct Oblimin (Delta=0.1)

with Kaiser Normalization.

The degree of association between factors was r = .450 when factors when allowed to correlate highly (Delta=0.1). In Figure 6 below factor a factor plot in rotated factor space graphically represents loadings. Again two clusters of variables can be discerned, although this time the results are especially clear.

Figure 6

A Graphical Representation Of Factor Loadings



Hypothesis 1: The items in the PRAI will cluster together to form one factor (H_a1a), or more than one oblique factors (H_a1b). The null hypothesis being that PRAI items do not produce any meaningful factors (H_01).

The alpha coefficient reliability statistics for the total PRAI scale were extremely high (.92 females and .90 males), clearly exceeding any minimum value for a scale that is considered to be internally consistent (usually .7). This replicates Franken et al.'s (1992) earlier work with the Danger Assessment Questionnaire, which also found that risk assessment items cluster together to form an internally consistent scale (alpha coefficient reliabilities of .86 for both males and females). What this means is that H_01 is unlikely to be true, in that items are likely to cluster together to form one homogenous first order factor (H_a1a), or more than one oblique first order factor (H_a1b). Perhaps the key questions then are whether the items cluster together to form a meaningful factor (or factors), whether these factors are robust and replicable between sexes, and whether a unifactorial or multifactorial model of physical risk assessments is more appropriate.

Different extraction criteria for the factor analysis produced differing estimates as to how many factors should be extracted. However only a two-factor solution produced meaningful results that were replicable between sexes. The results of a two-factor solution suggest that it accounts for a reasonable degree of variance in the initial correlation matrix (42% for males and 49% for females) and produces moderately correlated oblique factors (a correlation between factors of .351 for males, and .450 for females). Further analyses suggested that these factors produced meaningful clusters of items that were also highly internally consistent in both males and females (alpha coefficients ranging from .86 to .92), and these results were used in the development of the "Health" and "Sports" PRAI subscales. Taken together these results lend more support to H_a1b than H_a1a, in that is there appears to be more than one replicable and meaningful factor. The correlations between factors were moderately but not greatly high, and none of the various extraction criteria suggested that a unifactorial model might be appropriate. In short a two-factor oblique solution

appears to be most appropriate, as a result $H_0 1$ and $H_a 1a$ can be provisionally rejected, and support is lent to $H_a 1b$ subject to further validation and replication.

7.3. Descriptive And Reliability Statistics

Descriptive and reliability statistics are presented for the PRAI Total scale, and the Health and Sport subscales in Table 21 along with the other quantitative variables:

TABLE 21

Descriptive Statistics For All Quantitative Variables

Scale	**Females** (n=198)			**Males** (n=209)			**Total** (n=407)			**Sex Differences** (T-Test)
	Mean	SD	Reliability (α)	Mean	SD	Reliability (α)	Mean	SD	Reliability (α)	
PRAI Total	106.60	20.41	.92	103.11	18.61	.90	104.81	19.56	.91	Ns
PRAI Health	57.62	12.36	.92	54.72	10.94	.86	56.13	11.73	.89	f>m (t=2.51*)
PRAI Sport	48.98	11.78	.91	48.38	11.77	.90	48.67	11.77	.90	Ns
Infrequency	1.03	1.32	.54	1.17	1.38	.53	1.10	1.35	.53	Ns
Age	34.27	13.93	-	32.92	12.94	-	33.53	13.52	-	Ns
Occupation	3.54	.89	-	3.48	1.24	-	3.51	1.09	-	Ns
Knowledge	.34	.48	-	.36	.48	-	.35	.48	-	Ns
High risk sports	.14	.34	-	.20	.40	-	.17	.38	-	Ns

* = Significant at the <.05 level (1-tailed). Dashes indicate where statistics are not applicable.

These results show that the PRAI is an especially reliable scale, and that all scales have alpha coefficients exceeding .85. The only sex difference that reached significance was that of the PRAI Health subscale, and it will be interesting to see if this result can be replicated.

7.4. Interscale Correlations

The correlations between variables are shown in Tables 22, 23 and 24, and are subsequently discussed in relation to the research hypotheses. In Table 22 below the correlations between variables for all subjects are detailed, and this gives us an indication of the relationships that appeared to be important in this study.

Table 22

Interscale Correlations For All Subjects

	PRAI Total	PRAI Sport	PRAI Health	Infrequency	Age	Occupation	Risk Sports	Knowledge
PRAI Total	1.000	**.833**	**.832**	-.052	**.244**	.012	-.078	**-.140**
	.	.000	.000	.149	.000	.406	.059	.002
PRAI Sport	**.833**	1.000	**.386**	-.053	**.147**	-.016	**-.103**	**-.167**
	.000	.	.000	.143	.002	.378	.019	.000
PRAI Health	**.832**	**.386**	1.000	-.033	**.260**	.037	-.026	-.067
	.000	.000	.	.253	.000	.237	.298	.089
Infrequency	-.052	-.053	-.033	1.000	**.084**	**-.164**	-.053	**.183**
	.149	.143	.253	.	.047	.001	.143	.000
Age	**.244**	**.147**	**.260**	**.084**	1.000	**-.146**	**-.086**	-.054
	.000	.002	.000	.047	.	.002	.042	.141
Occupation	.012	-.016	.037	**-.164**	**-.146**	1.000	**.117**	-.075
	.406	.378	.237	.001	.002	.	.011	.073
Risk Sports	-.078	**-.103**	-.026	-.053	**-.086**	**.117**	1.000	**.092**
	.059	.019	.298	.143	.042	.011	.	.032
Knowledge	**-.140**	**-.167**	-.067	**.183**	-.054	-.075	**.092**	1.000
	.002	.000	.089	.000	.141	.073	.032	.

1-tailed Pearson Correlations, significant correlations ($p<.05$) are shown in bold for ease of interpretation. A significance level of .000 equates to $p < .0005$.

In Table 23 below the correlations for female subjects only are presented, and this gives the opportunity to compare with the male only results given in Table 24.

Obviously some relationships may be specific to one sex, for example age may influence perceptions of Sports risks for males only.

Table 23

Interscale Correlations For Female Subjects Only

	PRAI Total	PRAI Sport	PRAI Health	Infrequency	Age	Occupation	Risk Sports	Knowledge
PRAI Total	1.000	**.837**	**.853**	-.041	**.248**	-.033	**-.138**	**-.187**
	.	.000	.000	.283	.000	.329	.027	.005
PRAI Sport	**.837**	1.000	**.429**	-.080	**.158**	-.092	**-.171**	**-.204**
	.000	.	.000	.130	.014	.109	.008	.002
PRAI Health	**.853**	**.429**	1.000	.009	**.258**	.032	-.064	-.114
	.000	.000	.	.451	.000	.334	.185	.057
Infrequency	-.041	-.080	.009	1.000	**.188**	**-.209**	**-.120**	**.182**
	.283	.130	.451	.	.004	.002	.045	.006
Age	**.248**	**.158**	**.258**	**.188**	1.000	**-.167**	-.080	**.137**
	.000	.014	.000	.004	.	.013	.132	.029
Occupation	-.033	-.092	.032	**-.209**	**-.167**	1.000	**.127**	-.054
	.329	.109	.334	.002	.013	.	.043	.237
Risk Sports	**-.138**	**-.171**	-.064	**-.120**	-.080	**.127**	1.000	.088
	.027	.008	.185	.045	.132	.043	.	.110
Knowledge	**-.187**	**-.204**	-.114	**.182**	**.137**	-.054	.088	1.000
	.005	.002	.057	.006	.029	.237	.110	.

1-tailed Pearson Correlations, significant correlations ($p<.05$) are shown in bold for ease of interpretation. A significance level of .000 equates to $p < .0005$.

Table 24

Interscale Correlations For Male Subjects Only

	PRAI Total	PRAI Sport	PRAI Health	Infrequency	Age	Occupation	Risk Sports	Knowledge
PRAI Total	1.000	**.834**	**.804**	-.054	**.223**	.041	-.012	-.091
	.	.000	.000	.219	.001	.280	.432	.095
PRAI Sport	**.834**	1.000	**.342**	-.026	**.131**	.032	-.045	**-.131**
	.000	.	.000	.355	.029	.327	.260	.029
PRAI Health	**.804**	**.342**	1.000	-.064	**.239**	.037	.028	-.014
	.000	.000	.	.179	.000	.300	.343	.423
Infrequency	-.054	-.026	-.064	1.000	-.002	**-.137**	-.009	**.182**
	.219	.355	.179	.	.486	.026	.449	.004
Age	**.223**	**.131**	**.239**	-.002	1.000	**-.141**	-.075	**-.234**
	.001	.029	.000	.486	.	.023	.142	.000
Occupation	.041	.032	.037	**-.137**	**-.141**	1.000	**.117**	-.085
	.280	.327	.300	.026	.023	.	.048	.113
Risk Sports	-.012	-.045	.028	-.009	-.075	**.117**	1.000	.093
	.432	.260	.343	.449	.142	.048	.	.091
Knowledge	-.091	**-.131**	-.014	**.182**	**-.234**	-.085	.093	1.000
	.095	.029	.423	.004	.000	.113	.091	.

1-tailed Pearson Correlations, significant correlations ($p<.05$) are shown in bold for ease of interpretation. A significance level of .000 equates to $p < .0005$.

Hypothesis 2: Physical risk assessments are expected to increase with age, in other words a positive association (H_a2). The null hypothesis here is that no relationship between age and physical risk assessments is found (H_02).

For both males and females age was positively associated with the PRAI total scale and both the Health and Sports subscales. The correlations were small (ranging from .131 to .258), and yet were significant at the .05 level or higher, and most were significant at the .001 level. The results were highly significant for the total and Health scales for both males and females (correlations of .223 to .258, sig. <.001). Interestingly the correlations between age and the Sports subscale were the smallest

for both sexes (.131 for males, and .158 for females) although still moderately significant (sig. <.05). These results clearly show that physical risk assessments appear to be linked with age, therefore $H_0$2 can be rejected and H_a2 accepted subject to further conformation. Further investigation is required to check whether the stronger link with the Health subscale can also be replicated.

Hypothesis 3: The participation in high risk sports will be negatively associated with physical risk assessments (H_a3). Alternatively the null hypothesis is that there will be no relationship between high risk sports behaviour and physical risk assessments ($H_0$3).

The findings regarding a link between the participation in high risk sports and physical risk assessments are mixed yet generally negative. For male subjects there were no significant associations between high risk sports and the PRAI total scale or either of the subscales (p>.05) and the size of the correlations was extremely small (r = -.045 to .028). For females however there was a significant link with the Sports subscale (r = -.171, p<.01) and to a lesser extent the total scale (r = -.138, p<.05). The association between the participation in high risk sports and the Health subscale was not significant for either males or females, and there was even a small *positive* correlation in males (r = .028, p>.05). This suggests that there is no link with Health risk assessments and so $H_0$3 is partially supported. The fact that there were no significant correlations for males also lends support to $H_0$3. The small correlation with the Sports subscale found in females is the only important piece of evidence in favour of H_a3, and this finding alone prevents the provisional acceptance of $H_0$3. Further research is therefore necessary to check whether the association between the participation in high risk sports and the PRAI Sport subscale can be replicated in females, and whether this association remains exclusive to females. It might also prove useful to develop a more sophisticated measure of the participation in high risk behaviours in order to test for small associations of this kind.

Hypothesis 4: Physical risk assessments will be negatively associated with social desirability (H_a4). The null hypothesis is that there will be no association between physical risk assessments and social desirability.

The findings regarding a link between the PRAI and the ZKPQ Infrequency scale are clear. No significant correlations ($p>.05$) were found between the PRAI total scale or subscales and the Infrequency scale. The correlations were all exceedingly small (all $r<.1$), and one of the correlations was positive (with the Health subscale in females). Little support was therefore found for H_a4, and H_04 is therefore provisionally accepted, which provides support for the divergent validity of the PRAI.

Hypothesis 5: Knowledge of physical risk taking activities will be negatively associated with physical risk assessments (H_a5). Alternatively the null hypothesis is that there will be no association between physical risk assessments and knowledge of physical risk taking activities (H_05).

The results regarding a link between physical risk assessments and knowledge of physical risk taking activities are mixed. A significant negative correlation between the Sport subscale and knowledge was found for both males and females ($r = -.204$, $p<.01$ females; $r = -.131$, $p<.05$ males), which suggests a small but reasonably robust association. For the total scale the correlation was only significant for females ($r = -.187$, $p<.01$), and for the Health subscale none of the correlations were significant ($p>.05$). It seems reasonably apparent that people who are knowledgeable of physical risk taking activities tend to rate sporting risks to be lower (support for H_a5), and knowledge is relatively unrelated to the assessment of health risks (support for H_05).

Hypothesis 6: Occupation will be positively associated with physical risk assessments (H_a6). The null hypothesis is that physical risk assessments will be unrelated to occupation (H_06).

No significant (p>.05) correlations were found between occupation and any of the PRAI scales in males or females. This provides support for the null hypothesis ($H_0$6) and no support for the alternative hypothesis (H_a6). All of the correlations were very small (r <.1) and were both positive and negative, suggesting that there was not even a slight relationship. In short physical risk assessments appear to be completely independent of occupation.

Hypothesis 7: Females will in general assess physical risks to be higher than males (H_a7). The null hypothesis being that there is no relationship between sex (gender) and physical risk assessments.

Sex was clearly related to the assessment of Health risks (t=2.51, p<.05) which provides partial support for H_a7. However there was no significant (p>.05) association with Sport risks or the total scale which provides partial support for $H_0$7. Taken together these results suggest that Health risks may be associated with sex (support for H_a7), but Sport risks appear unrelated (support for $H_0$7).

7.5. General Discussion Of Results

Further research is needed to examine whether the 2 oblique factor structure of the PRAI can be further replicated (Objective 1). Such a replication would provide evidence for the factorial validity of the Health and Sport subscales, and allow us to become increasingly confident of the latent structure of physical risk assessments. It should be remembered however that separate analyses were conducted for males and females, and this means that the factor structure has already been replicated once. A two factor solution lends weight to Horvarth and Zuckerman's (1993) argument that risk assessments have a multifactorial latent structure. This finding is important and original in that it provides new information about the latent structure of physical risk assessments.

Importantly the internal reliability statistics for the PRAI total scale and each of the subscales were excellent for both males and females (alpha coefficients ranging

from .86 to .92). These values clearly exceed any minimum cut-off point, say the normal .7, or even a more stringent .8 as Hayes (2000a, 2000b) recommends. The extent to which these reliability results can be replicated is also of great interest, although it should be noted that Franken et al.'s (1992) highly similar Danger Assessment Questionnaire was also found to be very reliable (.86 for both males and females). The PRAI total scale appears to be more reliable than the Danger Assessment Questionnaire (.92 for females, .90 for males) and a replication of this result would lead to increased confidence that the PRAI represents an improvement over the Danger Assessment Questionnaire in terms of reliability (Objective 2).

It would be useful to standardise the PRAI although this was beyond the scope of the present study. The descriptive statistics for the PRAI scales do not constitute norms as such as the numbers involved would have to be far greater, however they could perhaps be used as a "rule of thumb" for the interpretation of individual results. The descriptive information presented here could be combined with the findings of future studies to produce more accurate normative data, and this could provide a useful area for future research. Further analyses are also necessary to replicate the findings of the present study and further investigate the construct validity of the PRAI.

There appeared to be no clear relationship between physical risk assessments and the participation in high risk sports (Objective 3). Although there was a significant negative association with Sports risk assessments for females, it was very small, and to some degree contradicted by a positive association with Health risk assessments for males. Clearly these results are inconclusive, yet they provide useful information for future researchers.

7.6. Summary

Physical risk assessments seem to be constituted by two moderately oblique factors that were identified by their items as "Sports" and "Health" factors; and factor loadings were used as the basis for the development of PRAI Sport and Health

subscales. Reliability statistics were excellent for the total scale and both subscales for both males and females, and crucially represented an increase in reliability over Franken et al.'s (1992) Danger Assessment Questionnaire. Correlations with the PRAI were mainly significant and in the predicted direction, although often confined to one subscale or sex. Straightforward findings included a positive association with age, and no association with either social desirability or occupation. Further research is necessary to examine whether these associations can be replicated, and examine the PRAI's relationship with a wider range of individual differences and behaviours.

Chapter 8.
STAGE 2 METHODOLOGY

8.1. Introduction

In this chapter the methodological approach adopted in the second main stage of the thesis is discussed. The primary aim of this stage was to investigate the nature of physical risk taking behaviours, and in order to do this a sophisticated way of measuring physical risk taking behaviours was sought. A number of behaviours relating to high risk sports and health risk behaviours were therefore selected according to a number of criteria (relating to the construct of risk taking behaviour) and incorporated in a "Physical Risk Behaviour Scale" or "PRBS". After piloting, the PRBS was then used to investigate the relationship between physical risk taking behaviours and a number of selected individual differences including Eysenck's broad dimensions of personality and physical risk assessments. The PRBS was also factor analysed in order to explore the factor structure of physical risk taking behaviours, and more specifically to test whether a similar ("Sport" and "Health") factor structure to the PRAI was obtained. This stage of the research was cross-sectional in design and took the form of a small-scale pilot study (the initial development of the PRBS), and a large-scale survey. A large number of specific hypotheses were made, and the overall approach is best described as hypothetico-deductive. That said an exploratory approach was adopted to investigate the latent structure of physical risk taking behaviours, and an open ended qualitative item was also used in order to provide information about the participants own motivations for taking or avoiding potentially fatal physical risks. Although the focus of this study is broadly nomothetic, the aim of the study was to investigate both the similarities and differences in the psychological profiles associated with different forms of risk taking behaviour.

8.2. Measuring Physical Risk Taking Behaviour

The nature of physical risk taking behaviours has been discussed elsewhere in considerable detail (see Chapter 2). However, it may be useful to recap the main points in order to fully appreciate what it is we are seeking to measure, and ultimately what it is we are trying to understand and explain. There are five main features of risk taking behaviours:

1. "Risk taking" may be conceptualised as a personality trait expressed through the participation in behaviours that contain a significant degree of risk.
2. "Significant" physical risk behaviour can be defined as behaviour that entails a relatively high probability of serious injury or death.
3. Risk taking is a matter of degree, a continuum rather than a dichotomy; it may be simpler to think of people as "risk takers" and "non-risk takers" but this an abstraction that may or may not be useful depending upon the circumstances. From a different perspective everyone is a risk taker, admittedly to differing degrees. The severity and frequency of risk taking behaviours may be relative to other people's behaviours rather than any objective benchmark or absolute function.
4. Risk taking behaviours must be voluntarily engaged in. This means that if someone is exposed to risk, they are not necessarily a risk taker. True risk taking is expressed in behaviours with a full awareness of the risks involved. Of course some but not all behaviours are assessed to be significantly risky.
5. People take differing risks in different areas of their lives, further research is needed to examine whether risk taking behaviours generalise to the degree that they can be treated as being functionally equivalent in psychological terms.

There are three main ways that risk taking behaviour is currently measured or quantified. Firstly groups are selected using different selection criteria, for example subjects who are known to participate in 'high' risk sports (such as rock climbing) can be contrasted with people who are known to participate in 'medium' or 'low'

risk sports (such as road running or rugby). This is probably the most common way of estimating people's risk taking behaviours, and the main advantage of this approach is that it provides a quick, relatively unambiguous and simple way of grouping people for comparison. The main disadvantages of this approach are that risk taking is a continuous (rather than dichotomous) variable, and that subjects may be taking risks that have not been allowed for in this rather specific way of gauging people's risk taking behaviours. A dichotomous measure of risk taking behaviour may be useful in certain circumstances because of its parsimonious nature, but in other contexts it oversimplifies the phenomena of interest and a considerable amount of information is lost in the measurement process. The fact that only a small number of risk taking behaviours are accounted for is a serious shortfall to such an approach, unless the participation in high risk behaviours is highly generalised.

Secondly people's intentions or willingness to participate in high risk activities are assessed, (often using the Sensation Seeking Scale V). The assumption here is that people's stated intentions are likely to correspond more or less accurately with their behaviour. The main advantage of this approach is that Zuckerman's SSS V is a reasonably short and well known and understood measure with considerable evidence of it's reliability and construct validity. The main problem with this approach is that people may exaggerate their willingness to engage in risky pursuits and high Sensation Seeking scores may often reflect high Social Desirability. This leads us to speculate that there might be a positive correlation between Sensation Seeking and Social Desirability. However, in reality there tends to be a small but significant *negative* correlation between Sensation Seeking and measures of Social Desirability (Zuckerman, 1994), suggesting that people who are high in Sensation Seeking tend to be less worried about what other people think and are more likely to be telling the truth. Perhaps a more serious shortfall with this approach is indicated by Zuckerman's (1994) work with the Sensation Seeking Scale VI which suggests that the correlation between people's intentions and actual behaviours is fairly high for the Disinhibition scale (r =.70 to .88), but only moderate for Thrill and Adventure scale (r =.44 to .58). Reasons for this discrepancy might include a lack of opportunity, financial considerations and social influences.

The third and arguably best way of estimating the extent of people's risk taking behaviours is to ask people to rate how often they have participated in a range of high risk activities. The main advantages of this approach are that they allow the risk taking behaviours of different individuals to be ordered along a continuum of risk taking extremity (from extremely low to extremely high risk taking). Often individual risk taking behaviours are treated as separate single item scales that are presumed to be related. Unfortunately very few studies have examined the extent to which these items are associated, and as a result whether these items are associated to the degree that they could form the basis of an internally consistent summative scale. One exception to this generalisation is Zuckerman's (1994) 128 item Sensation Seeking Scale VI (SSS VI), and more specifically the experience subscales. The SSS VI is based upon the Thrill and Adventure Seeking (TAS) and Disinhibition (Dis) subscales of the SSS V, and as such does not include measures of the other facets of Sensation Seeking (namely Experience Seeking and Boredom Susceptibility). Zuckerman only selected items relating to the TAS and Dis facets of Sensation Seeking because the corresponding scales had consistently proven to be more reliable than the ES and BS scales, the TAS and Dis facets seem to be the most diverse kinds of Sensation Seeking, and the BS scale especially does not translate very well into participative activities. In the SSS VI the same list of Sensation Seeking related activities is presented twice, the first time relates to people experiences, and subjects are asked to rate the number of times they have participated in each of the activities ("I have never done this", "I have done this once" or "I have done this more than once" scored on a 1 to 3 scale). The second time relates to people's intentions, where subjects are asked to rate the degree to which they are motivated to participate in each of the activities ("I have no desire to do this", "I have thought of doing this, but will probably not do it" or "I have thought of doing this and will do it if I have the chance." Scored on a 1 to 3 scale again).

The decision was made not to use the SSS VI in the present study despite its advantages (especially its theoretical and empirical pedigree). One theoretical reason

was the desire to use a measure of Sensation Seeking that did not refer to specific activities in order to address concerns with tautologous associations being produced (Slanger & Rudestam, 1997; Zuckerman, 1994). Another reason concerns the mixture of "social" and "health" related items in the SSS VI Dis scales, as it was considered desirable in this study to have as pure a measure of physical risk taking behaviours as possible. Other items (e.g. item 3 "running a marathon") seem more relevant to Sensation Seeking than risk taking as such and this limits the degree to which the SSS VI can be considered to be a specific measure of risk taking. The SSS VI also contains a number of items that are relatively uncommon (such as item 6 "walking a tightrope") and does not include more common activities such as rock climbing and kayaking. This may also explain the moderate reliability of the TAS experience scale (alpha coefficients of .62 to .66). From a practical point of view the SSS VI is also reasonably lengthy (128 items) and it was considered to be desirable to use a shorter scale that would be quicker to administrate and less off-putting to potential subjects when combined with a large number of additional measures (such as personality and demographic items). It also contains items that seem more appropriate for use with North American subjects (e.g. item 51 "backpacking in the wilderness (U.S.A.)"). Preliminary norms are presented by Zuckerman (1994) although these are based upon a small sample (74 males and 192 females) of American undergraduate students. Preliminary norms may be useful, although they may be misleading, and it is difficult to know the extent of their relevance to the British adult population. Many of these limitations obviously stem from the fact that the SSS VI is not a measure of physical risk taking as such and was never designed to be, rather it is a measure of the two main Sensation Seeking facets that are in turn related to risk taking behaviours. These comments are not so much criticisms of the SSS VI as such; rather they represent the limitations of the measure in accomplishing the aims of the present study. In the light of these findings it became clear that it would be both necessary and desirable to develop a measure of physical risk taking behaviours for use in the present and future studies.

8.3. Initial Development Of The Physical Risk Behaviour Scale

The Physical Risk Behaviour Scale (PRBS) was developed in an attempt to address the need for a way of measuring the participation in physical risk taking behaviours. The PRBS was developed to incorporate 22 behaviours that are associated with the participation in high risk sports and high risk health behaviours. The PRBS can therefore be used as a measure of people's physical risk taking behaviours in studies concerned with the comprehension, conceptualisation and prediction of behaviours which contain a significant likelihood of serious injury or death. It offers a number of advantages over existing measures including the fact that it is specifically developed to measure physical risk taking behaviours, and it is relatively short, convenient and straightforward to use. To future researchers it also constitutes a measure that can be used free of charge, can be easily obtained (in Appendix C), and does not require expensive or time consuming training.

The preliminary pool of items for the PRBS was drawn from a large number of sources. As we have seen physical risk taking behaviours can be classified as behaviours which are freely engaged in, are perceived to contain a significant degree of risk, and a relatively high probability of serious injury or death. 'Activities' such as natural disasters and certain occupational risks were therefore excluded as potential items because they are not voluntarily engaged in. A number of activities are suggested to be (high) physical risk behaviours in the specialised psychological literature, examples of are given below in Table 25:

Table 25

Behaviours Proposed To Contain Significant Physical Risk

Authors	Proposed Physical Risk Behaviours
Chirivella & Martinez (1994)	Sports (climbing, pot-holing, mountaineering, motorcycling, parachuting, puenting-bungee-diving,

	rafting, deep sea diving).
Zuckerman (1994)	Sports (parachuting, hang gliding, canoeing, auto racing, mountain climbing, scuba diving, gun shooting, skiing, climbing, sailing), driving (speeding, passing other cars with limited visibility, drink driving, motorcycle riding, accidents, seat belt use, convictions for driving offences), injuries (sporting and non-sporting), sexual behaviour (large number of partners, unprotected sex), drug use (smoking, drinking, illegal drugs).
Cogan & Brown (1999)	Sports (mountain climbing, sky diving, parachute jumping, extreme skiing and snowboarding), injuries (sporting).
Kraft & Rise (1994)	Health (smoking, alcohol consumption, coital experience, number of partners, experience of casual sex, contraception use).
Newcomb & McGee (1991)	Drug use (alcohol, smoking, cannabis, "hard drugs" e.g. cocaine), sexual behaviours (getting pregnant or getting someone else pregnant, contracting a venereal disease, having homosexual experiences, having heterosexual experiences).

In the first main stage of the current research project most subjects completing the PRAI rated a number of activities to be of above "moderate physical risk". These items effectively provide a guide to selected behaviours that are assessed to be highly risky to the average participant. Table 26 illustrates which behaviours were rated as being high risk (mean ratings of >4) or extreme risk (mean ratings of >5):

Table 26

Behaviours Assessed To Contain Above "Moderate" Levels Of Physical Risk

Mean Physical Risk Assessment	Behaviour
"High risk behaviours"	Mountain climbing, parachute jumping, skiing fast down a mountain, being sexually promiscuous, heavy drinking, rock climbing, hang gliding, using hallucinogenic drugs, white water kayaking, using illegal stimulants, smoking cigarettes, having unprotected sex, and using cocaine.
"Extreme risk behaviours"	Driving recklessly, driving after drinking alcohol, and using heroine.

A number of statistical sources were also consulted in order to estimate which behaviours are relatively common in western societies, and which activities commonly lead to serious accidents and fatalities. Estimates of number of injuries or fatalities per hour of participation were especially useful to help estimate which activities contain a significant or above average degree of risk. A reasonably consistent picture of what behaviours are relatively common, freely engaged in, seen to contain a significant degree of risk, and lead to serious injuries or death relatively frequently became apparent. As a result 18 items were included that appeared to include the most common and risky behaviours (e.g. item 8 "been motor cycling").

In addition 2 items were included that related to the number of injuries received in sporting and non-sporting contexts; and a further 2 items were included that referred specifically to the number of times the subject had chosen to take a potentially fatal risk in sporting and non-sporting contexts. A full list of the items is provided in Table 27 below:

Table 27

Items Included In The Physical Risk Behaviour Scale

Risk Behaviour Category	PRBS Item
Sports – Air	3. Been parachute jumping
	21. Been hang gliding
Sports – Land	10. Been mountain climbing
	17. Participated in motor sports
	1. Been rock climbing
	8. Been motor cycling
	5. Been alpine / downhill skiing
Sports – Water	19. Been deep sea diving
	15. Been white water kayaking / canoeing
Sports – Miscellaneous	12. Had a serious sporting injury (e.g. a broken bone)
	16. Chosen to take a potentially fatal risk in a sporting context
Health – Sexual	18. Had sexual intercourse with a person other than your current (or most recent) partner
	13. Had unprotected sex

Health – Driving	6. Had a speeding ticket or fine
	14. Been involved in a traffic accident
Health – Drugs	2. Smoked tobacco
	4. Had a hangover due to alcohol consumption
	11. Taken illegal drugs (excluding marijuana)
	7. Been physically sick due to alcohol consumption
Health – Miscellaneous	20. Been involved in a fight
	22. Had a serious non-sporting injury (e.g. a broken bone)
	9. Chosen to take a potentially fatal risk in a non-sporting context

At this stage both sport and health psychologists were consulted regarding the content validity of individual items and the overall clarity and comprehensibility of the layout and instructions. A 5-point scale was adopted ranging from 0 ("Never" having participated in the behaviour) to 4 (participated in the behaviour "11+ times in the past 12 months"). The 5-point scale was adopted as a compromise between the possible increases in reliability associated with a larger number of options (Kline, 2000a), and the added simplicity of a smaller number of options.

A trial version of the PRBS was then administered to 7 British females and 5 British males (a convenience sample of psychology postgraduate students) who were asked to fill in the PRBS and explain why they answered in the way that they did, their reasons for their answers, and their own interpretation of what the instructions meant. This initial piloting stage helped to identify early flaws, develop the overall format, provide an estimate of how long the measure takes to administer, test for demand characteristics, and explore the overall usefulness of the inventory (Clark-Carter, 1997). Problems with this initial draft included 2 items that were ambiguously phrased, poorly worded and difficult to interpret. The pilot sample also

provided alternative ways of phrasing these 'problem' items and the PRBS was revised in the light of their suggestions. Once the PRBS had been piloted it then became desirable to administer the measure to a large number of subjects in order to investigate its relationship with a broad range of individual differences.

8.4. Aim

The primary aim of this study is to investigate the nature of physical risk taking.

8.5. Objectives

1. To investigate the associations between different physical risk taking behaviours and their underlying factor structure.
2. To further investigate the reliability and validity of the PRAI.
3. To investigate the usefulness of individual differences in the prediction and interpretation of physical risk taking behaviours.
4. To investigate the usefulness of individual differences in the prediction and interpretation of the willingness to take risks.

8.6. Hypotheses

Due to the large number of hypotheses in this section, hypotheses are grouped according to the objective they correspond to

Hypotheses related to Objective 1

1. When factor analysed, different types of physical risk taking behaviour are likely to cluster together and form a single meaningful factor (H_a1a) or more than one oblique factor (H_a1b). The null hypothesis being that physical risk taking behaviours are unrelated in factor analyses and do not form any meaningful factors (H_01).

Hypotheses related to Objective 2

2. Physical risk taking behaviours are thought to decrease with age (H_a2). The null hypothesis is that there is no relationship between age and physical risk taking behaviours.
3. Physical risk taking behaviours will be negatively associated with sports risk assessments (H_a3). The null hypothesis being that physical risk taking behaviours will be unrelated to sports risk assessments ($H_0 3$).
4. Physical risk taking behaviours will be negatively associated with health risk assessments (H_a4). The null hypothesis here being that physical risk taking behaviours will be unrelated to health risk assessments ($H_0 4$).
5. Physical risk taking behaviours will be positively associated with attitudes towards physical risk (H_a5). The null hypothesis is that physical risk taking behaviours will be unrelated to attitudes towards physical risk ($H_0 5$).
6. Physical risk taking behaviours will be positively associated with attitudes towards social risk (H_a6). The null hypothesis is that physical risk taking behaviours will be unrelated to attitudes towards social risk ($H_0 6$).
7. Physical risk taking behaviours will be positively associated with Impulsivity (H_a7). The null hypothesis being that physical risk taking behaviours will be unrelated to Impulsivity ($H_0 7$).
8. Physical risk taking behaviours will be positively associated with Sensation Seeking (H_a8). The null hypothesis being that physical risk taking behaviours will be unrelated to Sensation Seeking ($H_0 8$).
9. Physical risk taking behaviours will be positively associated with Extraversion (H_a9). The null hypothesis is that physical risk taking behaviours will be unrelated to Extraversion ($H_0 9$).
10. Health related physical risk taking behaviours are thought to be positively associated with Neuroticism ($H_a 10a$), whereas the participation in high risk sports appears to be negatively associated with Neuroticism ($H_a 10b$). The null hypothesis is that physical risk taking behaviours will be unrelated to Neuroticism ($H_0 10$).

11. Physical risk taking behaviours will be positively associated with Psychoticism (H_a11). The null hypothesis being that physical risk taking behaviours will be unrelated to Psychoticism (H_011).
12. Sports related physical risk taking behaviours are thought to be negatively associated to social desirability (H_a12a), whereas the participation in health related physical risk behaviours appears to be positively associated with social desirability (H_a12b). The null hypothesis is that physical risk taking behaviours will be unrelated to social desirability (H_012).
13. Physical risk taking behaviours will be positively associated with Addictiveness (H_a13). The null hypothesis being that physical risk taking behaviours will be unrelated to Addictiveness (H_013).
14. Physical risk taking behaviours will be positively associated with Criminality (H_a14). The null hypothesis here is that physical risk taking behaviours will be unrelated to Criminality (H_014).
15. Physical risk taking behaviours will be positively associated with confidence (H_a15). The null hypothesis is that physical risk taking behaviours will be unrelated to confidence (H_015).
16. Sports related physical risk taking behaviours will be positively associated with occupation (H_a16a), whereas health related physical risk taking behaviours will be negatively associated with occupation (H_a16b). The null hypothesis being that physical risk taking behaviours will be unrelated to occupation (H_016).
17. Sports related physical risk taking behaviours will be positively associated with education (H_a17a), whereas health related physical risk taking behaviours will be negatively associated with education (H_a17b). The null hypothesis is that physical risk taking behaviours will be unrelated to education (H_017).
18. Physical risk taking behaviours will be positively associated with peer behaviour (H_a18). The null hypothesis being that physical risk taking behaviours will be unrelated to peer behaviour (H_018).

19. Physical risk taking behaviours will be positively associated with being male (H_a19). The null hypothesis here is that physical risk taking behaviours will be unrelated to sex (gender) (H_019).

Hypotheses Related To Objective 3

20. The willingness to take risks will be negatively associated with age (H_a20). Alternatively the null hypothesis predicts that the willingness to take risks will be unrelated to age (H_020).
21. The willingness to take risks will be negatively associated with sports risk assessments (H_a21). The null hypothesis is that the willingness to take risks will be unrelated to sports risk assessments (H_021).
22. The willingness to take risks will be negatively associated with health risk assessments (H_a22). The null hypothesis being that the willingness to take risks will be unrelated to health risk assessments (H_022).
23. The willingness to take risks will be positively associated with physical risk taking behaviours (H_a23). On the other hand the null hypothesis predicts that the willingness to take risks will be unrelated to physical risk taking behaviours (H_023).
24. The willingness to take risks will be positively associated with Impulsivity (H_a24). The null hypothesis is that the willingness to take risks will be unrelated to Impulsivity (H_024).
25. The willingness to take risks will be positively associated with Sensation Seeking (H_a25). The null hypothesis here is that the willingness to take risks will be unrelated to Sensation Seeking (H_025).
26. The willingness to take risks will be positively associated with Extraversion (H_a26). The null hypothesis is that the willingness to take risks will be unrelated to Extraversion (H_026).
27. The willingness to take social risks will be positively associated with Neuroticism (H_a27a), whereas the willingness to take physical risks will be negatively associated with Neuroticism (H_a27b). The null hypothesis is that the willingness to take risks will be unrelated to Neuroticism (H_027).

28. The willingness to take risks will be positively associated with Psychoticism (H_a28). The null hypothesis is that the willingness to take risks will be unrelated to Psychoticism ($H_0 28$).
29. The willingness to take risks will be negatively associated with social desirability (H_a29). The null hypothesis being that the willingness to take risks will be unrelated to social desirability ($H_0 29$).
30. The willingness to take risks will be positively associated with Addictiveness (H_a30). The null hypothesis is that the willingness to take risks will be unrelated to Addictiveness ($H_0 30$).
31. The willingness to take risks will be positively associated with Criminality (H_a31). Alternatively the null hypothesis predicts that the willingness to take risks will be unrelated to Criminality ($H_0 31$).
32. The willingness to take risks will be positively associated with confidence (H_a32). The null hypothesis is that the willingness to take risks will be unrelated to confidence ($H_0 32$).
33. The willingness to take physical risks will be positively associated with occupation (H_a33a), whereas the willingness to take social risks will be negatively associated with occupation (H_a33b). The null hypothesis is that the willingness to take risks will be unrelated to occupation ($H_0 33$).
34. The willingness to take physical risks will be positively associated with education (H_a34a), alternatively the willingness to take social risks will be negatively associated with education (H_a34b). The null hypothesis being that the willingness to take risks will be unrelated to education ($H_0 34$).
35. The willingness to take risks will be positively associated with peer behaviour (H_a35). The null hypothesis is that the willingness to take risks will be unrelated to peer behaviour ($H_0 35$).
36. The willingness to take risks will be associated with being male (H_a36). The null hypothesis here being that the willingness to take risks will be unrelated to sex (gender) ($H_0 36$).

Hypotheses Related To Objective 4

37. Physical risk assessments will be positively associated with age (H_a37). The null hypothesis is that physical risk assessments will be unrelated to age ($H_0 37$).
38. Physical risk assessments will be negatively associated with attitudes towards physical risk (H_a38). Alternatively the null hypothesis predicts that physical risk assessments will be unrelated to attitudes towards physical risk ($H_0 38$).
39. Physical risk assessments will be negatively associated with attitudes towards social risk (H_a39). Te null hypothesis is that physical risk assessments will be unrelated to attitudes towards social risk ($H_0 39$).
40. Physical risk assessments will be negatively associated with Impulsivity (H_a40). The null hypothesis here is that physical risk assessments will be unrelated to Impulsivity ($H_0 40$).
41. Physical risk assessments will be negatively associated with Sensation Seeking (H_a41). The null hypothesis is that physical risk assessments will be unrelated to Sensation Seeking ($H_0 41$).
42. Physical risk assessments will be negatively associated with Extraversion (H_a42). The null hypothesis being that physical risk assessments will be unrelated to Extraversion ($H_0 42$).
43. Physical risk assessments will be negatively associated with Neuroticism (H_a43). The null hypothesis predicts that physical risk assessments will be unrelated to Neuroticism ($H_0 43$).
44. Physical risk assessments will be negatively associated with Psychoticism (H_a44). The null hypothesis is that physical risk assessments will be unrelated to Psychoticism ($H_0 44$).
45. Physical risk assessments will be positively associated with social desirability (H_a45). The null hypothesis being that physical risk assessments will be unrelated to social desirability ($H_0 45$).

46. Physical risk assessments will be negatively associated with Addictiveness (H_a46). Alternatively the null hypothesis predicts that physical risk assessments will be unrelated to Addictiveness ($H_0 46$).
47. Physical risk assessments will be negatively associated with Criminality (H_a47). The null hypothesis being that physical risk assessments will be unrelated to Criminality ($H_0 47$).
48. Physical risk assessments will be negatively associated with confidence (H_a48). The null hypothesis here is that physical risk assessments will be unrelated to confidence ($H_0 48$).
49. Physical risk assessments will be positively associated with occupation (H_a49). The null hypothesis being that physical risk assessments will be unrelated to occupation ($H_0 49$).
50. Physical risk assessments will be positively associated with education (H_a50). The null hypothesis is that physical risk assessments will be unrelated to education ($H_0 50$).
51. Physical risk assessments will be negatively associated with peer behaviour (H_a51). The null hypothesis here being that physical risk assessments will be unrelated to peer behaviour ($H_0 51$).
52. High physical risk assessments will be associated with being female (H_a52). Alternatively the alternative hypothesis predicts that physical risk assessments will be unrelated to sex (gender) ($H_0 52$).

8.7. Sample And Procedures

The respondents were 113 adults, 94.7% of whom were British in nationality. 71 subjects were male aged between 16 and 73 (M = 38.65, SD = 12.88), and 42 subjects were female aged between 17 and 76 (M = 38.55, SD = 13.82). Subjects were recruited from a telecommunications company, an orienteering club, a financial services company, a job centre, a white water kayaking club, a fire station, a university, a mountaineering club, and a police station. 1 subject was currently unemployed (0.9%), 8 subjects were skilled manual workers (7.1%), 10 subjects were clerical or administrative workers (8.8%), 39 subjects were junior professionals

(34.5%), 42 subjects were professionals (37.2%), 2 subjects were senior professionals (1.8%), and 11 subjects were students (9.7%). Questionnaires were mainly administered in small groups although subjects were allowed to take the questionnaires away with them for postal return if they preferred (14 subjects). All subjects were given the option of receiving individual feedback upon request. Subjects were briefly told of the nature of the questions to be asked and that participation was anonymous and entirely voluntary. 113 of 128 subjects agreed to participate, and a response rate of 88% was obtained.

8.8. Measures

8.8.1. Eysenck and Eysenck's (1996) Eysenck Personality Questionnaire-Revised

The 106-item Revised Eysenck Personality Questionnaire (EPQ-R) is dichotomously scored and provides a measure of the main dimensions of personality, namely Neuroticism (N), Extraversion (E) and to a lesser extent Psychoticism (P). These broad second order traits were conceived in this study as factor markers to help identify other psychometric tests and risk taking behaviours within factor space. The EPQ-R also contains a Lie scale (L) measuring social desirability, and Addiction (A) and Criminality (C) scales that measure a disposition towards those behaviours. The reliabilities of all of these scales are very good (alpha coefficients and test-retest reliabilities of >.75 for all scales) and a large amount of construct validity information exists (Eysenck & Eysenck, 1996). One criticism of the EPQ-R and a 'Big Three' model of personality is that three second order factors may be too broad a description of personality for certain needs (e.g. occupational selection). The counterpoint is to argue, as Eysenck did, that narrower descriptions of personality (i.e. first order traits) are in danger of becoming nothing more than what Cattell called 'bloated specifics', that is items that are only related to each other by semantic similarity rather than an underlying personality dimension. In this study the decision was made to use the EPQ-R as a well understood and reasonably concise measure of the main dimensions of personality, and to compliment this with additional information from scales that measure variables that are thought to be

especially relevant to physical risk taking behaviours (especially the first order traits of Impulsivity, Sensation Seeking and the willingness to take risks).

8.8.2. Zuckerman and Kuhlman's (2001) ZKPQ Impulsive-Sensation Seeking Scale

The 19-item Imp-SS is dichotomously scored and measures two narrow or first order traits which can be combined as a total scale to form a second order trait. Impulsivity and Sensation Seeking can also be measured separately using 8 item Impulsivity (Imp) facet scale, and the 11 item Sensation Seeking (SS) facet scale. Reliabilities for these scales are acceptable although low for the Imp facet scale (alpha coefficients, Total = .77 to .81, Sensation Seeking facet scale = .74 to .77, Impulsivity facet scale = .64 to .68). A number of validity studies have been conducted although no studies have yet examined its relationship with the participation in high risk sports (Zuckerman & Kuhlman, 2001; Zuckerman, M., personal communication, January 25, 2002).

8.8.3. Franken et al.'s (1992) Attitudes Towards Risk Questionnaire

The 10-item ATRQ measures attitudes towards physical and social risks. There are two subscales, a Physical Risk subscale (5 items) and a Psychological (social) Risk subscale (5 items). All items are scored using a 5-point scale ranging from 1 "Not Like Me" to 5 "Like Me". Reliabilities for the Total scale and two subscales are high (alpha coefficients, Total = .84, Psychological risks subscale = .79, Physical risk subscale = .85). Franken et al.'s (1992) study provides factorial and convergent validity information.

8.8.4. Physical Risk Assessment Inventory

The 27-item Physical Risk Assessment Inventory (PRAI) measures how risky people assess a variety of health and sporting behaviours to be in terms of their level of physical risk for the average participant. Responses are scored from 0 ("No

Physical Risk") to 6 ("Extreme Physical Risk"). There are two subscales to the PRAI, a Health Risk subscale (13 items) e.g. item 16 "Smoking cigarettes", and a Sports Risk subscale (14 items) e.g. item 11 "Rock climbing". Reliabilities are high for the Total scale and two subscales for both males and females (alpha coefficients ranging from .86 to .92). Initial validity evidence was provided in the first main study of the present paper, which demonstrated factorial invariance between sexes and concurrent validity in the form of predicted associations with demographic variables.

8.8.5. Behavioural Measures

Rather than assign subjects to groups of 'risk takers' and 'controls' all subjects were conceptualised as risk takers (to varying degrees), and physical risk taking behaviour as a continuous and possibly complex variable. The 22 item Physical Risk Behaviour Scale (PRBS) was therefore constructed to measure subject's engagement with a range of physical risk taking behaviours. Behaviours were included in the inventory where there was evidence for (1.) the relative frequency of these behaviours within developed countries, (2.) evidence of fatalities associated with voluntary participation, (3.) high levels of perceived risk, and (4) the classification as "high risk behaviours" within the specialised psychological literature. Behaviours were also selected to represent a range of different health and sporting activities. For each item frequency of participation responses are scored on a 5-point Likert style scale ranging from 0 ("Never") to 4 ("11+ Times In The Past 12 Months").

8.8.6. Other Measures

A single item measure of each subject's confidence in their own ability to manage potentially fatal risks in general was included, incorporating a 4-point scale ranging from 0 ("Not at all confident") to 3 ("Extremely confident"). Subjects were asked to estimate how many of their friends choose to take potentially fatal risks on a single item 5-point scale ranging from 0 ("None / 0%") to 4 ("The majority / 60-100%"). A single open answer qualitative item asked why subjects were motivated to take or

avoid potentially fatal risks. In addition 5 demographic items were included relating to primary occupation, nationality, age, sex, and highest educational level. Occupation was quantified using a scale of 0 to 6 where 0 = unemployed, 1 = unskilled manual, 2= skilled manual, 3= clerical/administrative, 4 = junior professional, 5 = professional, and 6 = senior professional.

8.9. Data Analyses

The data analysis in this study is comprised of 8 stages: (1.) The factor structure of the Imp-SS scale, ATRQ and PRAI was investigated in order to test the validity of both total scales and subscales with the current sample. This was especially important with the Imp-SS and ATRQ measures which were validated for use with North American populations. (2.) The factor structure of the PRBS was then examined to explore which if any behaviours cluster together and whether a total score, subscales or individual behavioural measures were most appropriate. (3.) Descriptive and reliability statistics were then calculated for all measures. (4.) Pearson correlations were calculated to explore the relationships between all variables. (5.) Exploratory factor analyses were conducted to see whether a small number of factors account for much of the variance in the initial correlation matrix. (6.) Pearson correlations between factor scores and excluded variables (e.g. total scores) were also computed to further clarify the nature of each factor. (7.) Linear regression analyses were used to indicate which variables provided the best predictors of physical risk behaviours and the willingness to take risks. And lastly (8.) qualitative data were analysed using an inductive content analysis. S.P.S.S. version 9 was again used for all stages of the quantitative data analysis. One-tailed statistical tests were used unless otherwise indicated, as the alternative hypotheses were directional (Coolican, 1999).

Prior to the analysis all quantitative variables were examined for the accuracy of data entry, missing values and the degree to which they satisfied the assumptions of multivariate analysis. There were 36 missing values, which appeared to be randomly distributed. No single variables exhibited a large number of missing values (<4%).

Missing values were replaced using expectation maximization (EM) method with multiple imputations (as recommended by Tabachnick & Fidell, 2001). Analyses were repeated without missing values and the results were found to be virtually identical. Two cases with very low z scores on both of the PRAI subscales were identified as univariate outliers; Another case had a very high z score on the EPQ-R Psychoticism scale. For all three cases raw scores were adjusted to around the limit of deviancy expected with 113 subjects (standardised scores of 3.29, $p<.001$, two-tailed test). No cases were identified through Manahoblis distance as multivariate outliers ($p<.001$). In this stage analyses were not conducted separately for each sex as in the first main stage for two main reasons, firstly the number of female subjects would have lead to low statistical power, and secondly sex did not emerge as an especially important variable in further analyses (including regression and factor analyses).

The qualitative data provided a rich source of information regarding the subject's own subjective interpretation of their own motivations for taking or avoiding potentially fatal risks. After the author became thoroughly familiar with the content of each answer, lower order themes were identified that corresponded closely with the raw data using inductive content analysis (Marshall & Rossman, 1999). A hierarchy of responses was then created when lower order themes themselves were grouped into higher order themes that were broader in scope. Frequency analysis was used in order to identify the relative importance of themes, and direct quotes that were particularly salient were used for illustrative purposes (Banister, Burman, Parker, Taylor, & Tindall, 1994).

8.10. Limitations

There may have been volunteer characteristics as the subjects were all volunteers and as such were self-selecting. The relatively high response rate of 88% limits the extent to which this can be considered to be an important limitation in the present study. Risk behaviours are likely to vary over time, and as this research was not longitudinal there is no opportunity to examine how variables co-vary over time.

That said the PRBS does take into account past risk taking behaviours. Directional hypotheses were again used and this may have introduced demand characteristics to the study. Possible exceptions to this include the qualitative item that concerns an individual's motivation to take or avoid potentially fatal risks and the investigation of the factor structure of the PRBS, which both have a more exploratory focus. Further research is needed to investigate how physical risk taking behaviours are related to an alternative set of measurement instruments and/or psychological constructs (depending upon your theoretical orientation). Further research will be necessary to replicate many of the significant findings of this stage. That said some of the relationships with the PRAI have already been investigated in the first main stage of the present paper (e.g. with demographic variables such as age), and if the same results were found in this stage they will have been replicated. The PRBS incorporates different kinds of physical risk taking behaviour, but other types of non-physical risk taking behaviour (e.g. financial or criminal) were not included. Further investigation is needed to examine how physical risk taking behaviours are related to other types of risk taking behaviours. It is controversial debateable if occupations can be ranked in the way in which they were in this study, and some theorists would consider it to be a nominal variable rather than ordinal or interval. This means that care must be exercised when interpreting the results of analyses (e.g. regression) which include occupation, and make statistical assumptions about the variables incorporated. Most participants were British in this stage and the first main data collection stage, and it is not known how these results will generalise to other cultures. Further cross cultural research is necessary to investigate whether the present results are peculiar to the British population. The interpretative nature of the qualitative data analysis may be particularly prone to inferential bias. However qualitative and quantitative methodologies generally suffer from different limitations, and the use of both approaches effectively constitutes one of the strengths of the research design.

8.11. Ethical Considerations

The potential dangers of the current research stage to participants were considered in the planning stage, and in this case were psychological and social. A literature review of this area generated information about potential problems and ethical difficulties in this area. Participants gave their consent to participate with an awareness of the overall aims and objectives of the study, but no knowledge of specific hypotheses or the nature of individual measures as this may have affected the outcome. The participants were fully aware that all of the information that they divulged would be strictly confidential, and subjects had the right to withdraw from the study at any time and refuse any information given up to that point without justifying their actions (Eysenck, 2000). The participants were informed that they would be debriefed at the end of the study, and they were given the chance to review the findings of the study and/or receive individual feedback. A summary of the research findings was also made available via the internet. A detailed research proposal was submitted to the Scottish School of Sports Studies departmental ethics committee at the University of Strathclyde, and subsequently approved.

8.12. Summary

In order to investigate the nature of physical risk taking behaviour further the decision was made to develop a new measure of physical risk taking behaviours, namely the Physical Risk Behaviour Scale (PRBS). Following a review of the nature of risk taking and risk taking behaviours, 22 items were selected that were classified as high risk behaviours in the specialised psychological literature, were associated with high physical risk assessments, are voluntarily engaged in, and were also associated with a relatively high probability of serious injury or death. After consulting both health and sports psychologists the PRBS was piloted with a convenience sample of 12 postgraduate psychology students, and a number of revisions were made. The main aim of the second data collection stage was to investigate the nature of physical risk taking, and a large number of specific hypotheses were formulated. This stage also allowed the opportunity to further

investigate the reliability and validity of the PRAI. A questionnaire pack including the Physical Risk Behaviour Scale (PRBS), the Eysenck Personality Questionnaire - Revised (EPQ-R), the Zuckerman Kuhlman Personality Questionnaire Impulsivity - Sensation Seeking scale (Imp-SS), the Attitudes Towards Risk Questionnaire (ATRQ) and Physical Risk Assessment Inventory (PRAI) was therefore administered to 113 adult subjects. The data analysis incorporated the extensive use of bivariate correlations, factor analyses, linear regression analyses, descriptive statistics, reliability statistics, and a qualitative inductive content analysis. Several limitations with this stage were discussed, and a review of the salient ethical considerations was given.

Chapter 9.
STAGE 2 RESULTS AND DISCUSSION OF RESULTS

9.1. Introduction

In this chapter the results for the second main stage are presented, that is the stage that aims to investigate the nature of physical risk taking. The data are analysed in seven main results sections, namely: (1.) The factor structure of the ZKPQ Impulsive – Sensation Seeking scale (Imp-SS), Attitudes Towards Risk Questionnaire (ATRQ) and Physical Risk Assessment Inventory (PRAI). (2.) The factor structure of the physical risk taking behaviours (measured by the PRBS). (3.) Descriptive statistics. (4.) Interscale correlations. (5.) Factor analysis of interscale correlations. (6.) Multiple regression analyses. (7.) Qualitative motivational data. Within these sections data is presented as it relates to each objective where it makes sense to do so (e.g. when dealing with interscale correlations), and collectively when it would be artificial to present separate results (e.g. factor analyses including all measures). A substantial discussion of these results is presented in relation to the meaning and significance of each stage of the data analysis, and secondly a more general discussion that relates to the relevance of these findings to each objective. Where specific hypotheses are relevant they are included and discussed in relation to whether the empirical evidence provides support for the alternative hypothesis, and whether or not we can confidently reject the null hypothesis. A summary section also provides an overview of the main findings and their significance.

9.2. The Factor Structure Of The Imp-SS, ATRQ And PRAI

As the Imp-SS, ATRQ and PRAI were all originally developed using factor analytic techniques the factor structure of these measures was investigated in order to test their factorial validity. The Imp-SS and ATRQ have been initially developed with North American subjects, and it is a priority to establish their suitability for use with a mainly British sample. In other words this section analyses the cross-cultural

replication of the proposed Imp-SS and ATRQ factor structures. It was also important to investigate the factor structure of the PRAI as it is a new measure (developed in the first main stage of this paper), and a further analysis of its hypothesised latent structure would provide additional evidence regarding its validity. The three measures are all thought to be underpinned by 2 oblique factors that correspond to their 2 correlated subscales. It was important therefore to decide whether a 2-factor solution is optimal in each case, and if so to investigate how many of the items correspond with their correct factors.

A number of different criteria were used in order to decide what number of factors should be extracted for each measure, and as would be expected, they produced differing estimates as to how many factors should be extracted. A Kaiser-Guttman test estimates the number of factors to extract from the number of eigenvalues exceeding unity (>1), as a factor must account for more variance than a single variable to be of any importance (Kline, 2000b). However the Kaiser-Guttman test suffers from many problems including perhaps most importantly a sensitivity to the number of variables in the analysis (Cooper, 1998). Cattell (1978) has shown that in large matrices the Kaiser-Gutman test tends to greatly overestimate the number of factors. Stevens (1996) recommends the use of the Kaiser-Guttman test when the number of variables is less than 30 and the mean communality is greater than 0.70, or when the number of subjects is greater than 250 and the mean communality is greater than or equal to 0.60. In this case the number of variables does not exceed 30 (the number of items in each scale) but the mean communalities do not exceed 0.70, the number of subjects do not exceed 250 either, and as such it is clear that the Kaiser-Guttman test may provide a poor estimate of the number of factors to be extracted according to Stevens' (1996) criteria. A Cattelian (1966) scree test is also based on the eigenvalues of factors, but is slightly more sophisticated in that it is the relative importance of the eigenvalues that is of interest and so it is less sensitive to the number of variables in the analysis.

A maximum likelihood factor analysis was also conducted because it provides a convenient statistical test for the number of factors to be extracted. This technique

involves the inspection of the residual correlation matrix in order to test whether any of the remaining correlations are significant. If significant correlations remain then it is a statistically valid procedure to extract more factors in order to account for the variance. Of course this is no guarantee that any of the extracted factors are indeed meaningful, and as such the maximum likelihood test provides an upper bound estimate of the number of factors that can be legitimately extracted. In theory this is a preferable procedure to a scree test as it is more objective, however in practice there is normally a close agreement between the two techniques (Kline, 1994). One limitation of the maximum likelihood approach however, is that it can prove unreliable with small samples, and huge samples (>1000) are often suggested to be necessary for reliable results (Kline, 2000a, 2000b).

Lastly, Loewenthal (1996) recommends extracting only those factors that account for at least 8% of the variance, for largely pragmatic reasons. However the obvious limitation of this approach is that the size of 'important' factors will partly depend upon the nature of the phenomenon that you are investigating (Tabachnick & Fidell, 2001). In the case of test development or validation we are only interested in large and robust factors, and it is reasonable to expect that a total scale or a small number of subscales would account for at least 8% of the variance each. In this study a slightly stricter criterion of >10% variance was applied in order to help ensure that trivial factors were not extracted.

Table 28 shows how many factors should be extracted for each measure according to a number of different criteria.

TABLE 28

The Number Of Factors To Be Extracted

Measure	Extraction Criteria			
	Eigenvalues > 1	Scree test	Maximum likelihood	Factors >10% variance
Imp-SS	6	2	3	2
ATRQ	2	2	3	2
PRAI	7	2	7	2

For each of the scales a 2-factor solution appeared viable. Following these initial analyses, and for each measure, 2 factors were extracted and subjected to Direct Oblimin rotation (as recommended by Kline [2000] and Cooper [1998] for oblique solutions).

With the Imp-SS a 2-factor solution accounted for 35% of the total variance. Items were most clearly identified when factors were allowed to correlate very highly (r = .329; delta = 0.4), in which case 18 out of 19 items had their highest loadings on the expected factors (item 50 "I tend to change interests frequently" did not). Mean loading (pattern matrix) of Sensation Seeking items on factor 1 = 0.49, mean factor loading of Impulsivity items on factor 2 = 0.46. All loadings were significant (>.3) except item 50. Item 89 loaded most highly on its allocated factor but was factorially complex (loading significantly [>.3] on both factors), mean communality = 0.28.

With the ATRQ a 2-factor solution accounted for 62% of the total variance. All items loaded significantly (>.3) and most highly on their allocated factor when factors were allowed to correlate highly (r = .521; delta = 0). Mean loading (pattern matrix) of Physical risk items on factor 1 = 0.71, mean factor loading of Psychological risk items on factor 2 = 0.71. No variables were complex, mean communality = 0.53.

With the PRAI a 2-factor solution accounted for 47% of the total variance. All items loaded significantly (>.3) and most highly on their allocated factor when factors were allowed to correlate highly (r = .422; delta = 0). Mean loading (pattern matrix) of Health Risk items on factor 1 = 0.65, mean factor loading of Sports Risk items on factor 2 = 0.60. There were no complex variables, mean communality = 0.43.

The first main findings of the second study refer to the factorial validity of the Impulsive-Sensation Seeking Scale (imp-SS), the Attitudes Towards Risk Questionnaire (ATRQ), and the Physical Risk Assessment Questionnaire (PRAI). As we have seen this was a necessary step in the study because these scales were developed for use with North American subjects or they were relatively new measures. Each of these scales was hypothesised to have a 2-factor oblique structure, and the evidence provided by this study supports this contention for all three measures. Different extraction criteria produced different recommendations as to how many factors were important (as would be expected) as each of these extraction criteria suffers from different limitations, however the scree test results are perhaps the most useful in this case, and taken together with the >10% variance criterion and previous research findings they provide compelling evidence that a 2-factor solution is optimal for each of these scales. This provides evidence for the factorial validity of the scales, and in the context of this study it provides evidence for the validity of the scales with the current sample of mainly British male and female adults. This is encouraging and goes some way to establishing the cross-cultural validity of the Imp-SS and ATRQ, especially when the highly satisfactory reliability and concurrent validity results are also considered. The PRAI was developed in the first main stage of the present thesis, and until the second main stage its factor structure had only been explored twice (when analyses were conducted separately for each sex). To find the same 2-factor oblique structure again in the third analysis is highly reassuring, and lends support to the factorial validity of the overall scale. This is a crucial finding in that it supports the validity and use of the Sports and Health subscales. In short, each of these measures performed as predicted, and their use in the present study can therefore be defended. In a wider

context these findings imply that these measures are likely to be suitable for use with British subjects, including people who regularly participate in high risk sports and health risk behaviours.

9.3. The Factor Structure Of Physical Risk Behaviours

It was important to investigate the factor structure of the PRBS as it is a new measure with an unknown latent structure, and also because it would help us to understand how different physical risk taking behaviours are related to each other. This was of primary importance in establishing the suitability of the PRBS as a summative scale. For example, if the inter-item variance could best be explained by 2 orthogonal factors, then it would be clear that 2 unrelated forms of physical risk taking behaviour exist, and the use of a total scale would be seemingly inappropriate. Previous research findings suggest that two correlated factors might best define the relationships between physical risk taking behaviours. However, Zuckerman (1994) did not find any meaningful factors when he examined the structure of similar measures, the "Disinhibition" (Dis-E) and "Thrill and Adventure Seeking" (TAS-E) experience subscales of the Sensation Seeking Scale VI (SSSVI). The correlations between behaviours may have been reduced by the relative infrequency of some of the TAS-E items, and this may also have reduced the internal consistency of the TAS-E subscale. The behaviours included in the PRBS were selected in part because they were relatively frequent behaviours, and was hoped that this would lead to a more clearly identifiable factor structure.

Principal components extraction with Varimax rotation was performed on the 22 variables. A principal components approach was selected (rather than principal factors) as it has the advantage of maximising the variance accounted for in weak solutions (Kline, 2000a). Checks were initially made to detect outliers, check multicollinearity, the factorability of the correlation matrix and for outlying variables. The factorability of the correlation matrix was suggested by a number of bivariate correlations that exceeded .30, mostly small values in the anti-image correlation matrix, and a Kaiser measure of sampling adequacy that exceeded .6

(Tabachnick & Fidel, 2001). The number of factors with eigenvalues >1 was 8, although this would clearly be too many factors as there were only 22 variables. A scree test suggested a 2-factor solution. A maximum likelihood statistical test of significance was also used to give an upper bound estimate of the number of significant factors (3 factors, 168 *df*, X^2 = 215.974, sig. = .007; 4 factors, 149 *df*, X^2 = 169.335, sig. = .122), the results of which indicated that up to 4 factors could be legitimately extracted. A 2-factor solution accounted for 29% of the variance and appeared to give more meaningful groups of behaviours as defined by factors in comparison to the 3 and 4 factor solutions. Factor 1 was identified by its highest loadings as "Health" risk behaviours, and factor 2 as "Sports" risk behaviours.

From the basis of previous research findings, oblique factors were expected. When the 2-factor solution was subjected to Direct Oblimin rotation (Delta = 0) to investigate the correlations between factors (Tabachnick & Fidell, 2001), however the correlation between factors was low (r = .185). An inspection of the correlations between marker variables from each factor (Gorsuch, 1983) also suggested little association (all r's < .130). Both orthogonal and oblique solutions were tried and found to produce near identical results due to the very small amount of overlap in variance between factors (<4%). As a result an orthogonal solution was selected due to its greater simplicity. 4 items failed to load significantly (>.3) on any factor (3, 6, 7, and 8). 18 items (82%) loaded most highly on their expected factor (items 8, 9, 12, and 17 did not). Mean loading (rotated component matrix) of "Health Risk" behaviour items on factor 1 = 0.46, mean factor loading of "Sports Risk" behaviour items on factor 2 = 0.47. There were no complex variables, mean communality = 0.29.

As a 2-factor solution provided a reasonable fit to the data and as these two groups of behaviours appeared to be relatively unrelated, it seemed preferable to develop two subscales relating to each of the 2 factors. Two 11-item PRBS subscales of "Health" risk behaviours and "Sports" risk behaviours were as a result developed, and initial reliability analyses suggested that they would be acceptably internally consistent as summative scales. Reliability statistics are shown in the next section,

although it should be noted that some theorists (e.g. Kline, 2000a) suggest that the use of reliability statistics with behavioural measures of this kind is inappropriate. The counter argument here is to suggest that if these behaviours are said to be functionally equivalent, and form the basis of a summative scale, then a reasonable degree of association between behaviours would be expected. In any case people of an alternative theoretical orientation can simply ignore these reliability statistics.

By investigating the factor structure of the PRBS (Physical Risk Behaviour Scale) we are essentially exploring the relationships between different behaviours that contain a significant degree of physical risk. The preceding results are discussed in relation to Hypothesis 1, in which specific predictions about the nature of the PRBS were made.

Hypothesis 1: Different types of physical risk taking behaviour will be unrelated ($H_0 1$). Different types of physical risk taking behaviour will cluster together to form one homogenous factor ($H_a 1a$). Different types of physical risk taking behaviour will cluster together to form more than one oblique factor ($H_a 1b$).

There were two main possibilities concerning the relationship between these variables, either the behaviours would be completely unrelated, or they would correlate with each other and cluster together to form one or more factors. All initial indications suggested that the initial correlation matrix was factorable (especially the number of correlations exceeding .3 and Kaiser's measure of sampling adequacy). This does not of course ensure that simple structure factor analysis will be achieved, or that the resulting factors will be valid or of any psychological meaning, however it does suggest that the exploratory use of factor analysis is acceptable. This was encouraging as it raised the possibility that if the behaviours did indeed cluster together to form one or more meaningful factor which could be used as the basis for a summative scale or subscales. The advantage of being able to combine behaviours in this way was clear, the logic being that if specific risk taking behaviours could act as functionally equivalent behaviours (in psychological terms) then they should all be taken into account. If functionally equivalent behaviours are not taken into

account then the danger is that correlations between individual differences and specific risk taking behaviours will be suppressed. Different numbers of factors were extracted but a 2-factor solution seemed optimal (and was recommended by scree test and the >10% variance criterion). It would have been statistically legitimate to extract up to 3 factors, although a three factor solution did not produce meaningful groups of behaviours in relation to previous research findings or existing theory. The factors in a 2-factor solution were identified by their highest loadings as a "Sports" risk behaviour factor and a "Health" risk behaviour factor which were used as the basis for the development of subscales. In brief we can conclude that simple structure appeared to have been reached, and a 2-factor solution appeared to be optimal and meaningful. This allows us to reject the theory that physical risk taking behaviours will be unrelated ($H_0$1), and provides evidence in support of alternative hypothesis b (H_a1b).

9.4. Univariate Statistics

Univariate statistics for the measures included in the study reveal a number of things. The means and standard deviations of the measures could be compared with existing information where applicable to check for the comparability of scores. Separate analyses for males and females also allow useful comparisons to be made, and T-test results show whether any of these differences are statistically significant. Reliability statistics are also included, and these provide information about the suitability of the scales for use as univariate summative measures.

Table 29 contains univariate statistics for all quantitative variables for all subjects.

TABLE 29

Descriptive Statistics For All Subjects On All Quantitative Variables

Scale	Females (n=42)		Males (n=71)		Total (n=113)		Reliability (alpha coefficients)	Sex Differences (T-test)
	Mean	SD	Mean	SD	Mean	SD		
Age	38.55	13.82	38.65	12.88	38.61	13.18	-	Ns
PRAI Total	111.21	13.56	101.10	19.16	104.86	17.91	.92	f>m, t=3.00**
PRAI Health	58.71	9.11	53.18	11.31	55.24	10.84	.91	f>m, t=2.69**
PRAI Sport	52.50	9.84	47.92	10.55	49.62	10.48	.89	f>m, t=2.29*
ATRQ Total	11.62	6.75	14.70	6.94	13.56	7.00	.87	m>f, t=2.31*
ATRQ Soc	4.60	3.87	5.85	4.00	5.38	3.98	.84	Ns
ATRQ Phys	7.02	4.16	8.86	3.98	8.77	4.26	.84	m>f, t=2.33*
ZKPQ Total	6.69	4.02	7.15	4.09	6.98	4.06	.80	Ns
ZKPQ Imp	2.00	2.06	1.68	1.85	1.80	1.93	.72	Ns
ZKPQ SS	4.69	2.82	5.48	2.90	5.18	2.89	.78	Ns
PRBS Total	12.98	6.90	17.49	6.77	15.81	7.13	.70	m>f, t=3.40***
PRBS Health	8.79	5.01	10.39	4.34	9.77	4.64	.68	Ns
PRBS Sport	4.19	3.37	7.10	5.16	6.02	4.78	.70	m>f, t=3.26***
EPQ E	14.79	4.63	13.37	4.84	13.89	4.79	.82	Ns
EPQ N	12.62	5.70	9.37	6.10	10.58	6.14	.90	f>m, t=2.81**
EPQ P	4.76	2.76	5.58	4.00	5.27	3.60	.75	Ns
EPQ L	8.19	4.59	7.55	3.94	7.79	4.18	.82	Ns
EPQ A	10.93	4.33	9.92	5.04	10.29	4.80	.79	Ns
EPQ C	11.98	5.19	9.58	5.73	10.47	5.63	.83	f>m, t=2.23*
Confidence	.71	.55	1.35	.85	1.12	.81	-	m>f, t=4.36***
Occupation	4.08	.74	4.21	1.17	4.16	1.02	-	Ns
Education	3.50	1.15	3.44	.98	3.46	1.04	-	Ns
Friends	.98	.81	1.37	1.05	1.22	0.98	-	m>f, t=2.08*

*** Significant at the <.001 level (1-tailed).

** Significant at the <.01 level (1-tailed).

* Significant at the <.05 level (1-tailed).

The means, standard deviations and reliabilities (alpha coefficients) of all of the scales were compared with normative data where available and found to be consistent. This further suggests the applicability of these measures in the present study and was particularly important for the measures that were developed outside of Britain (i.e. the Imp-SS scale and ATRQ) and new measures (i.e. the PRAI). The reliabilities of the Imp-SS scale and facet scales were good ranging from .72 for the Impulsivity facet scale to .80 for the total scale and were consistent with those in the ZKPQ manual (Zuckerman & Kuhlman, 2002). The reliabilities of the ATRQ and subscales were very good ranging from .84 for both subscales to .87 for the total scale, these reliability statistics were reasonably consistent with the figures quoted by Franken et al. (1992) although a little higher. The reliabilities of the PRAI total scale and subscales were excellent ranging from .89 for the Sport subscale to .92 for the total scale, these findings were consistent with those in the first main study, suggesting that it does indeed represent an improvement over Franken et al.'s (1992) Danger Assessment Questionnaire. The reliabilities for the EPQ-R scales were characteristically good ranging from .75 for Psychoticism to .90 for Neuroticism, and these were consistent with those quoted in the EPQ-R manual (Eysenck & Eysenck, 1996). None of these individual difference measures had reliabilities that were borderline in terms of reliability (all >.71), and the fact that the means and standard deviations closely matched those given as norms also allows us to be confident in their use in the present study. This also provides additional evidence for the cross-cultural validity of the ATRQ and Imp-SS.

The question of whether or not reliability statistics should be used for behavioural measures continues to be a point of some controversy. As previously stated, those who do not believe their use is appropriate can simply ignore reliability statistics for behavioural scales, and so due to largely pragmatic reasons they have been included. From a theoretical perspective a case can be made that if behaviours are said to be related in some way, perhaps influenced by a shared underlying personality trait, then we would expect there to be a degree of association between these behaviours. However behaviours that are relatively infrequent are not likely to constitute very reliable items, so what degree of reliability is acceptable in a behavioural measure?

To avoid the question it can be said that obviously the higher the reliability the better. Perhaps the degree of reliability that is suitable depends upon the task at hand, for example if a new behavioural measure has been developed as a potential improvement over another, then it would be preferable that it be more reliable. Unfortunately this kind of relative reliability principle has obvious limitations. In any case the reliability statistics for the PRBS were not excessively low, alpha coefficients were .70 for the Sports subscale and .68 for the Health subscale. When compared to the Experience scales of the Sensation Seeking Scale VI (SSS VI) that measures the similar constructs of Thrill and Adventure Seeking or E-TAS (α = .62 to .66) and Disinhibition or E-Dis (α = .83 to .94) we can see that the reliabilities of the PRBS scales fall between these values. The PRBS scales are also considerably shorter than the SSS VI Experience scales (11 items for both the PRBS Sports and Health subscales compared to 15 items for the E-TAS scale and 42 items for the E-Dis scale), and as alpha coefficient reliability statistics are sensitive to the number of items in a scale the PRBS therefore compares favourably with the SSS VI Experience subscales in terms of reliability.

Sex differences were noted in this section of the data analysis, and they were included in the descriptive statistics table as a matter of convenience. Where sex differences are considered to be important in relation to the research questions they are discussed in the appropriate section.

9.5. Interscale Correlations

The association between variables as estimated by bivariate Pearson product moment correlation coefficients is shown in this section. This is useful because it provides a simple estimate of the degree of linear association between two variables and is a useful step in exploring which relationships may be significant in statistical and psychological terms.

Correlations With Physical Risk Taking Behaviours And Risk Propensity

Due to the very large number of inter-scale correlations (576), and the fact that factor analytic techniques are later used in an attempt to simplify the correlation matrix, only the correlations with risk taking behaviours (both PRBS subscales) and attitudes towards risk (ATRQ subscales) are shown in Table 30. Statistically significant relationships are flagged for ease of interpretation.

TABLE 30

Interscale Correlations With Risk Behaviours And Risk Propensity

	PRBS Sport	**PRBS Health**	**ATRQ Physical**	**ATRQ Psych**	**ATRQ Total**
PRBS Sport	1	.146	.493***	.181*	.394***
	.	.062	.000	.027	.000
PRBS Health	.146	1	.360***	.420***	.451***
	.062	.	.000	.000	.000
ATRQ Physical	.493***	.360***	1	.491***	.869***
	.000	.000	.	.000	.000
ATRQ Psych	.181*	.420***	.491***	1	.858***
	.027	.000	.000	.	.000
PRAI Health	-.125	-.286**	-.038	-.228**	-.152
	.093	.001	.345	.008	.054
PRAI Sport	-.140	-.102	-.100	-.177*	-.160*
	.070	.140	.147	.030	.046
ZKPQ Imp	-.030	.156*	.319***	.329***	.375***
	.378	.050	.000	.000	.000
ZKPQ SS	.426***	.402***	.681***	.563***	.721***
	.000	.000	.000	.000	.000
EPQ E	.053	.301**	.301**	.330***	.365***
	.289	.001	.001	.000	.000
EPQ N	-.290**	.056	-.068	.286**	.123
	.001	.279	.239	.001	.097
EPQ P	.198*	.235**	.371***	.638***	.581***
	.018	.006	.000	.000	.000

EPQ L	-.079	-.332***	-.288**	-.439***	-.420***
	.202	.000	.001	.000	.000
EPQ C	-.194*	.148	.072	.419***	.281**
	.020	.058	.225	.000	.001
EPQ A	-.151	.141	.079	.402***	.275**
	.055	.069	.203	.000	.002
Confidence	.479***	.180*	.381***	.202*	.340***
	.000	.029	.000	.016	.000
Friends	.594***	.214*	.425***	.196*	.362***
	.000	.011	.000	.019	.000
Occupation	.163	-.226*	.034	-.034	.000
	.051	.011	.367	.367	.500
Age	-.170*	-.359***	-.291**	-.359***	-.375***
	.036	.000	.001	.000	.000
Sex	-.295**	-.168*	-.216*	-.152	-.214*
	.001	.037	.011	.054	.011
Highest education	.145	.086	.006	-.012	-.004
	.063	.183	.476	.448	.485
PRAI Total	-.158*	-.233**	-.081	-.242**	-.185*
	.048	.006	.196	.005	.025
ATRQ Total	.394***	.451***	.869***	.858***	1
	.000	.000	.000	.000	.
ZKPQ Total	.289**	.360***	.636***	.557***	.692***
	.001	.000	.000	.000	.000
PRBS Total	.765***	.749***	.565***	.395***	.557***
	.000	.000	.000	.000	.000

*** Significant at the <.001 level (1-tailed).

** Significant at the <.01 level (1-tailed).

* Significant at the <.05 level (1-tailed).

A significance level of .000 equates to $p < .0005$.

The main correlations ($r \geq .290$, $p \leq .001$) with the participation in high risk sport (as measured by the PRBS Sport subscale) are with overall attitudes towards risk, attitudes towards physical risk, sex – females lower, confidence in the ability to manage risks, having friends who take potentially fatal risks, Sensation Seeking, and

Neuroticism. Minor correlations ($r \geq .158$, $p \leq .051$[2]) were also observed between the participation in high risk sports and the willingness to take social risks, occupation, age, Criminality, overall physical risk assessments, and Psychoticism. There were no significant correlations ($r \leq .151$, $p \geq .055$) between the participation in high risk sports and highest educational level, Addiction, the assessment of health risks, the assessment of sporting risks, Impulsivity, Extraversion, the participation in Health risk behaviours, and Lie – social desirability.

The main correlations ($r \geq .233$, $p \leq .006$) with the participation in health risk behaviours as measured by the PRBS Health subscale are with overall attitudes towards risk, attitudes towards physical risk, attitudes towards social risk, age, overall physical risk assessments, health risk assessments, Sensation Seeking, Extraversion, Psychoticism, and Lie – social desirability. Minor correlations ($r \geq .156$, $p \leq .050$) were also observed between the participation in health risk behaviours and occupational rating, sex, confidence, having friends who take potentially fatal risks, and Impulsivity. There were no significant correlations ($r \leq .148 \geq .058$) between the participation in health risk behaviours and highest educational level, Addiction, Criminality, the assessment of sporting risks, the participation in Sports risk behaviours, and Neuroticism.

The willingness to take physical risks is correlated ($r \geq .216$, $p \leq .011$) with a willingness to take social risks, age, confidence, having friends who take potentially fatal risks, Impulsivity, Sensation Seeking, Extraversion, Psychoticism, sex, and Lie – social desirability. There were no significant correlations ($r \leq .100 \geq .147$) between the willingness to take physical risks and occupational rating, highest educational level, Addiction, Criminality, the assessment of physical risks, the assessment of health risks, the assessment of sporting risks, and Neuroticism.

[2] Strictly speaking a statistical significance level of p = .051 would not normally be considered to be significant. However, any cut-off point (such as p = .050) is essentially arbitrary, and as the correlation with occupation is so close to significance at the p = .050 level, and as the correlation is in the predicted direction, the correlation is included as a "minor" one – rather than concluding that there is no relationship between the two variables.

The willingness to take social risks is mainly correlated ($r \geq .228$, $p \leq .008$) with a willingness to take physical risks, age, Addiction, Criminality, the assessment of physical risks, the assessment of health risks, Impulsivity, Sensation Seeking, Extraversion, Neuroticism, Psychoticism, and Lie – social desirability. Smaller correlations ($r \geq .177$, $p \leq .030$) were also observed between the willingness to take social risks and confidence, having friends who take potentially fatal risks, and the assessment of sporting risks. There were no significant relationships ($r \leq .152 \geq .054$) between the willingness to take social risks and occupational rating, sex, and highest educational level.

The interscale correlations in this study are discussed in relation to the variables that are of key interest to the overall objectives; namely the participation in physical risk behaviours (Objective 2), physical and social risk taking propensity (Objective 3), and the assessment of physical risk (Objective 4). The correlations between these key variables and other individual differences are discussed with reference to the specific hypotheses made earlier in the methodology. Due to the large number of hypotheses (52) in this section they are grouped according to which objective they relate to, in other words the first group of hypotheses relate to physical risk taking behaviours, the second to physical and social risk propensity, and the third to physical risk assessments.

Hypotheses Relating To Objective 2

Hypothesis 2: Physical risk taking behaviours will be unrelated to age ($H_0 2$). Physical risk taking behaviours will be negatively associated with age ($H_a 2$).

Both the participation in high risk Sports ($r = -.170$, $p = .036$) and the participation with Health risk behaviours ($r = -.359$, $p = .000$) were negatively associated with age. The association with Health risk behaviours was clearly stronger in this study, although both correlations were significant and in the expected direction. As a result the null hypothesis ($H_0 2$) can be rejected, and support is lent to the alternative hypothesis ($H_a 2$). We can be especially confident of the result between age and the

participation in high risk sports, as it replicates the findings of the first main study where a very small negative correlation of borderline significance was also found (r = -.086, p = .042). The participation in both types of physical risk taking behaviour therefore appears to be associated with youthfulness, but not exclusively as the correlations are consistently small.

Hypothesis 3: Physical risk taking behaviours will be unrelated to sports risk assessments ($H_0$3). Physical risk taking behaviours will be negatively associated with sports risk assessments (H_a3).

Both the participation in high risk Sports (r = -.140, p = .070) and the participation in Health risk behaviours (r = -.102, p = .140) were not significantly associated with Sports risk assessments. Although the correlations were negative, the expected direction, such small correlations are unlikely to be of any psychological significance, and the small association found in the first main stage was not replicated. The null hypothesis ($H_0$3) cannot be rejected in this case, and no support is found for the alternative hypothesis (H_a3). An analysis of the bivariate correlations between individual Sports and Health behaviours and Sports risk assessments revealed that the only highly significant negative correlation was with item 12 "Had a serious sporting injury (e.g. a broken bone)" (r = -.243, p = .005). This suggests that people who assess Sporting risks to be lower are more likely to have a serious sporting injury. Unless future studies discover contradictory findings we can therefore conclude that there is little if any relationship between the way high risk sports are assessed in terms of risk and the participation in them. This undermines the theory that people participate in high risk sports because they are unaware of the risks or underestimate them, however it does provide support for the theory that people who perceive the risks to be lower are more likely to have accidents.

Hypothesis 4: Physical risk taking behaviours will be unrelated to health risk assessments ($H_0$4). Physical risk taking behaviours will be negatively associated with health risk assessments (H_a4).

The participation in high risk Sports was not associated with Health risk assessments to a statistically significant degree (r = -.125, p = .093) although the correlation was in the expected direction. The participation in Health risk behaviours however was negatively associated with Health risk assessments to a highly significant degree (r = -.286, p = .001). These findings provide partial support for the null hypothesis ($H_0$4) because no link was found with the participation in high risk Sports. However the link with Health risk behaviours provides partial support for the alternative hypothesis (H_a4). This means that people who participate in Health risk behaviours (e.g. smoking) tend to rate the risks involved to be lower than non-participants do. This could mean that people are more likely to participate in Health risk behaviours in the first place because they do not assess the risks to be as large as other people. Or it could mean that their direct experiences with the activities leads to reduced risk assessments of them. Horvarth and Zuckerman's (1993) work is relevant here, as their work involving the use of structural equation modelling suggests that lowered risk perceptions (assessments) are more likely to be a result of risk behaviours, rather than an antecedent influence or cause.

Hypothesis 5: Physical risk taking behaviours will be unrelated to attitudes towards physical risk ($H_0$5). Physical risk taking behaviours will be positively associated with attitudes towards physical risk (H_a5).

Both the participation in high risk Sports (r = .493, p < .0005) and the participation in Health risk behaviours (r = .360, p < .0005) were highly significantly associated with attitudes towards physical risk. The size of the correlations was moderate and positive, which was the expected direction. This lends no support for the null hypothesis ($H_0$5), and clear support for the alternative hypothesis (H_a5). This means that people with positive attitudes towards risk are more likely to participate in both high risk Sports and Health behaviours. We can be especially confident of this result due to the large amount of related research that has shown a link between measures of risk propensity or the related construct of Sensation Seeking and physical risk taking behaviours (Zuckerman, 1994).

Hypothesis 6: Physical risk taking behaviours will be unrelated to attitudes towards social risk ($H_0$6). Physical risk taking behaviours will be positively associated with attitudes towards social risk (H_a6).

The participation in high risk Health behaviours was clearly associated with positive attitudes towards social risk (r = .420, p < .0005). The participation in high risk Sports was also associated with positive attitudes although the degree of association and significance was more modest (r = .181, p = .027). As both correlations are in the expected direction and are both significant we can reject the null hypothesis ($H_0$6) and provisionally accept the alternative hypothesis (H_a6). The degree of association with Health risk behaviours is clearly stronger, and this makes sense considering the content of the scale (especially the illegal and unconventional behaviours such as drug use). We can be more confident of this result as a link between unconventional and illegal behaviours and with the related construct of Sensation Seeking (especially the "Experience Seeking" and "Disinhibition" facets) is well established (Zuckerman, 1994). It appears then that people who take physical risks, and in particular people who take risks with their health are willing to take social risks.

Hypothesis 7: Physical risk taking behaviours will be unrelated to Impulsivity ($H_0$7). Physical risk taking behaviours will be positively associated with Impulsivity (H_a7).

The correlation between the participation in high risk Sports (r = -.030, p = .378) and Impulsivity was not significant, although there was a small significant correlation with Health risk behaviours (r = .156, p = .050). What is more the correlations with different risk taking behaviours were both positive and *negative*, making it less likely that a strong positive relationship exists (with all physical risk taking behaviours at least). The null hypothesis can only be partially rejected ($H_0$7) and only some support for the alternative hypothesis (H_a7) was found. This means that sporting risk behaviours do not seem to be the result of sudden desires or

spontaneous whims. However partial support was found for the theory that people take health risks because they have not thought through their behaviours rationally.

Hypothesis 8: Physical risk taking behaviours will be unrelated to Sensation Seeking ($H_0$8). Physical risk taking behaviours will be positively associated with Sensation Seeking (H_a8).

Both the participation in high risk Sports (r = .426, p < .0005) and Health risk behaviours (r = .402, p < .0005) were positively associated to Sensation Seeking to a high degree of significance. The correlations were moderate in size and in the expected direction. These findings allow the null hypothesis ($H_0$8) to be rejected and provide support for the alternative hypothesis (H_a8). A substantial amount of literature exists to support a link between Sensation Seeking and a range of risk taking behaviours (Zuckerman 1979, 1994). This is the first study however to demonstrate a link between the Imp-SS scale or its Sensation Seeking facet scale and the participation in high risk sports. O'Sullivan, Zuckerman and Kraft (1996) did find that prostitutes, most of whom used drugs, were higher on the Imp-SS scale however. In short this study provides support for the theory that people who regularly participate in Health or Sport related risky activities are likely to be high Sensation Seekers.

Hypothesis 9: Physical risk taking behaviours will be unrelated to Extraversion ($H_0$9). Physical risk taking behaviours will be positively associated with Extraversion (H_a9).

The participation in Health risk behaviours was positively associated with Extraversion (r = .301, p = .001) to a high degree of significance. However the participation in high risk Sports behaviours was unrelated to Extraversion (r = .053, p = .289). Further analyses were conducted to examine whether there was any relationship between Extraversion and any of the individual Sports risk behaviours. There were highly significant positive correlations with item 5 "Been alpine / downhill skiing" (r = .359, p < .0005), item 10 "Been mountain climbing" (r = .754,

$p < .0005$), item 16 "Chosen to take a potentially fatal risk in a sporting context" ($r = .443$, $p < .0005$), and item 19 "Been deep sea diving" ($r = .346$, $p < .0005$). These findings provide partial support for the null hypothesis ($H_0 9$) because there was no overall relationship between Extraversion and high risk Sports, and partial support for the alternative hypothesis ($H_a 9$) because of the positive relationship with Health risk behaviours. This suggests that if there is a link between Extraversion and the participation in high risk Sports it is unlikely to be of any psychological significance, whereas the association with Health risk behaviours appears to be small but both statistically and psychologically significant. Further research is necessary to determine whether the relationship between Extraversion and selected risk taking Sports behaviours can be replicated.

Hypothesis 10: Health related physical risk taking behaviours are thought to be positively associated with Neuroticism ($H_a 10a$), whereas the participation in high risk sports appears to be negatively associated with Neuroticism ($H_a 10b$). The null hypothesis is that physical risk taking behaviours will be unrelated to Neuroticism ($H_0 10$).

The participation in high risk Sports was associated with low Neuroticism ($r = -.290$, $p = .001$) as predicted. The degree of association between Neuroticism and Health risk behaviours ($r = .056$, $p = .310$) was in the predicted direction but was of negligible size and did not reach significance. Taken together with previous research findings this suggests that there is a small but significant negative relationship between the participation in high risk Sports and Neuroticism, in support of alternative hypothesis b ($H_a 10b$). This suggests that sporting risk takers are not generally nervous people, and tend to be emotionally stable. There does not appear to be any relationship between Health risk behaviours and Neuroticism, which provides partial support for the null hypothesis ($H_0 10$). Further analyses revealed that there were also no significant relationships ($P > .05$) between individual Health risk behaviours and Neuroticism.

Hypothesis 11: Physical risk taking behaviours will be unrelated to Psychoticism ($H_0$11). Physical risk taking behaviours will be positively associated with Psychoticism (H_a11).

There was a small positive association between Psychoticism and both the participation in high risk Sports (r = .198, p = .018) and the participation in Health risk behaviours (r = .235, p = .006). Both correlations were of borderline significance but were in the expected direction. Taken together these results provide support for the alternative hypothesis (H_a11) although the degree of association is clearly modest. This means that people who participate in physical risk taking behaviours are slightly more likely to be independent, driven, unsocialised and aggressive.

Hypothesis 12: Sports related physical risk taking behaviours are thought to be negatively associated to social desirability (H_a12a), whereas the participation in health related physical risk behaviours appears to be positively associated with social desirability (H_a12b). The null hypothesis is that physical risk taking behaviours will be unrelated to social desirability ($H_0$12).

There was no significant association between high risk Sports behaviours and social desirability (r = -.079, p = .202) and the correlation was not in the expected direction. However there was a significant association with the participation in Health risk behaviours (r = -.332, p < .0005) in the expected direction. This may mean that the participation in high risk Sports is unrelated to social desirability ($H_0$12), while people who participate in Health risk behaviours are less likely to 'fake good' and be socially naïve or conforming (H_a12b).

Hypothesis 13: Physical risk taking behaviours will be unrelated to Addictiveness ($H_0$13). Physical risk taking behaviours will be positively associated with Addictiveness (H_a13).

The participation in Health risk behaviours was positively associated with Addictivity (r = .141, p = .069) although the correlation narrowly missed significance. Surprisingly the association between the participation in high risk Sports and Addiction was almost significant and *negative* (r = -.151, p = .055), that is in the opposite direction to that predicted. It should be noted that both of these correlations are very small. As the Addiction scale is a composite of EPQ-R items, this negative relationship is likely caused by the negative relationship between the participation in high risk Sports and Neuroticism (see Hypothesis 10). By implication this means that people who participate in high risk sports are slightly less likely to become Addicted to drugs, because they tend to be emotionally robust people who are relatively low in anxiety. Further analyses of the associations between individual Health risk behaviours and Addictivity suggested that there were small positive correlations with item 2 "Smoked tobacco" (r = .171, p = .036), and item 7 "Been physically sick due to alcohol consumption" (r = .161, p = .044). Taken together these results suggest that the participation in high risk Sports may (unexpectedly) be negatively related to Addicitivity, and if there is a positive association between Health risk behaviours and Addictivity it is of little psychological significance.

Hypothesis 14: Physical risk taking behaviours will be unrelated to Criminality ($H_0$14). Physical risk taking behaviours will be positively associated with Criminality (H_a14).

The EPQ-R Criminality scale has overlapping item content to the Addictiveness scale (the scales typically correlate r = .894, p < .0005), and as a result the associations with physical risk taking behaviours are highly similar. Again there was a negative association with the participation in high risk Sports (r = -.194, p = .020), and again there was a positive association with Health risk behaviours that narrowly missed significance (r = .148, p = .058). Further analyses were conducted to examine whether there were any significant positive relationships with individual Health risk behaviours. Significant correlations were observed with item 2 "Smoked tobacco" (r = .184, p = .026), item 4 "Had a hangover due to alcohol consumption"

(r = .211, p = .013), item 7 "Been physically sick due to alcohol consumption" (r = .183, p = .026), and item 11 "Taken illegal drugs (excluding marijuana)" (r = .176, p = .032). These results suggest that there is a negative relationship between the participation in high risk Sports and Criminality, and a very small but positive relationship between Criminality and the participation in Health risk behaviours. Further analyses are necessary to determine whether the associations with individual Health risk behaviours can be replicated.

Hypothesis 15: Physical risk taking behaviours will be unrelated to confidence ($H_0$15). Physical risk taking behaviours will be positively associated with confidence (H_a15).

The participation in high risk Sports was clearly positively associated with confidence (r = .479, p < .0005), which provides strong support for the alternative hypothesis (H_a15). The participation in Health risk behaviours was also positively associated with confidence (r = .180, p = .029), although the size of the correlation and degree of significance was much smaller. These results provide support for the alternative hypothesis (H_a15), and the null hypothesis ($H_0$15) can be rejected. It is interesting that the degree of association appears to be stronger with the participation in high risk Sports compared with the participation in Health risk behaviours. This suggests that confidence is an important variable in the conceptualisation of high risk sports behaviours, but only a relatively minor influence with Health risk behaviours.

Hypothesis 16: Sports related physical risk taking behaviours will be positively associated with occupation (H_a16a), whereas health related physical risk taking behaviours will be negatively associated with occupation (H_a16b). The null hypothesis being that physical risk taking behaviours will be unrelated to occupation ($H_0$16).

The participation in Sports risk behaviours was positively associated with occupation (r = .163, p = .051), and although the correlation was in the expected

direction it was very small and narrowly missed significance. The association with the participation in Health risk behaviours however was negative and in the expected direction (r = -.226, p = .011), although again small. Taken together these results suggest that occupation does play a part in determining the choice of physical risk taking behaviour, but it is a relatively minor influence of limited psychological significance. The results provide partial support for the alternative hypotheses, especially relating to Health risk behaviours (H_a16b).

Hypothesis 17: Sports related physical risk taking behaviours will be positively associated with education (H_a17a), whereas health related physical risk taking behaviours will be negatively associated with education (H_a17b). The null hypothesis is that physical risk taking behaviours will be unrelated to education ($H_0$17).

Neither the participation in high risk Sports (r = .145, p = .063) or the participation in Health risk behaviours (r = .086, p = .183) was related to highest educational level. The sizes of the associations with physical risk taking behaviours were both exceedingly small, and were not close to reaching significance. Furthermore the association with Health risk behaviours was not in the expected direction. Further analysis revealed that there were a number of correlations with individual physical risk taking behaviours that reached moderate statistical significance. Statistically significant correlations were found between highest educational level and item 5 "Been alpine / downhill skiing" (r = .218, p = .010), item 9 "Chosen to take a potentially fatal risk in a non-sporting context" (r = .204, p = .015), item 10 "Been mountain climbing" (r = .206, p = .014), and item 16 "Chosen to take a potentially fatal risk in a sporting context" (r = .180, p = .029). In short, there does not appear to be any overall association between physical risk taking behaviours and highest educational level, and support was found for the null hypothesis ($H_0$17). Further research is needed to investigate whether highest educational level is robustly associated with these individual risk taking behaviours.

Hypothesis 18: Physical risk taking behaviours will be unrelated to peer behaviour ($H_0$18). Physical risk taking behaviours will be positively associated with peer behaviour (H_a18).

There was a strong link between the participation in high risk behaviours and peer behaviour (r = .594, p < .0005). There was also a much smaller association between peer behaviour and the participation in Health risk behaviours (r = .214, p = .011). Both of these correlations were in the predicted direction, although the link with Health risk behaviours is clearly of lesser psychological importance and was of borderline statistical significance. These results suggest that the null hypothesis can be rejected ($H_0$18), but also that the link between peer behaviours and physical risk taking behaviours is mainly limited to the participation in high risk Sports.

Hypothesis 19: Physical risk taking behaviours will be positively associated with being male (H_a19). The null hypothesis here is that physical risk taking behaviours will be unrelated to sex (gender) ($H_0$19).

Both the participation in high risk Sports (r = -.295, p = .001) and Health risk behaviours (r = -.168, p = .037) is negatively associated with sex, which is with being male. The degree of association was stronger for the participation in high risk Sports although still small, and the correlation with Health risk behaviours was of borderline statistical significance. These results suggest that the null hypothesis can be rejected ($H_0$19), but also that the degree of association with Health risk behaviours is likely to be of little psychological importance.

Discussion of hypotheses related to objective 3

Hypothesis 20: The willingness to take risks will be unrelated to age ($H_0$20). The willingness to take risks will be negatively associated with age (H_a20).

Both the willingness to take physical risks (r = -.291, p = .001) and social risks (r = -.359, p < .0005) were negatively associated with age. The size of the correlations

were small, but they were highly significant and in the expected direction. This provides no support for the null hypothesis ($H_0$20), and provides support for the alternative hypothesis (H_a20). The related construct of Sensation Seeking consistently demonstrates a negative association with age (Zuckerman, 1979, 1994), and these results combined allow us to be reasonably confident that the willingness to take risks declines with age.

Hypothesis 21: The willingness to take risks will be unrelated to sports risk assessments ($H_0$21). The willingness to take risks will be negatively associated with sports risk assessments (H_a21).

Both the willingness to take physical risks (r = -.100, p = .147) and social risks (r = -.177, p = .030) was negatively associated with Sporting risk assessments. In itself this result tends to lend support to the alternative hypothesis (H_a21), however only the correlation with social risk propensity was significant and the size of the correlation was small. We cannot therefore completely reject the null hypothesis ($H_0$21), and must conclude that little relationship of any psychological importance exists between risk propensity and the assessment of Sporting risks.

Hypothesis 22: The willingness to take risks will be unrelated to health risk assessments ($H_0$22). The willingness to take risks will be negatively associated with health risk assessments (H_a22).

There was no significant association between the willingness to take physical risks and the assessment of Health risks (r = -.038, p = .345). The willingness to take social risks however was negatively and significantly associated with the assessment of Health risks (r = -.228, p = .008). Although the correlation with the willingness to take physical risks was in the expected direction it was far too small to be considered to be of any practicable importance and was not statistically significant, this provides support for the null hypothesis ($H_0$22). The correlation with the willingness to take social risks was moderately significant, small in size, and in the expected direction, on balance this provides partial support for the alternative hypothesis

(H_a22). This means that people may be more willing to take certain social risks (e.g. drug use) because they assess the Health risks involved to be lower than other people do.

Hypothesis 23: The willingness to take risks will be unrelated to physical risk taking behaviours ($H_0$23). The willingness to take risks will be positively associated with physical risk taking behaviours (H_a23).

Both types of physical risk taking behaviour (Sport and Health) were significantly and positively associated with both types of risk propensity (Physical and Social). The participation in high risk Sports was associated with the willingness to take Physical risks (r = .493, p < .0005) and Social risks (r = .181, p = .027). The participation in Health risk behaviours was also associated with the willingness to take Physical risks (r = .360, p < .0005) and Social risks (r = .420, p < .0005). The size of these correlations was small to moderate and they were all highly significant, except the correlation between the participation in high risk Sports and the willingness to take Social risks which was very small and of borderline significance. Further analysis of individual Sports risk behaviours revealed that there were no highly significant (P>.01) correlations with the willingness to take Social risks. In short this means that the participation in high risk Sports appears to represent a form of physical risk taking, and the participation in Health risk behaviours appears to represent a form of Physical and Social risk taking. This provides support for the alternative hypothesis (H_a23), and the null hypothesis can be rejected ($H_0$23).

Hypothesis 24: The willingness to take risks will be unrelated to Impulsivity ($H_0$24). The willingness to take risks will be positively associated with Impulsivity (H_a24).

Both the willingness to take Physical risks (r = .319, p < .0005) and Social risks (r = .329, p < .0005) were positively and significantly associated with Impulsivity. The size of the correlations was moderate, but as they were both statistically significant and in the expected direction we can be reasonably confident of the result. As such

these findings provide support for the alternative hypothesis (H_a24), and the null hypothesis can be rejected ($H_0 24$). This means that the willingness to take risks is associated with Impulsivity, but the degree of association is very small and as such is of limited psychological significance.

Hypothesis 25: The willingness to take risks will be unrelated to Sensation Seeking ($H_0 25$). The willingness to take risks will be positively associated with Sensation Seeking (H_a25).

Both the willingness to take physical risks ($r = .681$, $p < .0005$) and the willingness to take social risks ($r = .563$, $p < .0005$) was strongly associated with Sensation Seeking. The correlations were both reasonably strong, highly significant and in the expected direction, that is positive. This provides support for the alternative hypothesis (H_a25), and allows us to reject the null hypothesis ($H_0 25$). This provides support for the theory that Sensation Seeking and risk propensity are closely related constructs.

Hypothesis 26: The willingness to take risks will be unrelated to Extraversion ($H_0 26$). The willingness to take risks will be positively associated with Extraversion (H_a26).

The willingness to take both physical risks ($r = .301$, $p = .001$) and social risks ($r = .330$, $p = .001$) was positively associated with Extraversion. The size of these correlations was moderate, but they were both highly significant and in the expected direction. This provides support for the alternative hypothesis (H_a26), and provides no support for the null hypothesis ($H_0 26$). This suggests that people who are willing to take risks are more likely to be Extraverted people, although the degree of association is small.

Hypothesis 27: The willingness to take social risks will be positively associated with Neuroticism (H_a27a), whereas the willingness to take physical risks will be

negatively associated with Neuroticism (H_a27b). The null hypothesis is that the willingness to take risks will be unrelated to Neuroticism ($H_0$27).

The willingness to take physical risks (r = -.068, p = .239) was negatively associated with Neuroticism but this association was not statistically significant. Although the correlation was in the expected direction it was extremely small and of no statistical or psychological significance. The willingness to take social risks (r = .286, p = .001) was positively and significantly associated with Neuroticism. The size of the correlation was small, but it was highly significant and in the expected direction. This suggests that the willingness to take physical risks is unrelated to Neuroticism, which provides partial support for the null hypothesis ($H_0$27); and that the willingness to take social risks is positively associated with Neuroticism, which provides support for the alternative hypothesis a (H_a27a).

Hypothesis 28: The willingness to take risks will be unrelated to Psychoticism ($H_0$28). The willingness to take risks will be positively associated with Psychoticism (H_a28).

Both the willingness to take physical risks (r = .371, p < .0005) and the willingness to take social risks (r = .638, p < .0005) were positively and highly significantly associated with Psychoticism. The size of the correlations was small to moderate with physical risk propensity, and large with social risk propensity. Both of the correlations were in the expected direction and this provides support for the alternative hypothesis (H_a28), and allows us to reject the null hypothesis ($H_0$28). The stronger degree of association with the willingness to take social risks suggests that it is more closely aligned with Psychoticism than the willingness to take physical risks. The high degree of association suggests that people who are willing to take social risks are likely to be independent, driven, unsocialised and aggressive. The same is true for people who are willing to take physical risks, but to a lesser degree.

Hypothesis 29: The willingness to take risks will be unrelated to social desirability ($H_0$29). The willingness to take risks will be negatively associated with social desirability (H_a29).

Both the willingness to take physical risks (r = -.288, p = .001) and social risks (r = -.439, p < .0005) were negatively and highly significantly associated with social desirability. The degree of association was stronger for the willingness to take social risks, and this seems to mirror the stronger relationship between the SSS V Dis scale and the EPQ-R Lies scale in comparison with its relation with the SSS V TAS scale. This allows us to reject the null hypothesis ($H_0$29), and the results provide support for the alternative hypothesis (H_a29), in which all types of risk propensity are negatively associated with social desirability. It seems then that people who are willing to take physical or social risks are less likely to be socially naïve or conforming.

Hypothesis 30: The willingness to take risks will be unrelated to Addictiveness ($H_0$30). The willingness to take risks will be positively associated with Addictiveness (H_a30).

The willingness to take physical risks (r = .079, p = .203) and social risks (r = .402, p < .0005) were both positively associated with Addictivity, although only the association with social risk propensity was significant. Although the correlation with the willingness to take physical risks was in the expected direction it was clearly too small to be of psychological significance, and it appeared to be relatively unrelated to Addictiveness. The correlation with social risk propensity was moderate, in the expected direction and highly significant. This suggests that the null hypothesis is partially supported by the lack of association with physical risk propensity ($H_0$30), and the alternative hypothesis is partially supported by the association with social risk propensity (H_a30). This means that people who are willing to take social risks are more likely to become addicted to drugs, but people who are willing to take physical risks are no more likely to than anyone else.

Hypothesis 31: The willingness to take risks will be unrelated to Criminality ($H_0$31). The willingness to take risks will be positively associated with Criminality (H_a31).

The results with the Criminality scale were almost identical to those with the Addiction scale discussed above, and as has been previously noted there is a high degree of association between these scales themselves. Again there was no significant relationship with the willingness to take physical risks (r = .072, p = .225) and a moderate and highly significant positive correlation with the willingness to take social risks (r = .419, p < .0005). This again provides partial support for the null hypothesis as far as physical risk propensity is concerned ($H_0$31), and the association with social risk propensity provides partial support for the alternative hypothesis (H_a31). This means that people who are willing to take social risks are more likely to participate in criminal behaviour, but also that people who are willing to take physical risks are not any more or less likely to become criminals than anyone else.

Hypothesis 32: The willingness to take risks will be unrelated to confidence ($H_0$32). The willingness to take risks will be positively associated with confidence (H_a32).

Both the willingness to take physical risks (r = .381, p < .0005) and the willingness to take social risks (r = .202, p = .016) was positively and significantly associated with confidence. The degree of association was stronger for physical risk propensity, but both correlations were highly significant and in the expected direction. This allows us to reject the null hypothesis ($H_0$32), and provisionally accept the alternative hypothesis (H_a32). This means that people who are willing to take risks tend to be more confident that they can manage risks, especially people who are willing to take physical risks.

Hypothesis 33: The willingness to take physical risks will be positively associated with occupation (H_a33a), whereas the willingness to take social risks will be

negatively associated with occupation (H_a33b). The null hypothesis is that the willingness to take risks will be unrelated to occupation ($H_0$33).

Neither the willingness to take physical risks (r = .034, p = .367) or the willingness to take social risks (r = -.034, p = .367) was significantly associated with occupation. The correlations were both in the expected directions (positive for physical risk propensity and negative for social risk propensity) although they were too small to be of statistical or psychological significance. As a result the null hypothesis ($H_0$33) cannot be rejected, and it seems in this study at least that the willingness to take risks is unrelated to occupation.

Hypothesis 34: The willingness to take physical risks will be positively associated with education (H_a34a), alternatively the willingness to take social risks will be negatively associated with education (H_a34b). The null hypothesis being that the willingness to take risks will be unrelated to education ($H_0$34).

Neither the willingness to take physical risks (r =.006, p = .476) or social risks (r = -.012, p = .448) was significantly associated with highest educational level. The correlations were in the expected direction but of negligible degree, and neither of the correlations was statistically significant. The null hypothesis ($H_0$34) cannot be rejected, and the willingness to take physical and social risks appears to be unrelated to highest educational level.

Hypothesis 35: The willingness to take risks will be unrelated to peer behaviour ($H_0$35). The willingness to take risks will be positively associated with peer behaviour (H_a35).

Both the willingness to take physical risks (r = .425, p < .0005) and social risks (r = .196, p = .019) were positively associated with having friends who are willing to take potentially fatal risks. The association with physical risk propensity was clearly greater, although both were statistically significant and in the expected direction. This allows us to reject the null hypothesis ($H_0$35), and provides support for the

alternative hypothesis (H_a35). People who have friends who are willing to take potentially fatal risks are therefore more likely to be willing to take risks themselves, especially physical risks.

Hypothesis 36: The willingness to take risks will be associated with being male (H_a36). The null hypothesis here being that the willingness to take risks will be unrelated to sex (gender) ($H_0 36$).

Both the willingness to take physical risk (r = -.216, p = .011; t = 2.33, p < .05) and the willingness to take social risks (r = -.152, p = .054; t = Ns) were associated with being male, although the association with social risk propensity narrowly missed statistical significance. The degree of association with physical risk propensity was small, but highly significant and in the expected direction providing partial support for the alternative hypothesis (H_a36). The degree of association with social risk propensity was so small as to be of no statistical or psychological significance, and this provides partial support for the null hypothesis ($H_0 36$). This means that men and women are equally likely to be willing to take social risks, but men are slightly more likely to be willing to take physical risks.

Correlations With Physical Risk Assessments

In order to investigate the nature of physical risk assessments and the concurrent validity of the PRAI, bivariate correlations between all variables and the risk assessment variables are shown in Table 31. Significant relationships are flagged for ease of interpretation.

Table 31

Interscale Correlations With Physical Risk Assessments

	PRAI Health	**PRAI Sport**	**PRAI Total**
PRAI Health	1.000	.411***	.846***

	.	.000	.000
PRAI Sport	.411***	1.000	.834***
	.000	.	.000
PRAI Total	.846***	.834***	1.000
	.000	.000	.
Occupation	-.072	.141	.039
	.236	.079	.347
Age	.303**	.235**	.321***
	.001	.006	.000
Sex	.248**	.212*	.274**
	.004	.012	.002
Education	.002	.209*	.123
	.491	.013	.096
Confidence	-.120	-.100	-.131
	.103	.146	.083
Friends	-.078	-.012	-.054
	.205	.451	.284
EPQ-R A	-.176*	-.118	-.176*
	.031	.107	.031
EPQ-R C	-.135	-.092	-.135
	.077	.167	.077
ATRQ Social	-.228**	-.177*	-.242**
	.008	.030	.005
ATRQ Physical	-.038	-.100	-.081
	.345	.147	.196
ZKPQ Imp	-.051	-.165*	-.128
	.296	.040	.089
ZKPQ Sens	-.187*	-.199*	-.230**
	.024	.017	.007
PRBS Health	-.286**	-.102	-.233**
	.001	.140	.006
PRBS Sport	-.125	-.140	-.158*
	.093	.070	.048
EPQ-R E	-.104	-.091	-.117
	.136	.168	.109
EPQ-R N	-.034	-.069	-.061
	.359	.235	.260
EPQ-R P	-.201*	-.270**	-.280**

	.016	.002	.001
EPQ-R L	.215*	.121	.201*
	.011	.101	.016
PRBS Total	-.270**	-.160*	-.257**
	.002	.045	.003
ATRQ Total	-.152	-.160*	-.185*
	.054	.046	.025
ZKPQ Total	-.158*	-.220**	-.224**
	.048	.009	.008

*** Significant at the <.001 level (1-tailed).

** Significant at the <.01 level (1-tailed).

* Significant at the <.05 level (1-tailed).

A significance level of .000 equates to $p < .0005$.

The assessment of Health related risks was mainly associated ($r \geq .228$, $p \leq .004$) with the assessment of Sports related risks, age, sex, social risk taking propensity, the participation in Health risk behaviours, and the overall participation in physical risk taking behaviours. Smaller associations ($r \geq .158$, $p \leq .048$) were also observed between Health risk assessments and Addiction, Sensation Seeking, Psychoticism, social desirability, and Impulsive-Sensation Seeking.

The assessment of Sports related risks was mainly associated ($r \geq .220$, $p \leq .009$) with the assessment of Health risks, age, Psychoticism, and Impulsive-Sensation Seeking. Smaller associations ($r \geq .160$, $p \leq .045$) were also observed between Sports risk assessments and education, social risk propensity, Impulsivity, Sensation Seeking, overall physical risk taking behaviours, and overall risk taking propensity.

Total (or overall) physical risk assessments were mainly associated ($r \geq .224$, $p \leq .008$) with age, sex, social risk propensity, Sensation Seeking, the participation in health risk behaviours, Psychoticism, the overall participation in physical risk behaviours, and Impulsive-Sensation Seeking. Smaller associations ($r \geq .158$, $p \leq .048$) were also observed between overall physical risk assessments and Addictivity, the participation in sports risk behaviours, social desirability, and overall risk propensity.

Discussion of hypotheses related to objective 4

Hypothesis 37: Physical risk assessments will be unrelated to age ($H_0$37). Physical risk assessments will be positively Associated with age (H_a37).

The Health subscale (r = .303, p = .001), the Sports subscale (r = .235, p = .006) and the total scale (r = .321, p < .0005) were all positively and significantly associated with age. The size of the correlations was small but they were in the expected direction and consistent with the results in the first main stage. As predicted from the results in stage 1, the association with age was stronger for Health risks than Sports, and this relationship appears to be reasonably robust. This allows us to reject the null hypothesis ($H_0$37), and provides support for the alternative hypothesis (H_a37). This means that people who are older tend to rate the physical risks involved in a range of activities to be higher.

Hypothesis 38: Physical risk assessments will be unrelated to attitudes towards physical risk ($H_0$38). Physical risk assessments will be negatively associated with attitudes towards physical risk (H_a38).

None of the associations between the willingness to take physical risks and physical risk assessments were significant. The correlations were all very small (r < -.11) and non-significant (p > .05). Although the correlations were in the expected direction (negative) they are so small as to be inconsequential, and as a result the null hypothesis cannot be rejected. This means that people who are willing to take physical risks are not likely to assess the risks involved to be different or underestimate the risks.

Hypothesis 39: Physical risk assessments will be unrelated to attitudes towards social risk ($H_0$39). Physical risk assessments will be negatively associated with attitudes towards social risk (H_a39).

The willingness to take social risks was negatively and significantly associated with the assessment of physical risks. The correlations were small (Sports risks: $r = -.177$, $p = .030$; Health risks: $r = -.228$, $p = .008$; Total risks: $r = -.242$, $p = .005$) but in the expected direction and statistically significant. As a result the null hypothesis can be rejected ($H_0$39), and support is provided for the alternative hypothesis (H_a39). This means that people who are willing to take social risks are slightly more likely to rate physical risks as being lower, or they may underestimate the risks involved.

Hypothesis 40: Physical risk assessments will be unrelated to Impulsivity ($H_0$40). Physical risk assessments will be negatively associated with Impulsivity (H_a40).

The associations between Impulsivity and Health risk assessments ($r = -.051$, $p = .296$), Sports risk assessments ($r = -.165$, $p = .040$), and total risk assessments ($r = -.128$, $p = .089$) were all negative, but only the association with Sports risks was statistically significant. The size of the correlations ranged from negligible for Health risks, to very small for Sports risks, although the correlations were in the expected direction. This means that on the whole there is little relationship between physical risk assessments and Impulsivity which provides support for the null hypothesis ($H_0$40). However, a small relationship may exist with Sports risk assessments that provides partial support for the alternative hypothesis (H_a40). This suggests that people who rate Sporting risks to be low are slightly more likely to be Impulsive.

Hypothesis 41: Physical risk assessments will be unrelated to Sensation Seeking ($H_0$41). Physical risk assessments will be negatively associated with Sensation Seeking (H_a41).

Sensation Seeking was negatively and significantly associated with the assessment of Health risks ($r = -.187$, $p = .024$), Sports risks ($r = -.199$, $p = .017$) and total physical risks ($r = -.230$, $p = .007$). The size of the correlations was small ($r < .25$), but they were in the expected direction, and the correlation with the total scale was highly significant ($p < .01$). This suggests that the null hypothesis ($H_0$41) should be

rejected, and provides support for the alternative hypothesis (H_a41). This provides support for the theory that high Sensation Seekers may judge the physical risks involved in activities to be lower because of their insensitivity to external stimuli.

Hypothesis 42: Physical risk assessments will be unrelated to Extraversion (H_042). Physical risk assessments will be negatively associated with Extraversion (H_a42).

Although the correlations between Extraversion and physical risk assessments were in the expected direction (negative) they were exceedingly small ($r < -.12$), and none of the correlations was significant ($p > .05$). This means that the null hypothesis (H_042) cannot be rejected. This finding does not provide support for the theory that the greater optimism and carefree attitude associated with Extraversion would lead to reduced physical risk perceptions.

Hypothesis 43: Physical risk assessments will be unrelated to Neuroticism (H_043). Physical risk assessments will be positively associated with Neuroticism (H_a43).

Negative correlations were observed between Neuroticism and physical risk assessments, which somewhat unexpectedly was not in the expected direction. However none of these correlations was statistically significant ($p > .05$) and the minute correlations ($r < .07$) suggest that no relationship of any psychological importance exists. The null hypothesis (H_043) cannot therefore be rejected, and no support is provided for the theory that the heightened emotionality and anxiety associated with Neuroticism would lead to increased physical risk assessments.

Hypothesis 44: Physical risk assessments will be unrelated to Psychoticism (H_044). Physical risk assessments will be negatively associated with Psychoticism (H_a44).

The associations between Psychoticism and Health risk assessments ($r = -.201$, $p = .016$), Sports risk assessments ($r = -.270$, $p = .002$), and total risk assessments ($r = -.280$, $p = .001$) were all negative and statistically significant. The size of the correlations was small, although the correlations were in the expected direction and

the correlation with the total scale was highly significant. This allows us to reject the null hypothesis ($H_0$44), and provides support for the alternative hypothesis (H_a44). This concurs with Eysenck and Eysenck's (1996: p.6) theory that high Psychoticism scorers have a "disregard for danger".

Hypothesis 45: Physical risk assessments will be unrelated to social desirability ($H_0$45). Physical risk assessments will be positively associated with social desirability (H_a45).

The Health subscale (r = .215, p = .011), the Sports subscale (r = .121, p = .101) and the total scale (r = .201, p = .016) were all positively and significantly associated with social desirability, although the association with Sports risks was not significant. The size of the correlations was very small, but they were in the expected direction and the correlations with the Health subscale and total scale were significant. The fact that the association with Sports risk assessments was not significant provides partial support for the null hypothesis ($H_0$45), however the significant associations with the assessment of Health risks and total physical risks provide support for the alternative hypothesis (H_a45). This means that people who assess physical risks to be small, especially Health risks, are slightly less likely to be socially naïve or conforming.

Hypothesis 46: Physical risk assessments will be unrelated to Addictiveness ($H_0$46). Physical risk assessments will be negatively associated with Addictiveness (H_a46).

The associations between Addictiveness and Health risk assessments (r = -.176, p = .031), Sports risk assessments (r = -.118, p = .107), and total risk assessments (r = -.176, p = .031) were all negative. The correlations were very small, although the correlations were in the expected direction and the correlations with the Health scale and total scale were significant. The small size of the correlations and the fact that the correlation with Sports risk assessments was not significant provides some support for the mull hypothesis ($H_0$46). On the other hand the correlations with Health risk assessments and the total scale were statistically significant and this

provides support for the alternative hypothesis (H_a46). This means that people who rate physical risks (especially Health risks) to be low are slightly more likely to become addicted to drugs.

Hypothesis 47: Physical risk assessments will be unrelated to Criminality (H_047). Physical risk assessments will be negatively associated with Criminality (H_a47).

Although the correlations with Criminality were in the expected direction, negative, the size of the correlations was exceedingly small ($r < .14$), and none of these correlations was statistically significant ($p > .05$). This means that the null hypothesis (H_047) cannot be rejected, and no support is found for the theory that people high in Criminality are likely to underestimate physical risks.

Hypothesis 48: Physical risk assessments will be unrelated to confidence (H_048). Physical risk assessments will be negatively associated with confidence (H_a48).

None of the correlations between physical risk assessments and confidence were statistically significant ($p > .05$), and although the correlations were in the expected direction they were of negligible size suggesting no psychological significance either ($r < .14$). The null hypothesis (H_048) cannot be rejected, and there seems to be no relationship between confidence in the ability to manage potentially fatal risks and the assessment of those risks.

Hypothesis 49: Physical risk assessments will be unrelated to occupation (H_049). Physical risk assessments will be positively associated with occupation (H_a49).

There were no significant ($p > .05$) correlations between physical risk assessments and occupation. The size of the correlations was negligible ($r < .145$), and the correlations were in different directions. The null hypothesis (H_049) cannot therefore be rejected, and there appears to be no relationship between occupation and the way in which physical risks are assessed.

Hypothesis 50: Physical risk assessments will be unrelated to education ($H_0$50). Physical risk assessments will be positively associated with education (H_a50).

There appeared to be no relationship between Health and total physical risk assessments and education ($r < .13$, $p > .05$), which provides support for the null hypothesis ($H_0$50). However there was a significant correlation between the assessment of Sports risks and education ($r = .209$, $p = .013$), which provides some support for the alternative hypothesis (H_a50). This means that people who have higher educational qualifications are slightly more likely to assess Sporting risks to be greater.

Hypothesis 51: Physical risk assessments will be unrelated to peer behaviour ($H_0$51). Physical risk assessments will be negatively associated with peer behaviour (H_a51).

The correlations between physical risk assessments and peer behaviour were not statistically significant ($p > .05$), and the degree of association was too small to be of any psychological importance ($r < .08$). The fact that the correlations were in the expected direction is of little importance here, and the null hypothesis ($H_0$51) cannot be rejected. Therefore people who have risk taking friends appear to assess the risks involved in the same way as people who don't.

Hypothesis 52: High physical risk assessments will be associated with being female (H_a52). Alternatively the alternative hypothesis predicts that physical risk assessments will be unrelated to sex (gender) ($H_0$52).

Females assessed Health risks ($r = .248$, $p = .004$; $t = 2.69$, $p < .01$) Sports risks ($r = .212$, $p = .012$; $t = 2.29$, $p < .05$) and physical risks in total ($r = .274$, $p = .002$; $t = 3.00$, $p < .01$) to be higher than males on average, as expected. As in the first main study the relationship between sex and Health risks was more important than that with Sports risks (in the first study there was no significant link with Sports risk assessments). The null hypothesis ($H_0$52) can therefore be rejected, and we can

conclude that females are slightly more likely to rate physical risks, especially Health risks, to be higher than males ($H_0$52).

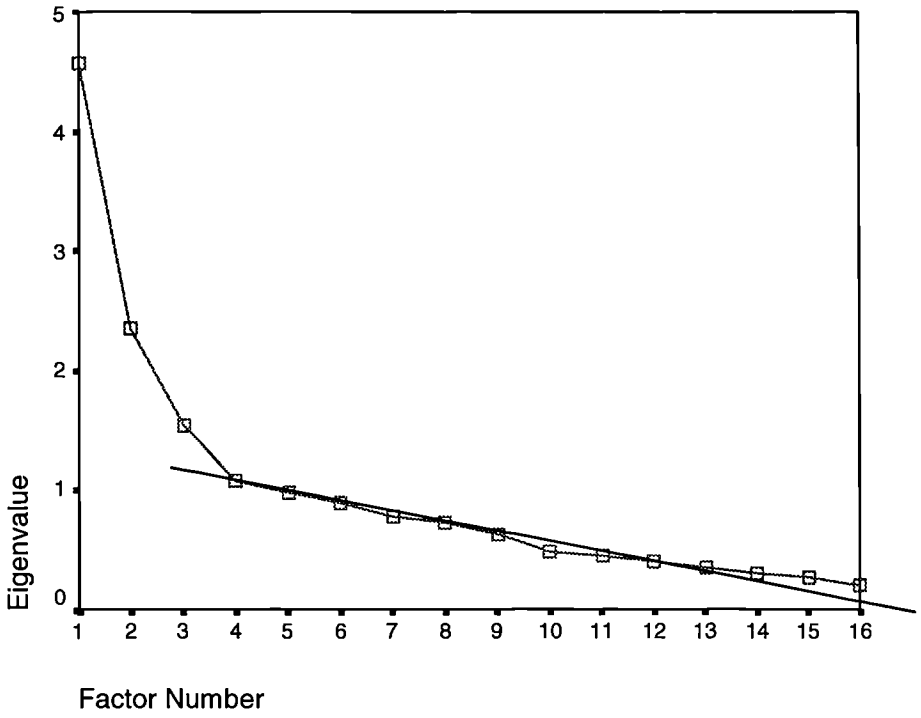
9.6. Factor Analytic Results

A factor analysis of the complete correlation matrix has the potential to effectively distil the essence of the variance and express it in terms of a number of underlying factors. This is especially true in this case because of the virtually incomprehensible number of interscale correlations, and also because of the desire to investigate the underlying latent structure of risk related constructs. Principal factors extraction with Varimax rotation was performed on the 18 variables that did not contain overlapping item content. Principal components extraction was used prior to principal factors extraction to estimate the number of factors, detect outliers, check multicollinearity, the factorability of the correlation matrix and for outlying variables. Two outlying variables (occupation and educational level) were excluded from subsequent analyses as they failed to load (>.3) on any factor.

Three and four factor solutions were extracted as indicated by statistical, mathematical and algorithmic techniques. The Kaiser-Guttman test (number of factors with eigenvalues >1) suggested a 4-factor solution, although this technique is known to commonly overestimate the number of factors (Kline, 2000a). A scree test (see Figure 7) suggested a 3-factor solution. A maximum likelihood statistical test of significance was also used to give an upper bound estimate of the number of significant factors, the results of which indicated that up to 4 factors could be legitimately extracted (3 factors, 75 *df*, X^2 = 106.428, sig. = .01; 4 factors, 62 *df*, X^2 = 73.851, sig. = .144). A four factor solution accounted for 60% of the variance, however factors 1 and 4 were highly correlated (-.529) in an oblique solution (Direct Oblimin with delta = 0) and had 9 shared loadings, suggesting that the correct number of factors had not been extracted. A 3-factor solution appeared superior, accounting for 53% of the variance, with all factors having a unique set of two or more defining variables. The results of the 3-factor solution are therefore presented here.

FIGURE 7

Scree Plot



Note: Scree test line shown

From a theoretical perspective correlated factors were possibly expected due to the known associations between the many of the measures included in the study. Three factors were subjected to Direct Oblimin rotation (Delta = 0) in order to investigate the factor correlation matrix (see Table 32), as recommended by Tabachnick and Fidell (2001).

TABLE 32

Factor Correlation Matrix

Factor	1	2	3
1	1.000	.147	-.219
2	.147	1.000	-.158
3	-.219	-.158	1.000

The correlations between factors were borderline in terms of whether the additional complexity of an oblique solution was warranted. The highest correlation (-.219), between factors 1 and 3, indicates that there is a maximum of 4.8% overlap in variance among factors. Tabachnick and Fidell (2001) suggest taking about 10% (correlations of .320 and above) overlap as the minimum to warrant oblique rotation. Gorsuch (1983) suggests taking the correlations between salient variables on each factor as the criterion for determining the correct amount of correlation between factors. The mean correlations between variables that loaded >.63 on each factor (considered to be "very good" loadings by Comrey and Lee [1992]) also indicated that the overlap between factors was of borderline significance (see Table 33).

TABLE 33

'Marker Variables' Correlation Matrix

Factor	1	2	3
1	1.00	.316	-.139
2	.316	1.00	-.010
3	-.139	-.010	1.00

Because both of these techniques suggest a modest amount of overlap between factors (<10%), and because no correlations between factors or mean correlations between factor markers exceeded Tabachnick and Fidell's (2001) recommended .320 for oblique rotation, orthogonal rotation was selected. Trials also indicated that the differences between oblique and orthogonal solutions were trivial. Varimax rotation was selected because it is generally agreed to be the best orthogonal rotational technique (Gorsuch, 1983; Kline, 2000a, 2000b; Tabachnick & Fidel, 2001). The rotated factor matrix is shown in Table 34, which indicates the loadings of variables on factors, communalities, eigenvalues and percents of total variance accounted for. For ease of interpretation the variables are sorted by the size of their loadings, and significant loadings (>.3) are shown in bold.

TABLE 34

Rotated Factor Matrix Showing The Latent Structure Of Physical Risk Related Constructs

	Factor			Communalities
	1	2	3	
ATRQ Social	**.747**	.108	-.156	.338
ZKPQ SS	**.686**	**.323**	-.022	.347
ATRQ Physical	**.619**	**.522**	.093	.468
EPQ P	**.591**	.151	-.179	.446
EPQ L	**-.541**	-.028	.157	.780
Age	**-.529**	-.103	.217	.326
ZKPQ Imp	**.502**	-.157	.021	.594
PRBS Health	**.434**	.138	-.210	.664
EPQ E	**.430**	.021	.016	.277
PRBS Sport	.125	**.805**	-.057	.575
Confidence	.158	**.657**	-.108	.252
Friends	.157	**.649**	.031	.667
Sex	-.015	**-.505**	**.302**	.186
EPQ N	**.351**	**-.428**	-.023	.307
PRAI Health	-.143	-.050	**.870**	.404
PRAI Sport	-.138	-.067	**.550**	.318
Eigenvalue	4.570	2.345	1.543	
% of total variance accounted for	28.6	14.7	9.6	

Notes: Extraction Method: Principal Axis Factoring.
Rotation Method: Varimax with Kaiser Normalization.

Factor scores were calculated by regression and correlated with previously excluded variables using a Pearson correlation coefficient (See Table 35). Significant correlations are flagged, and these should further aid the interpretation of factors.

TABLE 35

Correlations Between Factor Scores And Excluded Variables

Excluded Variables	Factor 1	Factor 2	Factor 3
EPQ Addiction	.533***	-.330***	-.199*
	.000	.000	.024
EPQ Criminality	.550***	-.378***	-.131
	.000	.000	.097
PRAI Total	-.176*	-.073	.909***
	.040	.234	.000
ATRQ Total	.864***	.406***	-.038
	.000	.000	.355
ZKPQ Imp-SS Total	.815***	.173*	-.006
	.000	.042	.476
PRBS Total	.411***	.695***	-.200*
	.000	.000	.023

*** Significant at the <.001 level (2-tailed).

** Significant at the <.01 level (2-tailed).

* Significant at the <.05 level (2-tailed).

A significance level of .000 equates to $p < .0005$.

The factor analytic results are interesting because they can help us to understand how such a large number of variables are related to each other. The fact that there were three main factors, and that these factors were virtually uncorrelated was revealing. The three-factor solution accounted for a satisfactory amount of variance in the initial correlation matrix (53%), especially when it is considered that some of the variables such as Extraversion did not have more than one measure or closely related measure. The fact that the factors were not correlated to the degree that oblique rotation was preferable tells us that the groups of variables identified by factor loadings are virtually independent from those in other factors, in this study at least. Factors were identified from their highest loading variables as "Antisocial risk taking", "Venturesomeness" and "Physical risk assessments". The participation in

Health risk behaviours was associated with the antisocial risk taking factor, although it was only the eighth highest loading, and the size of the factor loading was moderate (.434). Whereas the participation in high risk sports was clearly associated with the second Venturesomeness factor, it being the highest loading variable and having a high factor loading (.805). This clearly provides a better 'fit' for Sporting risk participation in contrast to Health risk participation, a result that is replicated in the regression analyses conducted separately. The correlations with excluded variables are important in that they help us to further identify the factors. The first factor is clearly linked with Impulsive-Sensation Seeking (r = .815, $p < .0005$) and most of all total risk propensity (r = .864, $p < .0005$) as would be predicted from the high loadings of each of the associated subscales. Interestingly there were also fairly strong associations with both Addiction and Criminality (r = .533 and .550 respectively, both $p < .0005$), which helps to confirm the labelling of the factor as 'antisocial' risk taking rather than 'health' risk taking. The second Venturesomeness factor was negatively associated with both Addiction and Criminality (r = -.330 and -.378 respectively, both $p < .0005$) which may be largely due to an association with low Neuroticism, and seems to confirm that the participation in high risk Sports is not a form of antisocial risk taking. The fairly low correlation between this factor and the Attitudes Towards Risk Questionnaire (r = .406, $p < .0005$) and the very low correlation with the Impulsive-Sensation Seeking Scale (r = .173, $p = .042$) seem to confirm that the participation in high risk Sport is associated with Sensation Seeking and physical risk propensity, but not with Impulsivity and social risk propensity. The third factor is clearly identified by an extremely high correlation with the Physical Risk Assessment Inventory total (r = .909, $p < .0005$), and it is interesting that this factor is also characterised by a small negative correlation with Addiction (r = -.199, $p = .024$).

These findings lend support to previous theorists who have suggested that the participation in high risk Sports and antisocial risk taking are separate and largely independent behaviours (e.g. Levenson, 1990). The meaning of this is also clear – it is a mistake to talk of a generic "risk taking personality" except beyond the shared influences of the Sensation Seeking trait. Physical risk taking behaviours also share

in common a preference for elevated levels of physical risk, but beyond these two variables, little of any importance can be said in such general terms. Further analyses revealed that these two generally applicable variables in combination could predicted 18% (multiple r = .419) of Health risk behaviours and 26% (multiple r = .508) of Sports risk behaviours, which compares somewhat poorly with the much larger amounts of variance predicted by a greater number of variables (38% and 60% respectively). It is clear, therefore, that there are both similarities between risk taking behaviours and a great deal of specificity as Zuckerman (1994) suggests. These findings are also important because they clarify the associations between the different risk taking behaviours and individual differences, for example the small but significant correlational link between high risk Sports behaviours and social risk propensity appears to be of no significance in the factor analysis, and it is therefore suggested to be of little psychological significance.

9.7. Multiple Regression Analyses

Multiple regression analyses are especially useful for two reasons. Firstly, they allow us to estimate the total amount of variance in the dependent variable that can be explained by a specified selection of predictor variables (the multiple regression coefficient or R). Secondly, because they allow us to estimate which independent variables predict unique variance in the dependent variable, that is variance that cannot be explained in statistical terms by other individual differences included in the present study. The standard (or simultaneous) regression method was used, and other methods, such as stepwise regression, were rejected due to their controversial nature and the very large number of subjects needed to ensure generalisable results (Tabachnick & Fidel, 2001). A number of variables (such as the EPQ-R Addiction scale and total scales) were excluded because of their overlapping content with included variables.

Regression Analyses were therefore completed with high risk Sports and Health behaviours as the dependent variables.

Table 36

Predictors Of Self-reported Risky Behaviours: Multiple Regression Beta Weights For All Main Variables

	Health Risk Behaviours	**Sports Risk Behaviours**
Extraversion	.133	-.126
Neuroticism	-.002	-.227*
Psychoticism	-.132	-.018
Lie (Social Desirability)	-.103	.040
Sensation Seeking	.187	.322**
Impulsivity	-.093	-.152
Risk Propensity (Physical)	.114	.261*
Risk Propensity (social)	.201	-.023
Risk Assessments (Sports)	.067	-.053
Risk Assessments (Health)	-.162	-.031
Risk Behaviours (Sports)	-.105	Excluded
Risk Behaviours (Health)	Excluded	-.084
Confidence	.044	.252**
Age	-.152	-.124
Sex	-.095	-.015
R	**.576*** **	**.682*** **
R^2	**.332*** **	**.465*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

Perhaps the most important finding from the multiple regression analyses was the estimation of the total amount of variance predicted by specified sets of independent variables. In the first analysis all variables were included unless they were composites of other scales. The total amount of variance predicted in the dependent

variables of Health risk behaviours (38%) and Sports risk behaviours (60%) was both sizable and highly statistically significant (both $p < .0005$). This suggests that just under half of the variance in Health risk behaviours and just over half of Sports risk behaviours could be predicted by the individual differences included in the present study. It is reasonable to wonder at this stage how this compares with the prediction of risk taking behaviours in other studies in order to assess the quality of variable sampling in the present study and the consistency with which risk taking behaviours can be predicted. In Horvarth and Zuckerman's (1993) study they managed to predict between 21% and 51% of a range of risk taking behaviours using a smaller set of independent variables (namely peer risk taking behaviours, Sensation Seeking, Impulsivity and risk appraisals). When the same set of independent variables (measured by different instruments) were used to predict physical risk taking behaviours in this study they predicted 22% of the variance in Health risk behaviours and 48% variance in Sports risk behaviours which compares closely with the range of predictive accuracy achieved in Horvarth and Zuckerman's study. This degree of prediction possible in these two studies taken together ranges from about 20% to 60%, and the average is about 40%. This means that the amount of variance predicted in the present study when incorporating all variables ranges from about average for Health risk behaviours to good for Sports risk taking. Of course the better the sampling of relevant variables, and the greater the reliability of individual measures, the better our estimates of the amount of variance in risk taking behaviours that is attributable to individual differences.

Few of the independent variables predicted unique variance in the dependent variable despite a large number of strong and statistically significant bivariate correlations. This was no doubt due to the fact that many of the independent variables were strongly correlated with each other and as a result they were both predicting the same variance in the dependent variable. Exceptions were Sensation Seeking that predicted unique variance in Sports participation ($r = .393$, $p < .0005$), peer risk behaviours that also predicted Sports participation ($r = .426$, $p < .0005$), and occupation that was negatively associated with Health risk behaviours ($r = -.271$, $p < .01$) and positively associated with Sports behaviours ($r = .192$, $p < .05$).

The zero order correlation between occupation and Sports risk behaviours was positive yet not statistically significant ($p > .05$), presumably this small relationship may have been obscured by the influence of other variables.

Further regression analyses were performed in order to examine whether a large degree of predictive efficacy was lost in the prediction of high risk sports participation when selected variables were excluded. Variables that did not correlate at the $P<0.01$ level were excluded from the analyses, which were conducted separately for each set of behaviours.

Table 37

Selected Predictors of Self-reported High Risk Sports Participation: Multiple Regression Beta Weights

	Sports Risk Behaviours
Neuroticism	-.240***
Sensation Seeking	.315***
Physical Risk Propensity	.027
Confidence	.110
Sex	-.062
Friends	.423***
R	**.735*** **
R^2	**.540*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

Further regression analyses were also performed in order to examine whether a large degree of predictive efficacy was lost in the prediction of health risk behaviours when selected variables were excluded. Variables that did not correlate at the $P<0.01$ level were excluded from the analyses.

Table 38

Selected Predictors of Self-reported Health Risk Behaviours: Multiple Regression Beta Weights

	Health Risk Behaviours
Age	-.116
Lie	-.100
PRAI Health	-.168
Sensation Seeking	.127
ATRQ Social	.223
ATRQ Physical	.115
Extraversion	.113
Psychoticism	-.145
R	**.556*** **
R^2	**.309*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

A smaller set of variables was then selected according to the statistical significance of the zero order correlations with the dependent variables ($p < .01$). This was done not to maximise the amount of variance that could be predicted, but rather to ensure that the variables included were associated with the dependent variable beyond reasonable doubt. Otherwise the estimations of predictable variance might effectively be inflated by the capitalisation of chance correlations and spurious associations, and this was especially important in this study where the sample size was moderate not extremely large ($n = 113$). It was encouraging however that these smaller sets of independent variables continued to predict the majority of the variance predicted by all variables. 31% of Health risk behaviours were predicted instead of 38%, a decrease of 7%. 54% of Sports risk behaviours were predicted instead of 60%, a decrease of 6%. Clearly these results are similar, which leads us to conclude that a relatively small number of key variables (6 to 8) are most important in this study.

Risk Propensity

Regression analyses were also performed with risk taking propensity as the dependent variable.

Table 39

Predictors of Self-reported Risk Taking Propensity: Multiple Regression Beta Weights For All Main Variables

	Physical Risk Propensity	**Social Risk Propensity**	**Overall (Total) Risk Propensity**
Extraversion	.076	.130	.146*
Neuroticism	-.160*	.276**	.078
Psychoticism	-.019	.384***	.256**
Lie (Social Desirability)	-.018	-.133	-.106
Sensation Seeking	.443***	.114	.399***
Impulsivity	.080	-.031	.036
Risk Propensity (Physical)	Excluded	.203	Excluded
Risk Propensity (social)	.183	Excluded	Excluded
Risk Assessments (Sports)	-.025	.003	-.016
Risk Assessments (Health)	.176*	-.035	.102
Risk Behaviours (Sports)	.033	-.041	-.005
Risk Behaviours (Health)	.114	.120	.166*
Confidence	.035	.015	.036
Age	.001	.033	.024
Sex	-.048	-.092	-.099
Friends	.252**	-.022	.165*
Occupation	.126	.068	.138*
Education	-.073	.106	.022
R	**.807*** **	**.789*** **	**.841*** **
R^2	**.652*** **	**.622*** **	**.707*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

The total amount of variance predicted by all variables was 62% for social risk propensity, 65% for physical risk propensity and 71% for overall risk propensity, all $p < .0005$. Although this was clearly a highly degree of predictive accuracy that was highly significant, there were no other results of this kind were found in the literature for comparison. Sensation Seeking and friends behaviours predicted a significant amount of unique variance in both physical and overall risk propensity, whereas Psychoticism predicted unique variance in social and overall risk propensity. Interestingly Neuroticism was associated with both social and physical risk propensity, but in opposite directions, indeed Neuroticism emerges as one of the variables that may explain why some people are willing to take risks in certain areas of their lives and not others. Again key variables, in this case the six variables with the highest significant bivariate correlations, were selected as independent variables to analyse their predictive efficacy.

Table 40

Selected Predictors of Self-reported Physical Risk Taking Propensity: Multiple Regression Beta Weights

	Physical Risk Propensity
Sensation Seeking	.508***
Social Risk Propensity	.166
Psychoticism	-.058
Friends	.188*
Confidence	.103
Risk Behaviours (Sports)	.096
R	**.757*** **
R^2	**.573*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

Table 41

Predictors of Self-reported Social Risk Taking Propensity: Multiple Regression Beta Weights

	Social Risk Propensity
Sensation Seeking	.174
Psychoticism	.424***
Physical Risk Propensity	.114
Lie	-.162*
Risk Behaviours (Health)	.159*
Age	.010
R	**.747*** **
R^2	**.558*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

Table 42

Selected Predictors of Self-reported Total Risk Taking Propensity: Multiple Regression Beta Weights

	Overall (Total) Risk Propensity
Sensation Seeking	.445***
Psychoticism	.267***
Lie	-.142*
Age	.013
Risk Behaviours (Sports)	.120
Risk Behaviours (Health)	.150*
R	**.803*** **
R^2	**.645*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

It was important to investigate how well a smaller number of independent variables could predict the dependent variable, although in this case too many variables were correlated at the $p < .01$ level. As a result the 6 highest loading variables were selected in order to predict the dependent variables. 57% physical risk propensity was predicted instead of 65%, a decrease of 8%. 56% social risk propensity was predicted instead of 62%, a decrease of 6%. And 65% total risk propensity was predicted instead of 71%, a decrease of 6%. These results are obviously similar and this suggests that 6 closely associated variables are almost as efficient at predicting the variance in the dependent variables (in this case risk propensity) as all of the variables incorporated in this study.

Physical Risk Assessments

Regression analyses were also performed with physical risk assessments as the dependent variable as this provides useful information about the concurrent validity of the PRAI and helps to further the understanding of physical risk assessments.

Table 43

Predictors Of Physical Risk Assessments: Multiple Regression Beta Weights For All Main Variables

	Health Risk Assessments	**Sports Risk Assessments**	**Physical (Total) Risk Assessments**
Extraversion	-.074	.040	-.031
Neuroticism	.031	-.039	-.008
Psychoticism	.022	-.092	-.062
Lie (Social Desirability)	.133	-.077	.051
Sensation Seeking	-.106	.039	-.062
Impulsivity	.107	-.137	-.026
Risk Propensity (Physical)	.352*	-.049	.277
Risk Propensity (social)	-.063	.006	-.053
Risk Behaviours (Sports)	-.004	-.252	-.230
Risk Behaviours (Health)	-.200	.171	-.029
Risk Assessments (Sports)	.335**	Excluded	Excluded
Risk Assessments (Health)	Excluded	.331**	Excluded
Confidence	-.037	.135	.088
Age	.162	.197	.325**
Sex	.146	.165	.282*
Friends	-.043	.158	.103
Occupation	-.213*	.247*	.027
Education	-.012	.116	.094
R	**.566****	**.573****	**.511***
R^2	**.321****	**.329****	**.261***

* = P<0.05, ** = P<0.01, *** = P<0.001

The total amount of variance predicted by all variables was 33% for Sports risk assessments, 32% for Health risk assessments and 26% for overall physical risk assessments. As with risk taking propensity there were no results found to be available in the literature for comparison. Age and sex predicted unique variance in overall physical risk assessments, and physical risk propensity predicted unique variance in Health risk assessments. Occupation predicted unique variance in both

Health and Sports risk assessments, but in the opposite direction. Obviously further research is needed to replicate these findings as many of these results are of marginal statistical significance, and also because there is little pre-existing data for comparison. For each risk assessment category further regression analyses were conducted incorporating the 6 variables with highest bivariate correlations, in an attempt to estimate whether the majority of predictable variance is accounted for by a smaller number of key variables.

Table 44

Selected Predictors of Health Risk Assessments: Multiple Regression Beta Weights

	Health Risk Assessments
Risk Assessments (Sport)	.321***
Age	.149
Sex	.149
Risk Propensity (Social)	-.012
Risk Behaviours (Health)	-.156
Lie (Social Desirability)	.039
R	**.520*** **
R^2	**.270*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

Table 45

Selected Predictors of Sports Risk Assessments: Multiple Regression Beta Weights

	Sports Risk Assessments
Risk Assessments (Health)	.327**
Age	.097
Sex	.111
Education	.183*
Sensation Seeking	-.025
Psychoticism	-.109
R	**.503*** **
R^2	**.253*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

Table 46

Selected Predictors of Physical Risk Assessments: Multiple Regression Beta Weights

	Physical Risk Assessments
Age	.245*
Sex	.247**
Risk Propensity (Social)	.027
Sensation Seeking	-.019
Risk Behaviours (Health)	-.069
Psychoticism	-.163
R	**.454*** **
R^2	**.206*** **

* = P<0.05, ** = P<0.01, *** = P<0.001

25% of Sports risk assessments was predicted instead of 33%, a decrease of 8%. 27% of Health risk assessments were predicted instead of 32%; a decrease of 5%. And 21% of total physical risk assessments were predicted instead of 26%, a decrease of 5%. These results appear to be reasonably similar, although the decrease in the prediction of Sports risk assessments of 8% is reasonably large, constituting a reduction of about one quarter in relative terms, that said the majority of predictable variance is still accounted for.

9.8. Qualitative Motivational Data

The qualitative motivational data provides information about peoples own subjective understanding of their own risk taking motivations. It constitutes their own attempts to understand their own risk taking behaviours and attitudes in terms of phenomenological insights. This approach is clearly different from the quantitative psychometric approach adopted in the majority of the present study, and enhances the study through the triangulation of methods. An inductive thematic analysis was conducted on the open ended qualitative responses subjects gave to the risk motivation item. Three general themes emerged from the data that can be used to categorise responses: (1.) Motivations for taking risks (2.) motivations for avoiding risks, and (3.) motivations that were mentioned as both reasons for taking and avoiding risks. Within these broad categories a number of specific themes emerged, and these are subsequently described with reference to salient quotes and their relative frequency.

Motivations For Taking Risks

The most frequently mentioned motivation for taking potentially fatal risks was for thrills, excitement and positive emotions (24 subjects, 22.9%). This motive appeared to equate to a form of Sensation Seeking, and a small number of subjects also specifically mentioned the need for novelty, change or the unknown (3 subjects, 2.9%). "I need new and exciting distractions frequently." "Adrenaline rush, feeling of excitement and overwhelming when its over." "Feels like living life to the full."

One subject describes a "buzz/sparkle/enjoyment while doing it" and also "elation afterwards, having got away with it." The second main motivation was for challenge, achievement and mastery (13 subjects, 12.4%). One subject stated: "I like doing exciting sports that challenge me and make my pulse race. I like the excitement and sense of achievement of doing it." One subject mentioned "pitting skill and instinct ... against risks", "overcoming problems" and "being brave." "Its fun and you feel you've achieved something when you come out alive." One subject (86) is motivated to take risks because "there may be an extreme goal, making the risk worthwhile." Subjects were also motivated to take risks because they saw the risks themselves to be calculated or minimised (8 subjects, 7.6%). "It is a calculated risk and not always potentially fatal, for example crossing the road is a potentially fatal risk." "I like taking on challenges so long as the majority of potential risks have been examined." Less common themes included the influence of peers or the more general social context of risk behaviours (5 subjects – 4.8%), and keeping things in perspective or escapism needs (3 subjects – 2.9%). "Talking in the pub afterwards, you'd always wished you'd done the 'fall' that you missed, so I try not to miss any!" Subject 68-"I like the buzz you get, the feeling going through your whole body. The physical risks are great to make me forget about anything else that might be going on at work etc... It makes me feel special as I am feeling at my best, happy with good friends."

Motivations For Avoiding Risks

The most common motivation for avoiding risk was due to the influence of safety needs, the will to live and the potential negative consequences being not worth it (57 subjects – 54.2%). One subject stated "...I tend to avoid other risks that don't seem worth it – life's too fun to throw away." "I am a scaredycat. I value my life. I still want to learn and experience so much more." "Danger does not excite me and I like my life." "Common sense prevails!" "Basically I want to live and enjoy my life and my future. Life is unpredictable and so risks from my point of view should be avoided or reduced." "I avoid potentially fatal risks because I don't like to get hurt." "Survival is fundamental." "Having experienced a close call I have a greater

appreciation of life and its value." The second main motivation to avoid risk was the specific influence of fear, anxiety and negative emotions (13 subjects – 12.4%). "I avoid things that scare me." Some subjects were also concerned about the possible effects on family members and others (12 subjects – 11.4%). "I would avoid potentially fatal risks if I was liable to cause harm to others through my actions." "Possible knock-on effects on others I'm responsible for." "I wouldn't take potentially fatal risks because of my responsibilities as a parent/wife." A small number of subjects also mentioned age as a reason to avoid potentially fatal risks (2 subjects – 1.9%). "I avoid potentially fatal risks because of my age." "Survival; at 50, or maybe even younger, sometimes your own mortality confronts you in the face through no fault of your own (illness), so you want to hang on to the years that are left."

Motivations For Taking / Avoiding Risks

The degree of personal control over the level of risk was mentioned as both a reason for taking and avoiding risk depending on the level of control (6 subjects – 5.7%) One subject stated "I could not do things which were what I felt to be uncontrolled (e.g. cocaine, heroine) because I feel there is a greater risk of dying... I like living!" One subject stated "I would only take potentially fatal risks or participate in potentially fatal activities if I felt that the situation was controlled and the 'average' or 'normal' outcome was known to be safe." "I enjoy the thrill of doing sports that are dangerous (paragliding, climbing) but I try to do them as safely as possible. Maybe it's to do with being in control of the risk and mitigating the risk." Subject 87- "Calculated risks for fun are fine e.g. bungee, skydiving, rallying etc. High risks that can affect your health/mind are pointless." Many subjects give both reasons for taking and avoiding risks (16 subjects – 14.2%), suggesting that their attitudes towards risk are not straightforward. Some subjects (9 subjects – 8%) also explicitly describe an approach withdrawal decision-making conflict when torn between the relative safety of smaller risks and the greater intrinsic rewards of larger risks. "...I want to have an interesting life with challenges in it. That said, I have no death wish – and strive to seek a balance between excitement and risk." "I don't want to get

hurt but I enjoy the challenge of rock climbing and the sense of achievement of getting up a hard route."

The qualitative data are interesting for a number of reasons, not least because they give an insight into people's own understanding of their actions from a subjective or phenomenological perspective. This data are derived from a complementary yet different source, that of the open ended qualitative item rather than the quantitative closed items that predominate in this study, and this constitutes a 'triangulation' of methodologies. The critical issues are twofold here; the first issue concerns the validity of the psychometrically driven conceptual model of risk taking developed in this study. Are risk takers own interpretations of their behaviour consistent with this model? Secondly the use of an open-ended question raises the possibility that new and as yet neglected variables will be discovered. Have any themes been raised therefore which have not already been incorporated in the aforementioned conceptual model?

The main reason given for the motivation to take potentially fatal risks equated to a form of Sensation Seeking, that is the need for new and exciting experiences. This is consistent with the moderate to strong correlations (r = .367 to .721, all $p < .0005$) between Sensation Seeking and the physical risk taking behaviours and the willingness to take both physical and social risks. Taken together these results provide strong evidence of the link between risk taking and the Sensation Seeking trait, which is consistent with a myriad of other studies.

The second most important reason given for taking risks was for the challenge, achievement and mastery and the third biggest reason mentioned was because they thought that the risks could be controlled or maximised. No measure of the need for achievement was included in this study although no relationship was found between the NEO-PI-R "achievement striving" facet scale and the participation in high risk Sports by Nicholson, Fenton-O'Creevy, Sloane and Willman (2002). However a number of other studies have also found that risk takers mention challenge, achievement and mastery needs when asked about their motivations (Balint, 1959;

Haris, 1973; Huberman, 1968; Piet, 1987: Slanger & Rudestam, 1997). Robinson (1985) found that although 30 "elite rock climbers" did not score significantly higher than high school and undergraduate sports participants on the "need for achievement" scale of the Sports Behaviour Scale, 97% consciously set themselves specific climbing goals to achieve. To complicate matters, we might bear in mind that there have been concerns about the validity of the 8 item NEO-PI-R facet scales, and Robinson's study incorporated a small number of subjects and a measure of questionable validity (Kline, 2000a). Until further research is done in this area we can only speculate that either risk takers do not have elevated achievement needs and are simply choosing to satisfy normal levels of this need in risk taking activities, or alternatively that methodological difficulties have so far obscured the true degree of association. Many "need for achievement" measures (e.g. the NEO-PI-R achievement striving facet scale) tend to focus upon the desire for extrinsic rewards such as financial and occupational success, and they may not be an appropriate measure of the elevated need for intrinsic rewards or achievements associated with high risk activities. What is far more clear is the clear link between risk taking and confidence in their own abilities to control the risks involved, especially though not exclusively with the participation in high risk sports and physical risk propensity (r = .513 and .409, $p < .0005$). This closely ties in with studies that have demonstrated a strong link between physical risk taking and perceived self-efficacy (Bandura, 1997; Slanger & Rudestam, 1997). Confidence appears to be a major disinhibiting factor and may also tie in with the achievement/challenge/mastery motive mentioned by so many risk takers in that risk takers may gain a sense of satisfaction in gaining the skills required to manage risks and as a result develop confidence through enactive mastery experiences.

It was interesting that the influence of peers was mentioned by a small number of risk takers (n =5) as a motive to take risks. This closely agrees with the strong link between risk taking and peer risk taking behaviours, especially with the participation in high risk sports and physical risk propensity (r = .607 and .420, $p < .0005$). This adds weight to the view that people with friends who are willing to take potentially fatal risks are more likely to have the opportunity to participate in the activities

themselves and are more likely to have positive attitudes towards risk. The fact that people high in social risk propensity were especially high in Psychoticism and low in social desirability does suggest on the other hand that this represents a less socialised form of risk taking, where people are less concerned with other people's attitudes and opinions and more concerned about personal gratification. In support of this hypothesis the associations between peer behaviour and social risk propensity was very small ($r = .182$, $p = .031$).

A small number of subjects (n = 3) also mentioned escapism needs, and this perhaps reinforced by the links between risk taking and social disinhibition and a lack of conformity (evidenced by high social risk propensity, high Psychoticism, and low social desirability). This also concurs with Nicholson, Fenton-O'Creevy, Sloane and Willman's (2002) study in which they found associations between a variety of risk taking behaviours and low Agreeableness, low Contentiousness and high Openness to Experience. Similar links between the NEO-PI-R scales and the risk related construct of Sensation Seeking help to convince that this result is reasonably robust (Zuckerman, 1994).

The first and second most common motives mentioned to avoid taking risks were safety needs and the specific influence of anxiety. This reinforces the finding that Sporting risk takers may be low in second order trait Neuroticism. What is interesting though is that people with high social risk propensity tended to be *higher* in Neuroticism ($r = .309$). This may at first appear contradictory, however "antisocial risk takers" such as drug users have often been linked to increased levels of Depression, Anxiety and Neuroticism (Eysenck & Eysenck, 1996; Levenson, 1990). It appears that people may participate in high risks sports because they are emotionally stable and confident people, but this disinhibiting effect appears to be limited to the participation in high risk sports. On the other hand people may take social risks because of high Neuroticism when combined with high Psychoticism.

The third most common theme was a concern for the possible effects on others, often mentioned were family members and people they were responsible for. This is

antithetical to the constructs of social desirability and especially Psychoticism, which helps us to understand their strong relationship with social risk propensity. This might lead us to hypothesise that risk takers, especially those with high social risk propensity, might have less family commitments. In particular they might be less likely to be married or be in a long-term relationship, and may be less likely to have children. This lack of responsibility might even generalise to other areas of life, for example are risk takers less likely to own their own house? Obviously these are purely speculative ideas at this stage, but as these variables can be easily assessed they could form the basis of an interesting new research topic.

A very small number of subjects (n = 2) also explicitly mentioned their age as a reason to avoid taking risks. Perhaps they lack the opportunity to participate in certain activities because of a general deterioration in their health and fitness, or perhaps they are unknowingly being influenced by psychological changes that occur with age (such as decreases in the Sensation Seeking trait). All of the risk taking variables (risk behaviours and risk propensities) were negatively related to age, and although the correlations were small they were significant. In short age appears to be a factor in influencing risk taking choices, but it only appears to account for around 3% to 10% of the variance in risk taking behaviours making it a comparatively small influence.

Perhaps most interesting of all was the fact that 6 subjects mentioned the degree of perceived control over the level of risk as both a reason to take and avoid risks. This again confirms the importance of self-confidence and the perception of control as major disinhibiting variables. This also helps to understand why many risk takers explicitly described an approach withdrawal decision-making conflict. In this way many risk takers are torn between taking ever greater risks in order to gain more extreme intrinsic experiences and rewards, and ever greater desires to reduce the levels of risk in order to maintain a reasonable degree of control and thus safety. It is the constant assessment of risk management ability in comparison with the perceived levels of risk that distinguishes a risk optimiser from a 'death darer'. Interestingly confidence is more closely associated with the participation in high risk

Sports than Health risk behaviours, which implies that the risks involved in high risk Sports may be perceived to be more controllable. Taken together these results suggest the obvious importance of perceived levels of control, and confidence in the ability to manage risks and cope with the situation.

These qualitative results "add flesh to the bones" of the conceptual model developed from quantitative data and previous (largely quantitative) research findings, and because they suffer from different limitations give different insights into the same phenomenon. The aforementioned conceptual model gives a good account of the phenomenological motives mentioned by risk takers themselves, and this lends further support to the validity of the model. The issues that were less satisfactorily dealt with were the possible influence of "intrinsic" achievement striving and the number of social responsibilities the risk taker has (such as children). It is clear how social responsibilities could be assessed (e.g. "are you married? Yes / No"), although unfortunately the same cannot be said for intrinsic achievement orientation. An initial examination of existing achievement related measures reveals that they are largely associated with extrinsic rewards, in terms of face validity at the least. Perhaps a suitable existing measure could be found, and this has the obvious practical advantage of avoiding the difficult and demanding process of test development and validation.

9.9. General Discussion Of Results

Objective 1: To investigate the associations between different physical risk taking behaviours and their underlying factor structure.

The results of the factor analytic results clearly show that the physical risk taking behaviours included in the IRPB cluster into two groups of relatively unrelated groups of behaviours, the participation in high risk Sports and Health risk behaviours. These factors bore a reasonably close resemblance to the Sports and Health factors of the PRAI, and also to the Thrill and Adventure Seeking - Experience and Disinhibition – Experience subscales of the Sensation Seeking Scale

VI (Zuckerman, 1994). Subsequent analyses revealed that these behavioural clusters could be used as the basis for reliable summative scales (alpha coefficients of .68 to .70), which could be used to measure physical risk taking behaviours. The associations between these behavioural clusters and a wide range of individual differences were almost exclusively as expected by previous theory, and these variables act as external criteria which provide evidence for the psychological meaning of the behavioural clusters themselves. These associations with individual differences are discussed more fully in the next section.

It was notable, if not entirely surprising that the correlation between the PRBS subscales was very small and non significant (r = .128, p = .100). This is contrary to the theory that all risk taking behaviours are closely associated, but in line with previous research which has found correlations between different types of risk taking behaviour to be from very low to moderate in size. For example, Horvarth and Zuckerman (1993) found that the risk taking behaviours measured by their General Risk Appraisal Scale correlated from r = .15 for "sports" and "financial" risks to r = .51 for "minor violations" and "criminal risks". Their "sports" risk subscale was only associated with each of the other three types of risk taking behaviour to a small degree (r = .15 to .22). Nicholson et al. (2002) also found that the correlations between different types of risk taking behaviour to be small to moderate, ranging from r = .144 to r = .430. Their "recreation" (sports) subscale was also only related to the other types of risk behaviour to a small degree (r = .169 to .291), and their "health" subscale was only related to the other risk areas to a small degree (r = .144 to .262). The correlation between their "sports" and "health" subscales was r = .169. Overall the degree of association between different risk taking behaviours appears to vary between about 2% and 25%, the degree of variation may be in part due to the degree of similarity between the risk behaviour domains being compared. These results are clearly in line with the small correlation found between the PRBS subscales, and it was on this basis the decision was made not to use a 'total' PRBS scale, and also to use an orthogonal rotational technique during the initial factor analysis.

Objective 2: To investigate the usefulness of personality and individual differences in the prediction and interpretation of physical risk taking behaviours.

The participation in high risk Sports and Health risk behaviours were clearly associated with a number of individual differences included in this study. Perhaps most conclusive are the multiple regression results which indicate that about 40% to 60% of the behaviours could be predicted from these individual differences, and to an extremely high degree of significance ($p < .0005$). For the participation in high risk Sports 9 out of 18 correlations (50%) were statistically significant and in the predicted direction. A further 5 correlations were in the predicted direction but were not significant, and in total 14 out of the 18 correlations were in the expected direction (78%). Of the four correlations that were not in the expected direction only two were significant, and these were with the EPQ-R Addiction and Criminality scales which contain overlapping item content. This unexpected result appears to be due to the negative correlation with Neuroticism, which appears to have 'overpowered' the positive associations with Psychoticism and Extraversion (the Addiction and Criminality scales are composite empirically derived scales that incorporate items from these other scales). For the participation in Health risk behaviours 12 out of 18 correlations (67%) were statistically significant and in the expected direction. When combined with the 5 correlations that were not significant but were in the expected direction 17 out of 18 correlations (95%) are accounted for. Only 1 correlation was not in the predicted direction, and this was not statistically significant. This means that the majority of correlations with physical risk taking behaviour were in the predicted direction (78% to 95%), and the majority of these expected correlations were statistically significant (50% to 67%). Of the few correlations that were not in the expected direction, even fewer were statistically significant (0% to 11%).

Perhaps at this point it is useful to return to one of the fundamental questions that underlie this study: Why do people take physical risks? In order to answer this question for each distinctly different kind of risk taking behaviour it is necessary select the variables which appear to be robustly associated with them, and fit all of

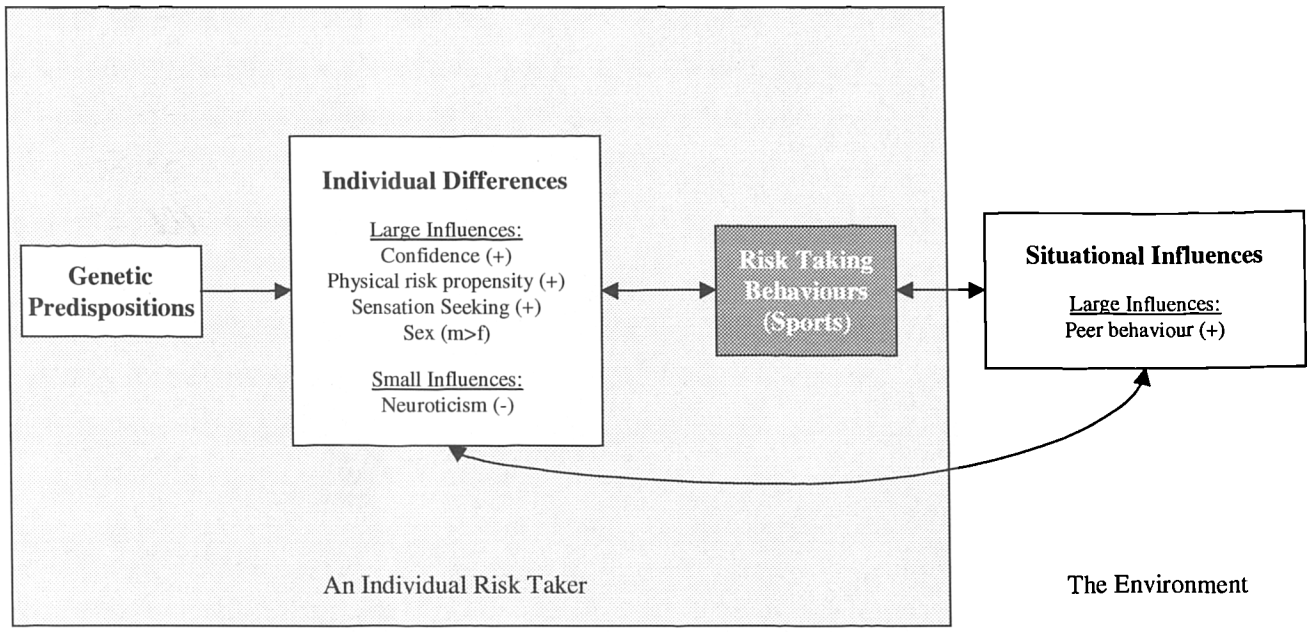
these variables within a conceptual model in order to construct a psychological profile.

A Psychological Profile Of High Risk Sports Participants

Figure 8 below illustrates how these individual differences and the participation in high risk sports can be conceptualised within a framework that charts the associations between variables. The individual risk taker is represented by the shaded area, and is an embedded agent within the environment. Specific situational influences originate within the larger and more general environment and are categorised as such. Variables that were associated with physical risk propensity at the $p < .0005$ level of statistical significance were classified as "large" influences, and variables associated at the $p < .001$ level were classified as "small" influences for taxonomic reasons. In this case peer behaviour was found to be strongly associated with the participation in high risk sports and a number of individual differences, and so it is categorised as a large situational influence within the overall category of situational influences. Situational influences are linked to risk taking behaviours and individual differences with bi-directional arrows in order to reflect a hypothesised two-way line of causality or influence, in that an individual may choose to be with a certain kind of person because of their own interests, but they themselves may be affected by the thoughts and behaviours of their peers. Individual differences are grouped in a similar way, although they are a characteristic of the risk taker themselves, and so they are grouped within the shaded area. The link between individual differences and the participation in high risk sports is also represented with a two way arrow because individual differences are thought to lead to the motivation to participate in high risk sports, and direct experiences with these behaviours are thought to influence certain individual differences (e.g. confidence). A number of individual differences are widely believed to be caused or influenced by underlying genetic differences, and these are represented by a separate category linked to individual differences via a one-way arrow to reflect a unidirectional pathway of influence.

Figure 8

A Conceptual Model Of High Risk Sports Participation



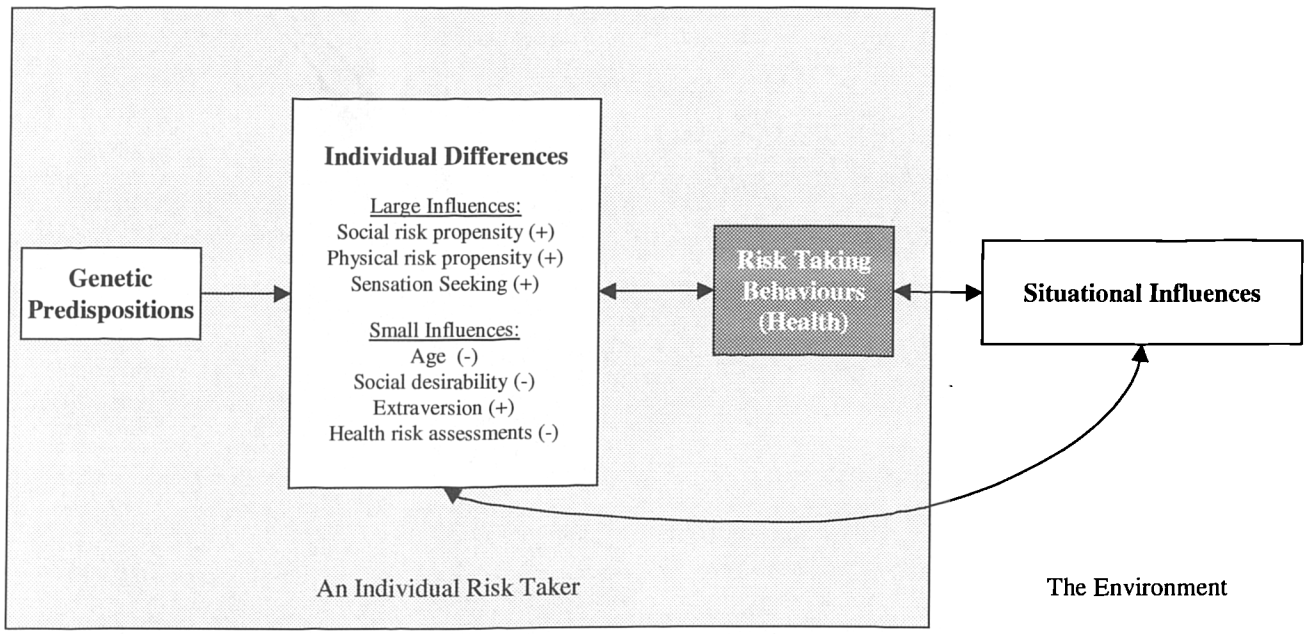
A high risk sports participant can therefore be described by the following psychological profile: They tend to have friends who choose to take potentially fatal risks, they themselves are confident that they can manage potentially fatal risks and are willing to take physical risks in order to trigger pleasurable physiological and psychological changes which are associated with the temporary satiation of unusually high Sensation Seeking needs and feelings of satisfaction derived from the exercise of control in challenging and dangerous circumstances. Sporting risk takers are more likely to be male and may be low in trait Neuroticism suggesting resilience to aversive stimuli and emotional stability that may partially explain their disinhibiting self-confidence. The motto of a sporting risk taker might be "who dares wins". If the risk taking sports participant has to be described in a phrase, one might say that they were a confident and physically adventurous risk taker motivated by Sensation Seeking and mastery needs.

A Psychological Profile Of Health Risk Behaviour Participants

In Figure 9 below the participation in Health risk behaviours is conceptualised within a framework that illustrates the role of individual differences and other relevant variables.

Figure 9

A Conceptual Model Of The Participation In Health Risk Behaviours



A person who takes Health risks can be described by the following psychological profile: They are willing to take both social and physical risks indicating that they are willing to defy social conventions and risk their physical well-being. Combined with elevated Sensation Seeking needs their generalised acceptance of risk leads them to try a variety of risky Health related behaviours that may be illegal or dangerous to others. They are more likely to be young people and Extraverted, which means that they may be sociable optimists, like parties, take chances and have many friends. They also tend to assess Health risks to be lower than other people, and if combined with an easygoing party attitude may lead them to take even greater

risks. The motto of a Health risk taker might be "if you want the ultimate high, you've got to be willing to pay the ultimate price". If the Health risk taker has to be described in one phrase you could say that they tend to be socially disinhibited Sensation Seekers willing to risk their physical health.

Objective 3: To investigate the usefulness of personality and individual differences in the prediction and interpretation of the willingness to take risks.

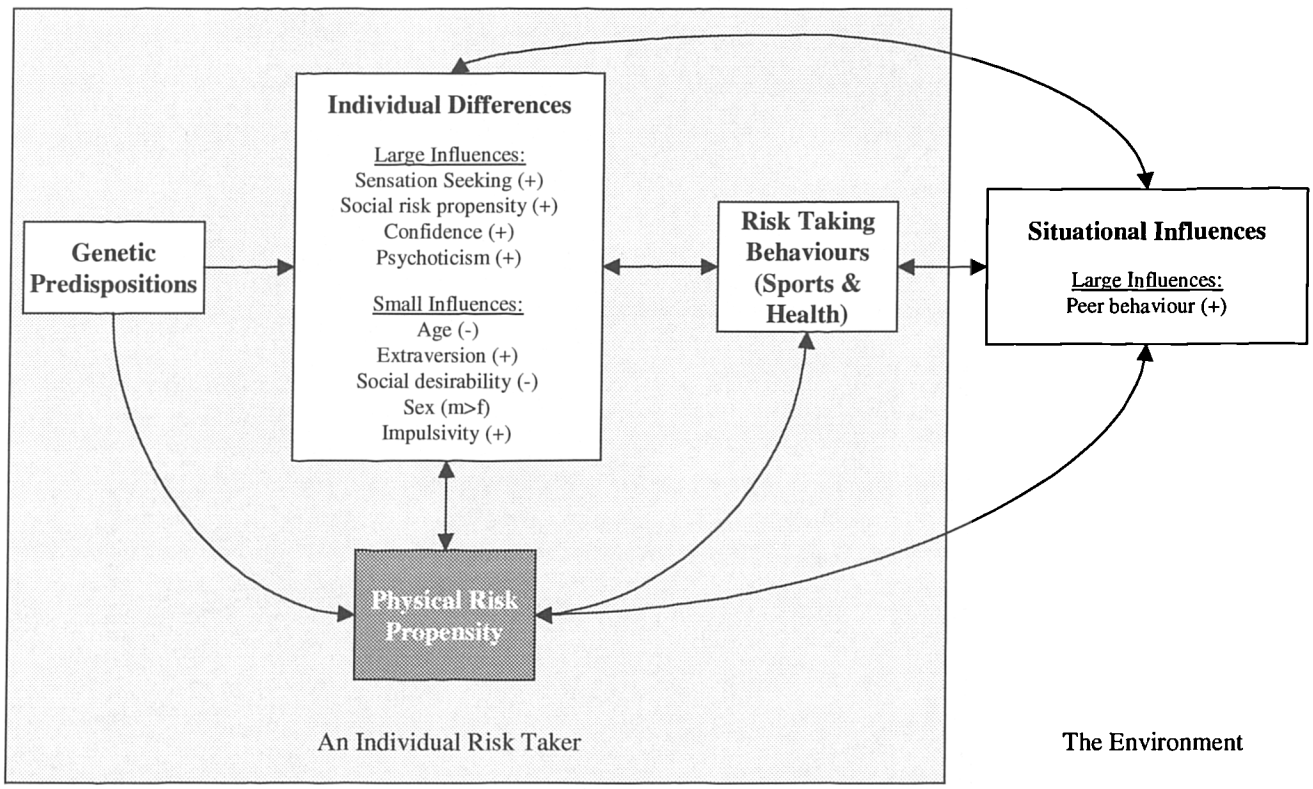
The willingness to take both physical and social risks was clearly associated with many of the individual differences in this study. As with the participation in physical risk taking behaviours the results of the multiple regression analyses indicated that a large and highly significant amount of variance could be accounted for (62% to 71% , $p < .0005$). Unlike the different physical risk taking behaviours, the willingness to take different kinds of risks were composed of oblique and highly correlated factors, which taken together with an examination of the internal reliability statistics supports the appropriateness of the 'total' risk propensity scale. For physical risk propensity 10 out of 17 correlations (59%) were statistically significant and in the expected direction. A further 6 correlations were in the expected direction but non-significant, and so 16 out of 17 correlations were in the expected direction (94%). The correlation that was not in the expected direction was not significant. For social risk propensity 13 out of 17 correlations (76%) were in the expected direction and significant, and a further 4 correlations were non-significant but in the expected direction. No correlations were in the unexpected direction, significant or otherwise, and in total 17 out of 17 correlations were in the expected direction (100%). For total risk propensity the results are similar with 15 out of 17 correlations (88%) being in the expected direction and statistically significant. A further 2 correlations were in the expected direction but non-significant, meaning that in total 17 out of 17 correlations were in the expected direction (100%). It seems clear then that the individual differences included in this study are closely associated with risk taking propensity, and also that they are associated with risk taking propensity in ways were predicted from theory and previous research findings. In order to further this understanding it will be useful to place risk taking propensity within the same kind

of conceptual model used in the description and explanation of physical risk taking behaviours.

In Figure 10 below physical risk propensity is conceptualised within a framework that illustrates the role of other individual differences and additional relevant variables including risk taking behaviours. Physical risk taking is conceptualised separately from other independent variables for illustrative and explanatory purposes only, and this distinction is not made in order to suggest that risk taking propensity is not an individual difference, but rather to show how other individual differences influence it.

Figure 10

A Conceptual Model Of Physical Risk Propensity



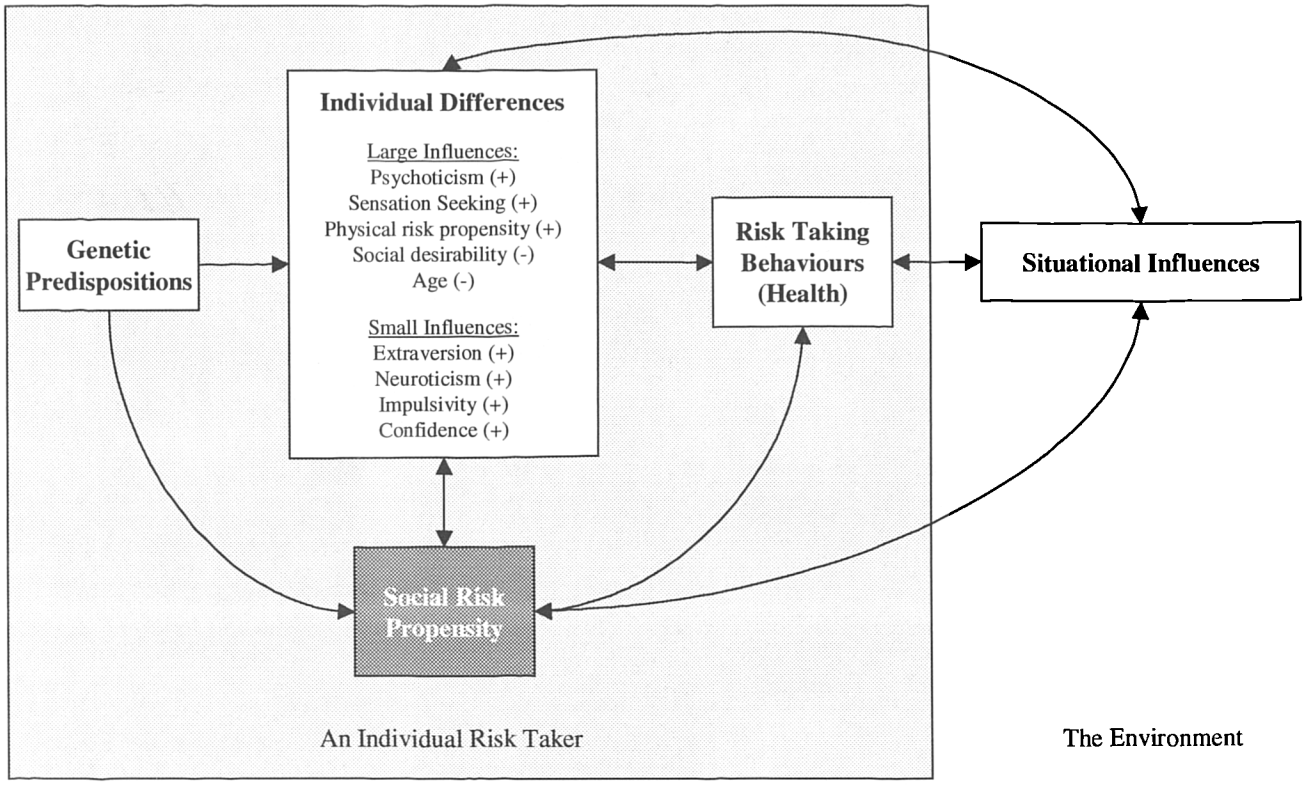
The willingness to take physical risks is associated with the following psychological profile: A physical risk taker is likely to *enjoy* taking physical risks, not because they

are mentally ill or suffering from a personality disorder, but because the engagement with risk itself satisfies Sensation Seeking needs and feelings of satisfaction derived from enactive mastery experiences. People who are willing to take physical risks also tend to be willing to take social risks, which suggests that risk taking propensity tends to generalise across different risk domains. Physical risk takers are normally confident in their own abilities to manage the risks involved and are often high in Psychoticism indicating a tough minded and possibly egocentric temperament. People with high physical risk propensity tend to participate in high risk Sports (e.g. rock climbing) and also in Health risk behaviours (e.g. drug use), and also tend to have friends who are willing to take potentially fatal risks. People with high physical risk taking propensity also tend to be younger and Extraverted which is associated with optimism and sociability. People willing to take physical risks are more likely to be male, and may also be slightly more Impulsive. The motto of someone with high physical risk propensity might be "feel the fear, and do it anyway". If the enjoyment of physical risk had to be explained in a single phrase, it could be described as the result of a developed sense of self-confidence and elevated Sensation Seeking and mastery needs.

In Figure 11 below social risk propensity is conceptualised within a framework that illustrates the role of other individual differences and additional relevant variables including risk taking behaviours.

Figure 11

A Conceptual Model Of Social Risk Propensity



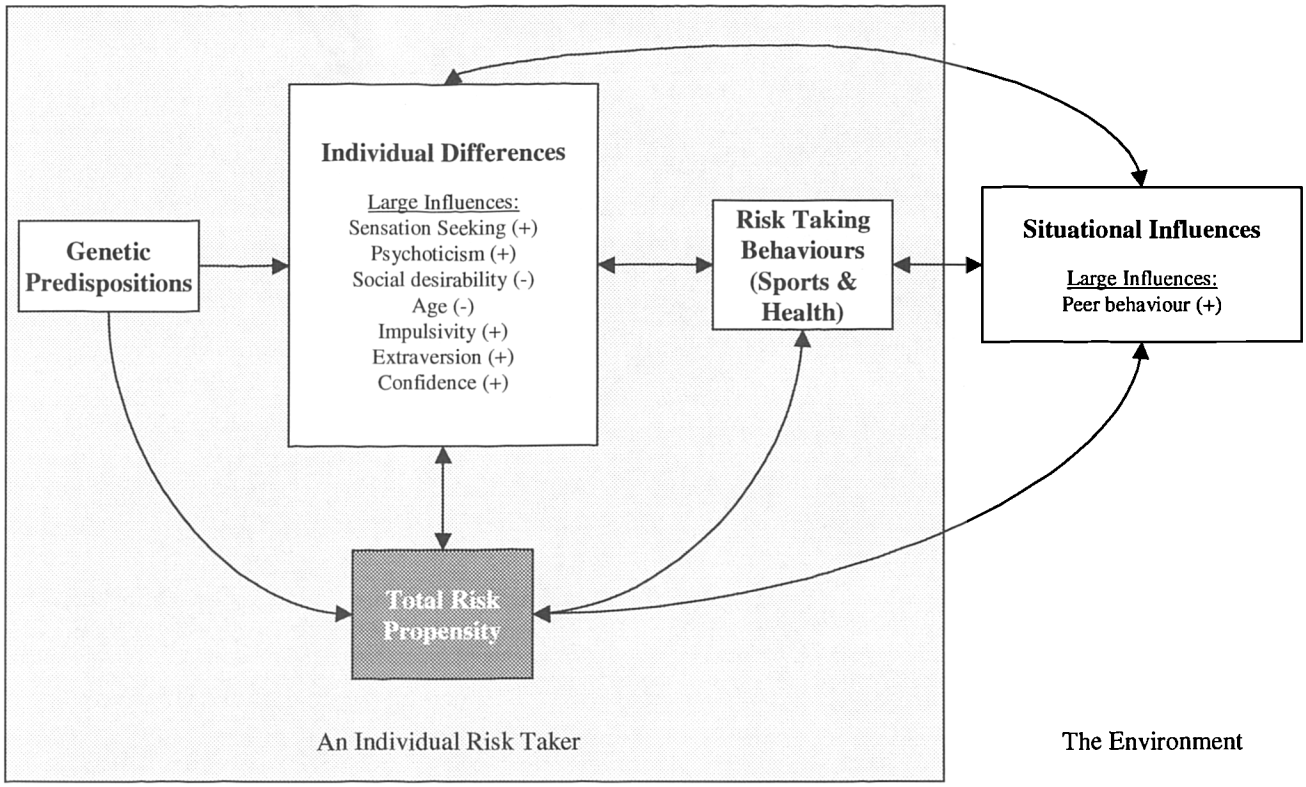
The willingness to take social risks is associated with the following psychological profile: A person with elevated social risk propensity is high in Psychoticism which means that they are likely to be independent, egocentric and unfeeling towards others. They seem to represent the less socialised for of Sensation Seeking, and are also willing to take physical risks which often leads them to take risks with their health. They are often young and low in social desirability which again suggests a lack of social conformity. To a lesser degree they also tend to be Extraverted, Neurotic, Impulsive and confident which may combine to further facilitate the motivation to take Health risks. The motto of someone with high social risk propensity might be "you have to get your kicks in any way that you can". If the enjoyment of social risk had to be explained in a single phrase, it could be described

as the result of a lack of socialisation, aggressiveness and independence combined with elevated Sensation Seeking needs.

In Figure 12 below total risk propensity is conceptualised within a framework that illustrates the role of other individual differences and additional relevant variables including risk taking behaviours.

Figure 12

A Conceptual Model Of Total Risk Propensity



The willingness to take risks is associated with the following psychological profile: A person with elevated risk propensity is high in Sensation Seeking and they are likely to have highly developed needs for new and exciting experiences. They tend to be high in Psychoticism and low in social desirability that means that they are not likely to conform socially, and may be independent, egocentric and aggressive. They are predisposed to participate in both high risk Sports and Health risk behaviours

and are likely to have friends who are willing to take potentially fatal risks. They are also likely to be young, Impulsive, Extraverted and confident. The motto of someone with high risk propensity might be "you only live once". If the enjoyment of the combination of social and physical risks had to be explained in a single phrase, it could be described as the result of a lack of socialisation, egocentrism and independence combined with elevated Sensation Seeking needs.

Objective 4: To further investigate the reliability and validity of the PRAI.

The validity of the PRAI is suggested by a number of different criteria. The PRAI has face validity in that it appears to measure physical risk assessments, and (arguably) the PRAI also has content validity. The argument for content validity goes as follows – since all behaviours can be said to contain some degree of physical risk, a measure that asks participants to rate the degree of physical risk involved in a number of behaviours *must* be valid (Cooper, 1998). The factor structure of the PRAI has been replicated three times with independent samples (the first study with separate analyses for each sex and the second main study), and these studies all suggested a 2-factor oblique solution to equate to simple structure. In all of these studies all items loaded on their allocated factor, which corresponds to the related Health and Sports subscales and provides good evidence for factorial validity. Excellent reliability statistics median alpha coefficients for the Health subscale = .91, the Sports subscale = .90, and the total scale = .92. These clearly exceed any accepted minimum value (such as .7 or even a highly stringent .8) and as such the PRAI can be regarded as a highly reliable measure.

Concurrent validity is suggested by the fact that 7 out of 16 (44%) correlations were significant and in the predicted direction by directional hypotheses for both PRAI subscales and the total scale. A further 7 correlations for the Health subscale and 8 correlations for the total scale and Sport subscale out of 16 (44% to 50%) were in the predicted direction but were not statistically significant ($p > .05$). Only 1 correlation for the total scale and Sport subscale, and 2 correlations for the Health subscale (6% to 12%) were not in the expected direction, and it is notable that none

of these unpredicted correlations were statistically significant ($p > .05$). This means that the majority of correlations (88% to 94%) were in the predicted direction, and the few correlations that were not in the expected direction were not statistically significant. Taken together these results suggest that the PRAI measures the construct that it was designed to assess, namely physical risk assessments, and this provides good evidence for the construct validity of the PRAI.

9.10. Summary

The Impulsive-Sensation Seeking Scale (Imp-SS), Attitudes Towards Risk Questionnaire (ATRQ) and Physical Risk Assessment Inventory (PRAI) were factor analysed in order to assess their factorial validity and their suitability for use in the present study. A 2-factor oblique solution was optimal for all three scales and this was in line with that suggested in previous studies and test development. All items loaded most highly on their allocated factor, except one item on the Imp-SS scale that had a split loading between factors. This helps to establish the cross-cultural and factorial validity of the Imp-SS scale and ATRQ as they were developed for use with North American subjects. It also replicates the factor structure of the newly developed PRAI which suggests its factorial validity. Importantly this also suggests the appropriateness of each measures subscales.

The participation in a range physical risk behaviours, as assessed by the Physical Risk Behaviour Scale (PRBS), was factor analysed and a 2-factor orthogonal solution appeared optimal. These two factors were homogenous to the degree that they could be used as the basis for high risk 'Sports' and 'Health' behaviour subscales. The small degree of association between behaviours is replicated in other studies, and it appears that the PRBS provides a convenient and sophisticated way of estimating the participation in physical risk taking behaviours.

The means, standard deviations and reliabilities of all measures were examined where appropriate and found to be consistent with previous findings. This provides further evidence of the cross-cultural validity of the ATRQ and Imp-SS, and

provides additional evidence to suggest that the reliability of the PRAI is excellent (median alpha coefficients of between .90 and .92 including the total scale and both subscales). The validity of the PRAI is also suggested by a number of criteria including face validity, factorial validity, and concurrent validity. Taken together these findings suggest that the PRAI may be useful in circumstances in which a concise, reliable and valid measure of physical risk assessments is required.

The bivariate correlations between variables revealed that the main associations with the participation in high risk sport were peer behaviours, high confidence, high physical risk propensity, high Sensation Seeking, and sex (males more likely to participate). The main associations with the participation in Health risk behaviours were high social risk propensity, high physical risk propensity, and high Sensation Seeking. The main associations with physical risk propensity were the participation in both high risk Sports and Health risk behaviours, peer behaviour, high Sensation Seeking, high social risk propensity, high confidence, and high Psychoticism. The main associations with social risk propensity were the participation in Health risk behaviours, high Psychoticism, high Sensation Seeking, high physical risk propensity, low social desirability, and low age.

The relationships between variables were also factor analysed, and an exploratory factor analysis confirmed that Sports and Health risk behaviours were associated with different psychological profiles as evidenced by their loadings on different orthogonal factors. Health risk behaviours loaded on an "antisocial risk taking" factor that was identified by high loadings on the willingness to take social and physical risks, high Sensation Seeking and high Psychoticism. Sports risk behaviours loaded on a "Venturesomeness" factor that was identified by high loadings on confidence, peer behaviour, high physical risk propensity and being male. Sports and Health risk assessments loaded on a third "physical risk assessment" factor which was also associated with being female and low Addiction scores. These results graphically illustrate that it is a mistake to talk in terms of a universal "risk taking personality" as different forms of risk taking are associated with different psychological profiles. The two exceptions to this were with physical

risk propensity and Sensation Seeking, which both loaded (> .3) on the factors associated with different risk taking behaviours.

Multiple regression analyses revealed that 38% of Health risk behaviours and 60% of Sports risk behaviours could be predicted by the individual differences in this study. Between 62% and 71% of physical, social and total risk propensities could also be predicted by the variables in this study. A smaller set of independent variables (6 to 8) was also successful at predicting the majority of this variance. The multiple regression analyses show that a large and highly significant proportion of the variance in physical risk taking behaviours and the willingness to take physical and social risks can be predicted with a relatively small number of independent variables. The qualitative motivational data were also revealing in that they provided a phenomenological insight into the risk taking mind. The main themes mentioned for taking potentially fatal risks related to Sensation Seeking, challenge/mastery, and confidence in their ability to control the risks involved. The most common themes mentioned as reasons for avoiding risks were safety needs and anxiety. Degree of perceived control was also mentioned specifically as both a reason to take or avoid risks depending upon the specific nature of the situation involved. The qualitative results provide support for the validity of the psychometric model previously outlined, in that this model gives a good account of the motives mentioned by risk takers themselves. Responsibilities to others and 'intrinsic' achievement-striving emerged as variables requiring further investigation.

If high risk Sports participants had to be described concisely we might say that they were physically adventurous risk takers motivated by Sensation Seeking and mastery needs. If Health risk takers had to be described in short we could say that they were socially uninhibited Sensation Seekers willing to risk their physical health for the next 'high'. Health risk takers tend to be less socialised and more Impulsive than Sports risk takers, and may find it more difficult to empathise with others. In comparison Sporting risk takers tend to be lower in Neuroticism and more confident that they can manage the risks involved.

Chapter 10.
CONCLUSIONS

10.1. Introduction

In this chapter general conclusions are made about the nature and significance of the present study. In particular the main findings are reviewed, and the adequacy of the proposed model of physical risk taking behaviours is examined. The implications of the present study are also examined, both to future academics and to a more general audience. Specific recommendations for future research are made, and an argument is made to suggest where this evolving body of knowledge may lead.

10.2. Conclusions

A critical overview of the construct of risk, the assessment of risk and the nature of risk taking behaviour is presented in the literature review, and it is hoped that this will encourage other researchers to be critical of the assumptions that underpin their own work. This is an essential section of the thesis as it provides an original synthesis of the existing literature and includes several innovative ideas. It is important to be aware of the limitations of current theory, and in particular the controversies and ambiguities that surround the risk assessment process, and by direct implication the classification of high risk behaviours. Indeed the practical implications of these abstract theoretical notions are demonstrated in the second main data collection stage, where they are used as the basis for selecting appropriate risk taking behaviours. One completely new idea is that there are three fundamental approaches to risk, that of the risk reducer, risk avoider, and risk optimiser. The important idea here is that different risk takers may assess the acceptability of these risks in different ways and the relationship between the acceptability of risk and the level of risk relative to their own abilities may not be linear. For example "risk optimisers" are motivated to increase the risks in order to facilitate greater psychological rewards but only up to a point, beyond which they are motivated to

reduce the levels of risk in order to ensure their own safety. Interestingly the subjects who took both Health and Sporting risks appeared to actually enjoy the exposure to risk, and according to this new taxonomy would be classified as risk optimisers. Conversely people who did not participate in these behaviours tended to have comparatively negative attitudes towards risk and would therefore be classified as risk avoiders.

A review of the psychoanalytic theory confirms that there is little if any evidence to suggest that risk taking is a form of illogical or pathological behaviour. This is important because it reassures us of the validity of the focus of the thesis, that of the relationship between risk taking behaviours and normal adult individual differences. If risk taking behaviour represented a form of mental illness or faulty reasoning then different hypotheses would be formulated and subjected to testing using alternative methods (one possibility would be the use of projective techniques). One aspect of this theory has received little attention by researchers however, and the possibility remains that risk takers underestimate the risks involved due to unrealistic belief systems. Unfortunately no appropriate measure of subjective risk assessments or physical risk assessments was identified in the literature, and the first main stage of the research concerns the development of such a scale, the Physical Risk Assessment Inventory (PRAI).

A review of contemporary theories is given, which is undoubtedly dominated by the role of personality traits, and more specifically the role of Sensation Seeking. This section is also important because it identifies several methodological difficulties in this area. In particular the uncritical use of the Sensation Seeking Scale V has often lead to inflated associations due to tautologous item content. There are many supporting studies that do not suffer from these shortfalls and the role of Sensation Seeking is well established. However the Sensation Seeking trait does not account for a great deal of the variance in risk taking behaviours, and the role of many other variables (including additional personality traits) is suggested.

Even less is known about the influence of individual differences other than personality traits on risk taking behaviours, and this constituted the subject matter of the final section of the literature review. Although many of the hypothesised relationships in this section were somewhat speculative, they were also important as it gave an indication of what avenues may or may not have been productive. Although enough information could be gleaned from the literature in order to make directional hypothesis the inclusion of these variables in the empirical research was undoubtedly of a more exploratory vain.

The first main data collection stage involved the investigation of the latent structure of physical risk assessments and their relationship with physical risk taking behaviours. This stage also involved the development of the PRAI that was designed in order to address the shortcomings of existing measures. The discovery of the latent structure of physical risk assessments (2 oblique "Health" and "Sports" factors) provides a good example of the original content contained in this thesis. The fact that this finding was replicated in three separate samples suggested that these are meaningful factors, and taken together with further evidence of validity suggest the appropriateness of the PRAI Health and Sports subscales. The PRAI represents an improvement over existing measures in two main ways, firstly a marked increase in reliability, and secondly the PRAI was developed using factor analytic techniques. Once the PRAI had been developed, the priority then became the investigation of physical risk taking behaviours and the potential influence of a wide variety of variables.

In the second main stage physical risk taking behaviours were factor analysed and found to form 2 orthogonal factors that were analogous to the Sports and Health subscales of the PRAI. These were therefore used as the basis of Physical Risk Behaviour Scale (PRBS) Health and Sports subscales, and a total scale was not used due to the negligible degree of association between factors. This factor solution to the latent structure of physical risk behaviours closely resembles the structure of Zuckerman's (1994) Sensation Seeking Scale VI (SSS VI). However the PRBS is specific to the measurement of risk taking behaviours and offers comparable

reliability although it is a shorter measure. Taken together with the results from the analysis of physical risk assessments it appears that Sports and Health behaviours are distinct types of physical risk taking. The implication is that all physical risk taking behaviours should not be treated interchangeably and may be associated with differing psychological profiles.

The participation in high risk sports was associated with a "Venturesomeness" factor defined by high loadings on confidence, peer behaviour, physical risk propensity and sex (males higher). Alternatively the participation in health risk behaviours was associated with an "Antisocial risk taking" factor that was defined by high loadings on physical and social risk propensity, Sensation Seeking, and Psychoticism. Multiple regression analyses suggest that a large proportion (38% to 60%) of these risk taking behaviours can be predicted by the variables included in this stage, which further suggests the validity of the proposed model and the adequacy of variable sampling. The convergent qualitative research findings were also interesting and raised several new possibilities for improvements including the role of responsibilities to others. Health and Sports risk behaviours therefore clearly constitute different types of physical risk taking behaviours, and are associated with different psychological profiles. The extent of a universal "physical risk taking personality" therefore appears to be limited to the shared influences of physical risk propensity and Sensation Seeking. An understanding of the differences between the psychological profiles associated with socialised and unsocialised risk taking behaviours may therefore provide the key to the displacement or modification of antisocial behaviours. Sex did not emerge as a key variable in the second stage, and this is somewhat surprising considering what we already know about its relationship with risk taking. However, this may simply because its *comparative* importance is low compared to the greater associations with other variables. The associations with sex largely conformed to predictions, and the fact that other variables were found to be more important highlights the adequacy of the variable sampling.

From a risk takers own subjective or phenomenological point of view the level of risk they are exposed to may be largely due to their own assessments of the

probability and magnitude of possible losses. For the physical risk taker this 'loss' may be a broken leg, disturbing flashbacks or worse. What is less clearly understood is how people combine these distinct qualities of risk probability and magnitude in order to make overall risk assessments. Matters become more complicated when the constructs of "acceptable risk" or "enjoyable risk" are raised. Risk taking from one perspective is a form of coping and maximising form of decision-making. Clearly the more motivated a person is to take a particular risk, the higher the perceived 'payoff', then the higher the level of risk they may consider to be acceptable. The logic being that it is reasonable to take a greater risk if the potential gains mean that it is worth it. Some risk takers, "risk reducers" participate in dangerous activities in spite of the risks involved, but a greater number of risk takers actually enjoy the element of risk, to a degree at least. The phenomenon of "risk optimisation" is perhaps the most interesting form of risk taking behaviour, where risk takers are motivated to take risks because of the element of risk in itself, due to the greater potential rewards (in their own eyes). If these risk optimisers are not reckless or suicidal they must temper their desire to take ever-greater risks with a realistic assessment of what level of risk they are capable of controlling to an acceptable degree. And of course the ability to control risk is relative to the changing abilities of the risk takers themselves. This helps us to understand why some risk takers explicitly mention a form of approach-withdrawal decision-making conflict when faced with potentially fatal risks, or the "dangerous edge" as it is sometimes called.

The theory of functional equivalence holds that physical risk taking behaviours may act as substitutes for each other, for example a drug user may be able to displace their underlying needs by going parachuting instead. If this were to be correct then it would have important implications for the treatment, care and rehabilitation of antisocial risk takers, e.g. dangerous drivers. The fact that both Sports and Health risk behaviours are associated with high Sensation Seeking and physical risk propensity is therefore encouraging. However there are also a number of clear differences in the psychological profiles associated with these behaviours, and most problematic are those that are known to have a strong genetic component. Crucially Sports risk takers tend to be lower in Neuroticism and Psychoticism in comparison

with Health risk takers, second order Eysenckian personality traits that are known to be stable over time and have a high genetic component (estimated at about 50%). The extent to which this presents a challenge to the theory of functional equivalence is due to the degree of association between these variables that is due to these genetic variations (or alternatively to differences in socialisation). Of course this question must be answered empirically, suffice to say that a considerable amount of uncertainty pervades this area.

It is clear that physical risk taking behaviours are influenced by a variety of different types of variable. Both broad and narrow personality traits play a role, as do individual cognitions and situational influences. As such physical risk taking behaviours appear to originate from the interaction of biosocial factors, mediated by psychological variables such as risk propensity. It is reasonable to wonder what proportion of physical risk taking behaviours can be predicted by the aforementioned psychological profiles, and as we have seen the full model in the second study of the present paper can predict around 40% to 60% of the variance in each type of physical risk taking. But what level of prediction can be considered to be good? Of course the more variance that can be explained the better, but other than this consideration there are no objective criteria for deciding what level of prediction is desirable. Indeed the level of prediction possible is likely, in part, to depend upon the nature of the predicted behaviours themselves. There will always be some degree of measurement error, and behaviours are always likely to be subject to specific situational influences. As a result it will never be possible to predict 100% of the variance in risk taking behaviours consistently. The more successful our attempts at predicting risk taking behaviours, the more accurate our predictions of future behaviours may be, and the more confident we can be in the validity of the proposed psychological model. Perhaps the best way to evaluate the usefulness of such a model is to compare it with the level of prediction achieved in other studies, and it is reassuring to note that the results of the present study compare favourably with Horvarth and Zuckeman's (1993) study in which 21% to 51% of risk taking behaviours were predicted.

In comparison with risk taking behaviours or the willingness to take risks, little is known about the nature of risk assessments. Indeed the present paper is one of only a handful to examine the nature of risk assessments empirically. In spite of the relative scarcity of information in this field, comparisons with a small number of other studies can be drawn. For example other researchers have also found negative associations between risk assessments and Sensation Seeking and Psychoticism. The relationships between physical risk assessments and age and sex were replicated between the two main empirical studies of the present paper, which suggests that these results are also reasonably robust. Whilst these are important discoveries in themselves they also suggest the convergent validity of the PRAI, which taken together with the evidence of factorial validity and excellent reliability is promising. The use of the PRAI is therefore recommended to future researchers who require a psychometric measure of physical risk assessments. In addition the development and factor analysis of the physical behaviours included in the PRBS provided a new and convenient way of estimating the participation in physical risk taking behaviours. This offers the practical advantage of being able to gauge levels of participation in Health and Sports risk behaviours to a greater degree of accuracy, and the theoretical advantage of treating risk taking behaviours as a continuous rather than dichotomous variable (e.g. "risk taker" versus "non risk taker" or "normal subject").

The strengths of the present paper include the wide range of variables incorporated in the second main study. Such a wide sampling of variables and the inclusion of "benchmark" measures such as the EPQ-R helped in the identification of lesser-known variables such as physical risk assessments. The inclusion of such a wide range of variables helped to explore the range of influences that lie beyond Sensation Seeking, that is the investigation of what other individual differences are relevant to the study of risk taking behaviours. Indeed the high degree of prediction possible is testament to the adequate sampling of variables. The second main study was also one of the few to investigate both the similarities and differences between different forms of risk taking behaviour. The combination or 'triangulation' of quantitative and qualitative methodologies is also considered to be a strength of the second study as they have complimentary advantages and suffer from different

limitations. The development of a conceptual model within which the associations between individual differences, situational variables and risk taking behaviours can be understood, is also considered to be a useful contribution to this field of research.

The second main study was the first ever to demonstrate a link between the Imp-SS scale and Sports risk behaviours, and one of only a handful to show a link with Health risk behaviours. It was also one of the first studies to use the Impulsive-Sensation Seeking scale (Imp-SS) with a mainly British sample and to test its factorial validity, reliability and concurrent validity. The second main study was also the first to demonstrate a link between the Attitudes Towards Risk Questionnaire (ATRQ) and physical risk taking behaviours, and also to use the ATRQ with a mainly British sample, test its factorial validity, reliability and concurrent validity. These findings are important because they suggest the cross-cultural validity of these measures and the suitability of their use with British subjects.

In short, we can conclude that attempts of this kind to produce meaningful models of risk taking behaviours are improving, but these results are not "set in stone". As such it remains essential to keep an open mind about how such conceptualisations may be improved, and more research is needed in which an element of critical exploration is achieved. The original content of this thesis however moves us significantly closer to the shared goal of understanding the nature and psychological origins of risk taking behaviours.

10.3. Recommendations For Future Research

Perhaps the ultimate goal should be the prediction of future behaviours, and this could be accomplished through longitudinal studies. Regression analyses could be used to generate equations that could be used to predict future behaviours, and this may be especially useful with antisocial forms of risk taking. This may have practical application in applied settings where the modification of future behaviours could be desirable, e.g. social work. Another interesting area for future researchers to consider is how these different types of physical risk taking behaviour relate to

other types of risk taking, such as financial, social, occupational and criminal. For example, are Health risk behaviours associated with the same psychological profile as criminal or financial risk taking behaviours? Are Sports risk behaviours associated with the same psychological profile as vocational or social risk taking behaviours?

It is essential to keep pushing the boundaries in the field of risk taking psychology. Possible improvements in this area include the investigation and possible inclusion of other variables such as the cost of activities or their accessibility. The possible influences of family responsibilities (or even general responsibilities such as house ownership), 'intrinsic' achievement striving, and assessments of the risks for the individual risk taker themselves (relative risk), emerged as possible influences in the present study which warrant further investigation. Another possible improvement in this area would be the improved measurement of variables that are already known to be relevant. For example, Franken et al.'s (1992) Attitudes Towards Risk Questionnaire has proven to be a useful measure of physical and social risk propensity, but it may be too narrow in scope in that it does not account for financial and occupational risk taking.

It is also important to compare the predictive efficacy of competing measures of personality in order to test their comparative validity, as Goldberg (1999) suggests. Although it would also be preferable to undertake this project with a wider range of behaviours, it would be illuminating to examine the associations with risk taking behaviours specifically. For example, is Costa and McCrae's (1992b) NEO-PI-R measure of adult personality more useful than Eysenck and Eysenck's (1996) EPQ-R in the prediction of Sports risk behaviours? In particular it would be interesting to test the validity of first order subscales or facet scales, as a criticism often raised is that they are often too short to be anything other than what Cattell called bloated specifics, that is items that cluster together only due to semantic similarity. If these first order scales were indeed bloated specifics then they would not be expected to correlate with external criteria, in this case risk taking behaviour. The investigation of these possibilities would be illuminating for the both personality researchers and

risk taking behaviour specialists alike. In this study for example the use of the Imp-SS facet scales of Sensation Seeking and Impulsivity was of greater predictive efficacy than the use of the total Imp-SS scale alone. The greater efficacy of the facet scales in predicting risk taking behaviours was most graphically demonstrated by the fact that the participation in high risk Sports was positively associated with Sensation Seeking, and negatively associated with impulsivity. The amount of variance predicted in Sports risk behaviours dropped from 23% to 8% because these opposing correlations were effectively cancelling each other out when they were combined and the total Imp-SS scale was used. This effect was smaller with Health risk behaviours, yet still noticeable, with a decrease in prediction from 16% to 13%.

Although the body of knowledge in this field is fast increasing, the use of qualitative methodologies is still to be encouraged for two main reasons. Firstly, qualitative methodologies allow us to explore the risk takers' own understanding of their own behaviours and experiences in a way that maximises the phenomenological validity of the resulting information. Of course this type of subjective insight should not be treated at face value, but rather it provides researchers with a wealth of information about risk taking behaviours from the risk takers own perspective. This may be useful because it allows us to consider the adequacy of any interpretative model of understanding to account for such experiences and provides a deeper insight into the role of existing themes. Secondly, the use of qualitative methods may lead to the discovery of new variables that may be incorporated in later quantitative studies. For example in the second main study of this paper the issue of family responsibilities was raised, and following quantitative studies might address the possibility of an association with risk taking behaviours. Unexpected findings of this kind are essential if the validity of evolving and competing conceptual models are to be developed and compared.

For risk taking behaviours to be understood in their entirety it will be necessary to not only develop more sophisticated and effective psychological models of risk taking behaviour, but also to integrate these models into the complementary areas of biology and sociology. This will help to uncover the processes that underlie risk

taking behaviours and may help to bridge the gap between phenomenological insights and physiological, social or genetic variations. Improvements in the field of genetics are also likely to lead to greater improvements in the understanding of risk taking behaviour, in particular our understanding of the degree to which risk propensities are inherited will increase, and a greater understanding of mediating physiological processes may also be achieved. Sociological insights may help us to appreciate the wider context of risk taking behaviour and keep up to date with the situational variables that are selected. For example, an awareness of media influences and societal changes may help us to understand why present society is often referred to as a risk society *and* an insurance culture. Of course the paradoxical character of these generalisations may be revealing in itself, and quickly leads to conclusions of a very postmodern flavour.

10.4. Epilogue

This thesis does not culminate in a definitive prescriptive model of the multifaceted phenomenon of risk taking, but it does point in the direction which such a solution would be found. At this stage we can be reasonably sure of some things but not others, in particular the role of physical risk propensity, Sensation Seeking, age and gender are well established as relevant variables. The degree to which these variables alone can be said to account for physical risk taking behaviours remains a controversial issue, not least because of methodological difficulties associated with the uncritical use of the Sensation Seeking Scale V. It is not helpful at this stage to dwell upon this issue, but it serves as a reminder that there is still much to be done in the field of risk taking psychology. The ultimate aim regarding the psychological study of risk taking behaviour must be twofold: Firstly, the kind of "two factor" model proposed in this thesis must be subjected to continual testing, and crucially it must be critically compared with competing conceptualisations of the same behaviours. Secondly, every effort must be made to link these models with underlying biological and sociological processes; indeed these should ultimately be used as criteria for the validity of such models. It can be argued quite convincingly that the process of addressing these aims has already begun in earnest, indeed as we

have seen a number of variables are well established as influences, and the proposed biosocial origins of Sensation Seeking are often quoted as a success story in the wider field of personality psychology. That said it would be inappropriate and inadvisable to propose a definitive interpretation of physical risk taking at this stage, as this form of totalising reason would stifle new and possibly more productive avenues of future research. The study of this evolving body of knowledge should therefore be seen as an ongoing process, characterised by the constant interplay of theory and research findings. It is as we begin to delineate the various antecedents of different kinds of risk taking behaviours that we go beyond simplistic "thrill seeking" explanations and gain real insight into the risk taking mind.

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APPENDICIES

Appendix A: The Danger Assessment Questionnaire

Appendix B: The Physical Risk Assessment Inventory (PRAI)

Appendix C: The Physical Risk Behaviour Scale (PRBS)

Appendix A: The Danger Assessment Questionnaire (source: Franken, et al., 1992)

Instructions: Fill out the following in terms of how dangerous you think they are. These items may appear familiar. That is because they relate back to the first 40 items that you filled out. Use a new optical scoring sheet for these questions.

Not at all	Somewhat	Fairly	Moderately	Very Dangerous
A	B	C	D	E

1. Mountain climbing
2. Exploring a strange city by yourself
3. Smoking marijuana
4. Using hallucinogenic drugs
5. Water skiing
6. Scuba diving
7. Going to a singles bar
8. Parachute jumping
9. Going on a blind date
10. Heavy drinking
11. Associating with the jet set
12. Sailing across the ocean
13. Having homosexual friends
14. Smoking cigarettes
15. Eating fatty foods
16. Skiing fast down a mountain
17. Jumping or diving of a high board
18. Using stimulants
19. Travelling in a strange country with no preplanned itinerary
20. Being sexually promiscuous
21. Using cocaine
22. Watching pornographic movies
23. Associating with swingers

Appendix B: The Physical Risk Assessment Inventory (PRAI)

Instructions: Circle the appropriate number to the right of each of the following activities to indicate their **level of physical risk** to the average participant. In each case circle any number from 0 (No Physical Risk) to 6 (Extreme Physical Risk).

		No Physical Risk ←			**Moderate Physical Risk**			→ **Extreme Physical Risk**
1	Mountain climbing	0	1	2	3	4	5	6
2	Smoking marijuana	0	1	2	3	4	5	6
3	Water skiing	0	1	2	3	4	5	6
4	Eating fatty foods	0	1	2	3	4	5	6
5	Parachute jumping	0	1	2	3	4	5	6
6	Skiing fast down a mountain	0	1	2	3	4	5	6
7	Being sexually promiscuous	0	1	2	3	4	5	6
8	Scuba diving	0	1	2	3	4	5	6
9	Driving recklessly	0	1	2	3	4	5	6
10	Heavy drinking	0	1	2	3	4	5	6
11	Rock climbing	0	1	2	3	4	5	6
12	Hang gliding	0	1	2	3	4	5	6
13	Using hallucinogenic drugs	0	1	2	3	4	5	6
14	White water kayaking	0	1	2	3	4	5	6
15	Using illegal stimulants	0	1	2	3	4	5	6
16	Smoking cigarettes	0	1	2	3	4	5	6
17	Mountain biking	0	1	2	3	4	5	6
18	Having unprotected sex	0	1	2	3	4	5	6
19	Piloting a small plane	0	1	2	3	4	5	6
20	Using cocaine	0	1	2	3	4	5	6
21	Surfing	0	1	2	3	4	5	6
22	Not exercising regularly	0	1	2	3	4	5	6
23	Driving after drinking alcohol	0	1	2	3	4	5	6
24	Horse riding	0	1	2	3	4	5	6
25	Ocean sailing	0	1	2	3	4	5	6

26	Using heroin	0	1	2	3	4	5	6
27	Diving off a high board	0	1	2	3	4	5	6

PLEASE CHECK THAT YOU HAVE ANSWERED <u>ALL</u> THE QUESTIONS

Appendix C: The Physical Risk Behaviour Scale (PRBS)

Instructions: Remembering that your answers are *completely confidential*, please indicate how many times you have participated in each of the following activities...

		Never	Not in the past 12 months	1-5 times in the past 12 months	6-10 times in the past 12 months	11+ times in the past 12 months
1.	Mountain climbing	€	€	€	€	€
2.	Smoked tobacco	€	€	€	€	€
3.	Parachute jumping	€	€	€	€	€
4.	Had a hangover due to alcohol consumption	€	€	€	€	€
5.	Alpine / downhill skiing	€	€	€	€	€
6.	Had a speeding ticket or fine	€	€	€	€	€
7.	Been physically sick due to alcohol consumption	€	€	€	€	€
8.	Motor cycling	€	€	€	€	€
9.	Taken an avoidable risk in a non sporting context	€	€	€	€	€
10.	Rock climbing	€	€	€	€	€
11.	Taken illegal drugs (excluding marijuana)	€	€	€	€	€
12.	Had a serious sporting injury (e.g. a broken bone)	€	€	€	€	€
13.	Had unprotected sex	€	€	€	€	€
14.	Been involved in a traffic accident	€	€	€	€	€
15.	White water kayaking / canoeing	€	€	€	€	€
16.	Taken an avoidable risk in an outdoor activity	€	€	€	€	€
17.	Motor sports	€	€	€	€	€
18.	Had sexual intercourse with a person other than your current (or most recent) partner	€	€	€	€	€
19.	Deep sea diving	€	€	€	€	€
20.	Been involved in a fight	€	€	€	€	€
21.	Hang gliding	€	€	€	€	€
22.	Had a serious non-sporting injury (e.g. a broken bone)	€	€	€	€	€

PLEASE CHECK THAT YOU HAVE ANSWERED ALL THE QUESTIONS