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DRIVER AGGRESSION: THE ROLE OF PERSONALITY, SOCIAL CHARACTERISTICS, RISK AND MOTIVATION

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Abstract
The report addresses the topic of aggression in driving, with a consideration of a number of subject areas: theories of aggression; the definition of aggressive behaviour in driving; measurements of aggression; extreme forms of driver aggression; less extreme forms of driver aggression. The report's conclusions focus on society's role in aggressive behaviour, strategies for coping with aggression, including driver education and screening, and directions for future research.

Keywords
Aggression, aggressive driving, driver behaviour, risk assessment, risk measurement.

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CONTENTS

EXECUTIVE SUMMARY

This report addresses the topic of aggression in driving and related areas of research. A range of different subject areas are reviewed including theories of aggression, factors contributing to aggressive driving behaviour, the measurement of aggression, the characteristics of driver groups at high risk of crash involvement, strategies for combatting aggression in driving and the identification of a number of research issues.

Approaches to the study of aggression

There are a number of different theoretical approaches to the study of aggression. However, none are considered to be complete explanations but reflect the orientation and requirements of the researchers who developed them. Biological theories consider aggressive behaviour to be innate, although specific responses can be modified by experience. In the psychoanalytic tradition, the frustration-aggression hypothesis proposes that the origin of aggressive behaviour is to be found in external factors. Finally, social learning approaches argue that aggression is a learned response through observation or imitation of socially relevant others. Aggression is the result of the norms, rewards, punishments and models to which individuals have been exposed.

Although these three approaches differ in the emphasis they place on the role of biological (genetic inheritance and evolutionary) processes and experience (learning through exposure to environmental factors), they generally assume that aggressive behaviour is the combined result of these factors.

Defining aggression in driving

Aggression can be defined as any behaviour directed at

causing physical or mental injury. However, as Bandura (1983) points out, the classification of an act as aggressive depends on subjective judgements of intention and causality. For the purposes of this report, the concept of intent is useful in discriminating between driving acts where the intent was to cause harm and other driving acts which reveal a willingness to chance dangerous outcomes in order to fulfill the driver's motives. This latter situation necessarily encompasses behaviour in which the driver may not intend to harm other road users and may not be aware that significant risk is involved. Two definitions of aggression in driving are proposed which encompass the range of possible aggressive behaviours.

The first definition of aggression in driving includes what would normally be classified as extreme behaviour. These are acts of murder, suicide and willful and malicious assaults (physical or psychological). The second definition encompasses the concept of risk taking. This driving behaviour is aggressive in appearance, but does not necessarily imply intent to cause harm, although it may subsequently put other road users at risk.

The motives of drivers

The behaviour of the road user (of which aggression is one aspect) needs to be considered within the framework of the social and psychological context in which it occurs. The view is expressed that the road user's behaviour is seen as reflecting a balance between personal motives (for example, thrills, the desire for speed or position in the traffic stream) and the subjective risk of crash involvement. Central to this view is the argument proposed by Naatanen and Summala (1974, 1976) that drivers in general do not perceive any risk of crash involvement. This lack of subjective risk of accident involvement allows

drivers to fulfill a variety of other needs.

Another approach to the concept of subjective risk has different implications for driver risk taking. This is the concept of risk homeostasis which argues that road users always operate at the maximum level of risk that they are prepared to accept. This theory assumes that the driver is aware of and desires the level of risk he or she is taking.

Other factors may also influence aggressive or risky behaviour. There is evidence that stress and alcohol may influence aggressive behaviour. In contrast, however, there appears to be relatively little information available with regard to the effects of other drugs and disease on aggressive behaviour.

Methods of Measurement.

For the most part, investigations of aggression in driving have focussed on the evaluation of personality variables. A large number of studies have used psychometric tests in order to measure or predict aggressive driving behaviour. Psychometric tests used in the investigation of aggression in driving have included; projective techniques, objective techniques, and psychiatric or more general interviews. The use of these tests is not without serious problems with regard to their reliability and validity. Adequately standardized tests employed in the correct way may provide useful information about an individual's personal characteristics, although it may be only qualitative in nature.

Methodological issues

Studies comparing driver characteristics and crash record have produced equivocal results. While many studies claim to

have distinguished between crash involved and crash free drivers on the basis of particular personality or social traits, the majority of these findings have not been validated. These differences in findings may be due to differing or inadequate methodology. Methodological problems found in these studies include; inadequate control for variation in exposure and hazard level, small sample sizes, use of inadequately standardised tests, and failure to validate findings with different populations.

Extreme forms of driver aggression

There are a number of different dimensions to be considered when discussing aggression on the road. These include how society views traffic offenders and the association between crash involvement and crime (including suicide and murder) in the community.

The argument is made that society for the most part regards people who break the law as deviants. However, this attitude does not extend to people convicted of motor vehicle offences. A number of researchers consider that these people are still regarded by society as law abiding citizens whose behaviour is not only tolerated but excused.

Researchers have considered the idea that serious traffic offenders may be more likely to have criminal records than non-offenders. This idea has been extrapolated to argue that in societies in which there are high rates of violent crime there will also be high rates of deaths and injuries by motor vehicle crash. The results of several studies suggest that there is a correlation between rates of death or injury by motor vehicle crash and violent crime. However, due to methodological problems, these results should be treated with great caution.

Fatalities which are the result of motor vehicle crashes are very rarely certified as suicides. Evidence suggests that probably substantially less than five percent of all deaths by motor vehicle crash are the result of suicide. In addition, while the characteristics of successful suicides and those involved in fatal accidents were considerably more deviant than the general population, greater deviancy was found in the suicide sample than in the crash sample.

Other reports of willful acts of violence or malicious damage on the road directed against other road users are rare although they do occur.

Less extreme forms of driver aggression

The concept of 'accident proneness' (as it is always referred to in the literature) has had a major influence on the study of personality factors of crash-involved drivers. Early investigations into personal factors and crashes originate at least in part from studies of accident proneness. Accident proneness can be defined (very broadly) as a propensity to have accidents. This propensity refers to one or more personality trait/s or type/s. The concept has a number of problems and has generally fallen into disfavour as it has failed to provide a means by which to predict individual accident involvement.

While accident proneness has for the most part been put aside, the research into aggression in driving continues to embody the notion that some individuals by virtue of their personal characteristics are more likely to be involved in accidents than others.

Drivers at high risk of crash involvement exhibit a broad range of personal and social characteristics. Certain

demographic features are associated with increased risk of being involved in a crash. These include age less than 25, education of less than twelve years, being a semi-skilled or unskilled worker, single marital status and low socio-economic status. Within this population of high risk drivers are a number of sub-groups which include crash-repeating drivers, people who drive under the influence of alcohol, young drivers (particularly young men) and possibly the mentally ill.

Personal factors which have been identified as associated with motor vehicle crashes include generally high levels of aggression and hostility, competitiveness, less concern for others, poor driving attitudes, driving for emotional release, impulsiveness and risk taking. A background of social disruption and deviancy appears to be more common amongst high crash and/or violation drivers.

The potential value of research into the personality and social characteristics of problem drivers lies in establishing effective means of predicting crash reliability. However, while some consistency has been found in these characteristics, there appears to be no single test or test battery by which individual accident liability can be predicted.

The role of aggression in driving

The attention focussed on the role of aggression in driving and the personality characteristics of repeated crash and conviction-involved drivers appears unwarranted given the likely contribution of these factors to crash causation. The accurate identification of such individuals is problematic. Furthermore, the effect of removing these individuals from the driving population would appear to be comparatively small as they can be considered to constitute only a small proportion of the driving

population. Also, in general the composition of the crash repeater group is not constant from year to year. The extent of the problem also needs to be questioned. A study investigating the contribution of aggression to road crash statistics claims that of the human factors identified as being involved in crashes only 0.6 percent were identified as frustration or aggression and 1.6 percent as reckless driving (Sabey and Staughton, 1975 cited in Hampson, 1984).

Concluding comments

There can be little doubt that there is a substantial learned component (at least in the ways and situations in which aggression is expressed) to aggressive behaviour. The argument is made that society as a whole determines the level of safety margins. Risk taking and competitiveness can be considered, in part, to be encouraged by society.

Further understanding of the context in which aggressive driving takes place is required. Possible strategies for coping with aggressive driving include; screening drivers and modifying driver behaviour (enforcement and driver education). However, attempts to modify driver attitudes have been largely unsuccessful. Further research is required to identify the reasons for the general lack of effectiveness of driver education and publicity campaigns.

The study of risk taking and risk assessment by drivers may be a more productive line of research than attempting to identify aggressive personality traits. Greater understanding of the contexts in which aggressive or risky driving takes place is required. The study of the personality and social characteristics of crash involved drivers may not be productive

as these traits have been found to change with time, age and situation and cannot yet be used to predict accurately the crash history of individual drivers.

Any further research investigating possible causal links between aggression and road traffic crashes using psychometric testing needs to employ stricter methodological controls than those used to date. Given the apparently small number of drivers involved repeatedly in crashes and the inadequacy of the psychometric instruments available, it may be more productive (in terms of countermeasures) to concentrate on other areas of research.

GENERAL INTRODUCTION

For the last twenty years, significant progress has been made in upgrading the safety characteristics of both vehicles and the roadway environment. However, it is now recognised that many of the easily implemented improvements on road safety resulting from initiatives in these two areas have now been achieved. As a result, some road safety practitioners are encouraging increased emphasis to issues relating on driver behaviour and performance.

While road users are only one component in a complex interacting system, they nevertheless determine to a very large degree the level of road safety that is achieved. The personal attributes of drivers, along with their abilities and limitations, have a significant effect on the number and type of crashes that occur. For example, it is known that young males, as a group, are overrepresented in crash statistics.

One personal attribute frequently cited as a contributing factor to road crashes is aggression. For example, eye witnesses will report that one vehicle appeared to be driven in an aggressive or hostile manner. Statements concerning the aggressive tendencies of a particular driver are to be heard in courts of law. The purpose of this report is primarily to examine the construct of aggression and to review related topics.

Theories of aggression will be briefly reviewed in the report to illustrate the diversity of approaches to the topic. This will provide a basis for examining issues concerning aggression on the road. However, it can be generally said the more basic research in the area of aggression has had relatively little influence on considerations linking road safety and aggression.

Aggression can be regarded as an expression of a driver's motives, as a manifestation of risk taking in a particular environment, as a more permanent personality factor, or as the primary factor in some drivers experiencing repeated crashes (the so-called 'accident prone' driver). Because aggression on the road is closely related to the concepts of motives, risk taking, personality, and accident proneness, these topics will also be reviewed in some detail.

Investigators have observed that aggression can take a wide range of different forms. Murder and suicide on the road would represent the more extreme form of aggression, and these areas are reviewed. Aggression in its less extreme forms has often been considered in terms of the prediction of traffic crashes by psychological tests of individual characteristics or, less frequently, by observations of behaviour on the road. The focus here is on studies concerning personality or social factors, rather than tests of abilities such as information processing. A number of deficiencies in this literature will be identified.

Crash producing factors associated with the topic of aggression and personal characteristics will be discussed, including the role of alcohol, the young driver and the mentally ill. It is interesting to note that much of the research in this field was conducted more than twenty years ago. The relatively little research in recent times probably reflects the judgement of many investigators that the identification of drivers likely to have crashes by such means is not a fruitful approach. There appears to be a widespread belief that research in this area will probably not result in substantial and effective countermeasures. Nevertheless, some research topics can be identified that are

deserving of attention, and these are discussed at the conclusion of the report.

CHAPTER 1

APPROACHES TO THE STUDY OF AGGRESSION

The range of definitions of the term aggression reflect the diversity of approaches which have been developed to investigate the concept. None of these approaches can be considered complete explanations of the phenomenon of aggression. However, each appears to reflect a different aspect (Barchas, 1981) depending on the needs of the researchers who developed it. One of the difficulties in aggression research has been the freedom with which it has been applied to both human and animal behaviour both in every day usage and in research. As Brain (1981) notes, the concept of aggression as applied to man:

- may refer to an extremely diverse assortment of written, verbal and physical phenomena.
- have an element of value judgement. Whether an action is aggressive or a reasonable action depending on the convictions of the observer.
- include reactions generally considered to be products of complex interactions between biological, environmental and experiential factors.

The area of aggression research is associated with an extremely large selection of papers from such diverse areas of research as physiology, zoology, psychology and sociology and has involved research into both animal and human aggression. This chapter is not intended to provide an in-depth analysis of the various approaches to the study of aggression but will briefly consider a number of distinct approaches to the study of aggression. In addition the associated concepts of motivation and personality will be briefly considered.

THEORIES OF AGGRESSION

Biological approaches

Biological theories of aggression emphasise the innateness of the aggressive response (Edmunds and Kendrick, 1980). The genetic material of a species is seen as the primary determinant of a range of possible behaviours (including aggression) (Barchas, 1981). This base may be modified by experience. This is not to imply that there are no differences in patterns of aggressive behaviour between humans and animals particularly primates. However, it is generally assumed that some similar principles of behaviour may be seen in both groups. From an evolutionary perspective, emotions are one of the most important traits to have developed in humans. In this perspective, emotions are regarded as having evolved for specific functions (Plutchik and Kellerman, 1980). Emotions are seen as communicators from one animal to the next, providing information about the probability of occurrence of a given behaviour. Emotions are viewed as being basically adaptive, helping to organize the animal's behaviour in a way which meets the demands of the environment.

Ethological theories. A major biological approach to the study of aggression is that of the classical ethologists (those concerned with detailed observation of behaviour). Most classical ethologists claim that aggression is in part a consequence of an organism's biological inheritance, making it subject to evolutionary pressures. Aggression is regarded as fulfilling useful biological functions. However, some researchers make no claims regarding the innateness of aggressive behaviour (Brain, 1981). Ethological views of aggression have

been received pessimistically by some (Brain, 1981). Hinde (1978, cited in Brain, 1981) notes that there is no dispute that aggressive behaviour has been selected as an adaptive characteristic in a larger number of the higher species other than humans. Hinde has argued for the survival value of aggressive behaviour. Lorenz (1966, cited in Brain, 1981) has emphasised "the utility of aggression to social organization in human society" (p. 616). Eibl-Eibesfeldt (1971, cited in Brain, 1981) argues for the view that aggression may have cohesive force in a society when one common enemy has been identified. From the biological point of view, man can be seen as being "biologically predisposed to behave in a fashion that can be labelled as 'aggression' under defined circumstances of experience and in the presence of particular environmental factors" (Brain, 1981, p. 619). The majority of ethologists agree that situational and experiential factors are important in the control of aggression. However, the degree to which aggression (in humans particularly) is determined by genetic, physiological or learning factors is open to debate. A debate which according to Brain is "inherently sterile" (p. 619).

Psychoanalytic theory. Another approach to the study of aggression is based on psychoanalytic theory. Freud viewed aggression as a basic instinct or a fundamental need or drive for aggressive behaviour (Barchas, 1981). Aggressive behaviour occurs when need for aggression has built to such a level that it can no longer be contained. However, through socialization and resolution of developmental stages of growth, the aggressive drive can be attached to more constructive behaviours (Barchas, 1981).

Drive theories: The frustration-aggression hypothesis

The general principles of the frustration-aggression hypothesis were developed from the psychoanalytic tradition and the work of Freud (Dollard, Doob, Miller, Mowrer and Sears, 1939). However, in contrast to Freud, Dollard et al (1939) proposed that the origin of aggressive behaviour was to be found in external factors (that is, accumulated frustrating experiences) whereas Freud had postulated an internal (or instinctive) base for aggressive behaviour. Initially, in the original statement of the frustration-aggression hypothesis (Dollard et al, 1939), it was assumed that aggressive behaviour was always the consequence of frustration. It was hypothesised that a one-to-one relationship existed between frustration and aggression. Aggression was defined as "an act whose goal response is injury to an organism (or organism surrogate)" Dollard et al, 1939, p. 11). Frustration was defined as "that condition which exists when a goal-response suffers interference" (p. 11). The intensity with which the frustration was experienced was seen to depend upon three factors. These included the strength of the instigation to the frustrated response, the degree of interference with the frustrated response, and the number of previous goal-response sequences frustrated. Obviously, the stronger the feelings of frustration, the stronger the aggressive response. This definition of aggression was later revised (Miller, 1941, cited in Kaufmann, 1965) to say that frustration produces an instigation to aggression. The instigation may or may not be strong enough to provoke aggressive behaviour. However, when aggression has been elicited, the organism will be instigated to attack an opponent.

Berkowitz (1962, 1981) subsequently argued that an organism has a tendency to continue an activity until its goal has been reached. Inability to achieve this goal causes frustration. Catharsis (as Berkowitz terms it) occurs when and because the aggressor achieves his or her aggressive goal. **Contrary to the arguments** of Dollard et al (1939), Berkowitz (1981) argues that the occurrence of aggressive behaviour (or the achievement of an aggressive goal) would decrease only the aggressive instigation that had provoked the behaviour and not reduce accumulated instigations that are the result of previous frustrations. Berkowitz (1981) notes that it is not possible to say that only one type of aggression exists or that there is only one sort of aggressive goal. He goes on to argue that it is worthwhile to differentiate between hostile and instrumental aggression. In hostile aggression the goal is to injure the object of the attack, whereas in instrumental aggression the primary goal of aggressive behaviour is to reach a goal beyond causing injury to the victim of the attack, such as domination, access to resources and so on. It could be hypothesised that much of the 'aggression' observed on the road would correspond to this second type.

Social learning theories

Social learning theorists argue that aggression is not due to instinct or drive, but is the result of the norms, rewards, punishment and models to which individuals have been exposed (Bandura, 1983). Aggression is therefore viewed as a learned response, through observation or imitation of socially relevant others (Barchas, 1981). The more often aggressive behaviour is reinforced the more likely it is to occur again. For example

values which indicate that 'to be a man, sometimes you have to stand and fight'. If parents punish children for aggressive behaviour, such behaviour may soon become inhibited in the presence of the parents, however, the imitative response will be strongly learned. Aggressive behaviour would then be expected to occur in situations in which the parent is not present. Physically punishing children for aggressive behaviour may effectively act as a model for aggressive behaviour.

Biological mechanisms set limits on the types of aggressive behaviours that can develop and influence the rate of learning (Bandura, 1983). In the social learning view, individuals are understood to be endowed with neurophysiological mechanisms which allow them to behave in an aggressive way. However, the elicitation of aggressive behaviour depends on the occurrence of appropriate stimulation and is largely under cognitive control (Bandura, 1983). Thus, the actual form the aggressive behaviour will take, the frequency of its occurrence and the circumstances in which it arises will depend on complex social learning factors (Bandura, 1983).

Aggressive behaviours may be learned through observation from aggressive models. Bandura (1983) proposes that aggressive behaviour patterns can be obtained in Western society from three primary sources. Possibly the most fundamental of these is the role of family members in the modelling of aggressive behaviour. However, the family is contained within a complex social system which plays an important secondary role in the modelling of aggressive behaviour patterns. Finally, the mass media is viewed as the third most important source of aggressive behaviour modelling for individuals. According to Bandura (1983) there is mounting evidence that television affects behaviour and may act

as a symbolic model for aggressive behaviour. He goes on to say that television has been found to affect behaviour in four ways; by teaching aggressive behaviour styles, altering restraints over aggressive behaviour, desensitizing and habituating viewers to aggressive behaviour, and shaping viewers' images of reality, upon which they base much of their behaviour. Direct experience in the social learning approach is also considered to influence aggressive behaviour styles. The formulation of suitable behaviour patterns is developed from observing the effects of ones own actions (Bandura, 1983). Such reinforcement appears to act as an informative and motivational mechanism rather than as a mechanical response shaper.

OVERVIEW OF THEORIES OF AGGRESSION

The various theories of aggression differ in the types of behaviour which they include under the heading of aggressive behaviour. They also differ in the aspects they emphasise in terms of biological, motivational and social factors. However, generally they assume that human aggression is caused by the combined result of biological factors (genetic inheritance and evolutionary processes) and experience (learning through exposure to environmental factors). The significance attributed to each of these factors and the process by which they influence behaviour depends on the approach being examined. The forces postulated to determine the occurrence of aggressive behaviour also differ according to the theory being examined. The motivation of humans deliberately to engage in aggressive activity has been hypothesised by biological theories to be driven by innate forces of which the individual is not

necessarily aware. However, other theories place emphasis on external conditions (such as cultural forces) as motivating factors. Therefore, the motives of individuals have been seen variously as being conscious or unconscious, compelled by drives and instincts, or determined by incentives, goals and values (Cofer and Appley, 1964).

The extent to which differing personality types influence the occurrence of aggressive behaviour is not really known. The opinions expressed by researchers will very much depend upon their orientation toward the causes and development of aggressiveness. The emphasis placed on innate factors and/or social forces in the development of personality will also be determined by the personal orientation of the researcher. However, whatever the orientation adopted by researchers, it is difficult to relate aggression to personality as at present it does not appear possible to identify the aggressive individual on the basis of any single cluster of so called aggressive personality traits (Feshbach, 1970, cited in Johnson, 1972). Much of the literature on aggressive behaviour in driving relates to attempts to associate personality characteristics of individuals with the frequency of occurrence of crashes or traffic violations. Crashes and violations are thus regarded as being the behavioural indicators of the occurrence of aggression and, as such, indicators of the individual's propensity for aggressive behaviour.

DEFINING AGGRESSION

In spite of a range of approaches to the study of aggressive behaviour in humans, it would appear that, with only few exceptions, a general definition of aggression has been

agreed upon in the literature. This general definition would define as aggression any behaviour directed at causing physical or mental injury. Behaviour not directed at inflicting harm is excluded from this definition.

Given the diversity of approaches to the study of aggression, and the wide variety of contexts to which it has been applied, an operational definition of aggression in driving needs to be considered. Aggression can generally be defined as behaviour which results in personal harm and/or physical injury. This personal harm may be physical or emotional (for example, verbal abuse) (Bandura, 1983). However, not all acts which result in some form of injury can be labelled aggressive. The intent of the perpetrator is central in determining whether a given act was aggressive or not. However, whether an act will be classified as aggressive depends on subjective judgements of intention and causality (Bandura, 1983) by observers. Furthermore, the same injurious act may be viewed differently depending upon the sex, age, attractiveness, status, background, etc. of the perpetrator (Bandura, 1983). Bandura reports that people are more disposed to judge harmful acts as unintentional if the perpetrator is favoured than if he or she were not favoured. This problem in part, has lead Buss (1961) to propose that the concept of intent is awkward and unnecessary in the definition of aggression. As Buss points out, intent is a private event which the individual may or may not be able to express verbally. This approach leads to obvious problems - how can injuries caused accidentally by a second party be equated with deliberate cause of injury?

To some extent, the definition of aggression used in this

literature review must be determined by the way in which the concept has been employed in the literature on road user aggression. The literature on aggression in driving has covered a broad area of research from investigations of homicide and suicide by motor vehicle to relatively common aggressive acts such as risk taking (for example, speeding). For the purposes of this literature review, the concept of intent is useful in discriminating between driving acts where the intent was to cause harm and other driving aggressive acts which reveal a willingness to chance dangerous consequences in order to fulfill the driver's motives. This latter situation necessarily encompasses behaviour in which the driver may not intend to harm other road users or himself and may not be aware that significant risk is involved. However, due to the involvement of other factors, the driver performs in a manner which endangers other road users. Such behaviour would be aggressive in appearance, however, the intent of the driver may not be readily definable. Neither of these two definitions makes any assumptions regarding the awareness of the individual of his or her motivation or the basic nature of the aggressive response. Thus, in terms of the definition of aggression in driving it is possible to distinguish a range of behaviours that may be.described as aggressive.

We would therefore, like to view the range of possible aggressive behaviours from extreme forms of aggression in which the intent to cause harm is fairly explicit to less extreme forms of aggression in which other motives (not necessarily including intent to cause harm) influence the road user to drive aggressively and therefore dangerously. We would therefore propose two definitions of aggression in driving. The first (strong) definition of aggression in driving encompasses more

extreme forms of aggression, including any behaviour the intent of which was to cause physical and/or psychological harm or damage to oneself, other roads users, or property. Examples of such behaviour include willful, malicious acts such as assault (psychological or physical) of other road users, homicide, or suicide. The second definition of aggression generally involves less extreme behaviours and encompasses both actual aggressive behaviour and aggressive-looking driving behaviour. Here Berkowitz's (1981) concept of instrumental aggression is useful. The primary goal of the individual's behaviour in this situation is not the injury of a victim, but some unknown factor (motive) beyond this. These motives are commonly quoted in the literature. A wide range of motives which may be conscious or unconscious have been postulated including; faster speed, arriving sooner, thrills, release of emotional tension, bad temper. While the intent of the driver is not necessarily to cause harm, the behaviour reveals the individual's willingness to risk hazardous outcomes. This willingness may be due to any number of conscious or unconscious motives, or may in fact communicate a lack of awareness of current road dangers.

CHAPTER 2

THE ISSUE OF AGGRESSION IN DRIVING

WHAT IS AGGRESSIVE DRIVING?

Parry (1968) argues that,

"it may be accepted that some accidents are precipitated by 'chance situations' difficult even for the experienced motorist to foresee. In such a context the term 'accident' carries the proper and accurate meaning. However, it would be totally incorrect to suggest (as some do) that all accidents are the result of chance situations, fate, or some such random occurrence, and therefore are bound to happen" (p. 4).

While such a statement can be challenged, this quote underlies the position that individual characteristics contribute significantly to crashes. Parry goes on to suggest that many of these types of crashes could be avoided but for the frame of mind and the personality of the driver involved. A dominant theme of many studies investigating the causes of motor vehicle crashes, although not so much in recent years, has been the expression by drivers of aggressive patterns of behaviour. In terms of the definition of aggression in driving it is possible to distinguish a range of behaviours that may be described as aggressive.

As discussed in chapter 1 a strong definition of aggressive driving would be driving with the intent to cause harm to other road users, to oneself or to property. Examples of such behaviour are assault (psychological or physical) of other road users, homicide, or suicide. It would appear unlikely that the majority of road traffic crashes reported in the literature are the result of attempted suicide, homicide or assault. Overt aggression and irresponsibility would appear to cause only a small number of crashes (Road accidents and driving behaviour, 1978). This is a view supported by police assessments of the

situation (Road accidents and driving behaviour, 1978). It is important to differentiate between the aggressive types of behaviour encompassed in the extreme definition of aggression and the less extreme aggressive or aggressive-looking behaviour encompassed by the second definition. This second type of aggressive driving behaviour has been called less extreme in order to differentiate it from acts of murder or suicide. Much of the literature to be discussed later deals with crash repeaters whom research has attempted to distinguish from the normal driving population on a number of personality dimensions - notably aggressive traits. However, subjective experience would also indicate that even members of the 'normal' driving population exhibit aggressive driving behaviour relatively frequently. Members of the 'normal' driving population may also become aggressive when faced with difficult driving situations such as slow moving traffic. In this view, aggressive-looking driving behaviour (risk taking) is also considered. The driver in this situation does not have any conscious intent to harm other road users but his or her exhibition of deviant behaviour puts other road users at risk. The next chapters will consider the motives of drivers for driving behaviour in addition to investigating the personality characteristics of drivers with multiple crashes or traffic violations.

It is likely that the majority of people who drive dangerously do not do so through an impulse either for self destruction or to injure others. Some of the literature to be discussed focuses on the role of driving as defined by the extreme definition (suicide, homicide or assault). Most of the literature to be considered in this review looks at the less extreme end of the aggressive driving spectrum, examining the

motivational components of road user behaviour, their underlying characteristics, expression and control.

THE MOTIVES OF DRIVERS

The behaviour of the road user (of which aggression is one aspect) needs to be considered within the framework of the social and psychological context in which it occurs. As Wilde (1976) remarks, it is probably difficult to find examples of road user behaviour completely free from some form of social influence - these being social customs, habits, values and expectations. Naatanen and Summala (1976) put forward the proposition that it may be more fruitful to investigate the behaviour of drivers within the context of their motivation to behave in a particular way. They argue that with regard to safe driving behaviour, the critical determinants of the road user's behaviour are motivational in nature. Clifford and Marjoram (1978) claim that the embracing of a more responsible attitude to driving by road users is a fundamental pre-requisite to obtain substantial and permanent improvement in road safety. The driver needs also to be regarded as a creator of traffic situations, and not just as a responding agent. The literature to be considered in this review testifies to the position expressed by Naatanen and Summala that the driver does not always (naturally) give his or her best in order to avoid crashes. In this view, the road user's behaviour is seen as reflecting a balance between personal motives (thrills, speed, headway etc.) and the subjective risk of being involved in a motor vehicle crash.

In general, the principal motives accepted for driver's driving have been commonly presumed to be travelling to a given

destination, and arriving safely (Naatanen and Summala, 1976). Naatanen and Summala also stress the wide variety of other kinds of motives individual road users might have. **All of which may** result in expressions of aggressive behaviour. These motives have been termed the 'extra motives' of the driver. The importance of these 'extra motives' in the determination of driver behaviour has not been widely studied (Naatanen and Summala, 1976). The 'extra motives' of drivers have been termed 'excitatory' in order to contrast them with 'inhibitory' motives the most important of which is the subjective risk of crash involvement. Naatanen and Summala argue that, in general, there is an absence of subjective risk on the part of the driver.

In the view of Naatanen and Summala,

> "Man satisfies his needs everywhere that is possible. If (and when) road traffic affords opportunities for this in abundance and the absence of perceived risk presents him with plenty of subjective freedom of choice, then why not take advantage of the opportunity?" (Naatanen and Summala, 1976, p. 79).

The lack of subjective risk and the extra motives of road users are considered to be among the major causes of the failure of many countermeasures designed to influence driver attitudes (Naatanen and Summala, 1976).

Naatanen and Summala's concept of the 'extra' motives of drivers is important when studying driving behaviour as it allows us to consider not only the sources of possible aggressive behaviour but also other risky driving acts and the behaviour (motives) of drivers not only among so called 'high risk' driver groups, but also amongst the general driving population. However, the intent of the driver may be difficult if not impossible to determine. The concept of risk taking and aggression in driving are closely associated. The next sections will investigate Naatanen and Summala's concept of 'extra

motives' and the road user's feelings of subjective risk of being involved in a crash and the source of his or her subsequent risk taking behaviour in the light of the relevant literature. Any of these motives may give rise to aggressive or aggressive-looking driver behaviour, which may subsequently put other road users at risk.

Naatanen and Summala's (1976) broad classification of the kinds of the possible 'extra' motives drivers is as follows:

a. Aims of the road user for the trip he or she is taking. For example, goals arising from a desire to get to point B with haste, competition between drivers, timetable pressures, obtaining a better position in the traffic flow. Driving to attain these goals may result in increased risk taking behaviour.

b. Behavioural models. Traffic behaviour is influenced by the driving norms of the individual's peer group. Klein (1972) remarks that for many adolescents knowledge about, ingenuity in modifying and skill in driving motor vehicles may represent the only means of achieving status with peers. A motor vehicle may be used as a means of asserting manhood for some young male drivers (Robinson, 1972, cited in Henderson, 1972). Naatanen and Summala comment that some individuals tend to be very assertive and competitive drivers, believing such behaviour to be a sign of driving skill. Competitiveness in driving could conceivably be ascribed to aggressiveness (Naatanen and Summala, 1976). Adolescents in particular may be attracted to high powered vehicles. Advertisements for high powered cars or sports cars imply symbolic autonomy and power (Klein, 1972). The message of advertising is that of speed and acceleration. This type of advertising to sell vehicles while being successful, serves only

to reinforce the extra motives of the driver. The example set by other road users may also influence behaviour. Lefkowitz, Blake and Mouton (1955, cited in Naatanen and Summala, 1976) observed that pedestrians more often crossed at red traffic lights when an experimenter's model was present who violated the rule, than if the model was not present.

c. The driver may feel the need to prove his or her skill as a driver. Naatanen and Summala argue that consciously or unconsciously people generally seem to regard driving speed and overtaking ability as a measure of driving skill. They also argue that this conception is maintained by motoring advertising, magazines and races.

d. Hedonistic objectives. The excitement of driving especially at speed are also cited by Naatanen and Summala as extra motives. Black (1966) in a study comparing the responses of drivers to aspects of driving such as safety in the hypnotised and unhypnotised states observed that drivers while under hypnosis stressed the freedom of owning a motor vehicle. To quote one subject "the pleasure comes from moving...I feel free...I'm driving fast and enjoying what that means to me" (p. 66). Parry (1968) reports one subject responded in a sentence completion task to the phrase "to take a risk when driving...is exhilarating" (p. 38). Naatanen and Summala (1976) make the point that the desire to travel at speed (which is expressed not only in fast car driving but also in our desire to play on roller coasters and so on) may be seen as a reduction in drive or tension from a biological point of view. Or for the experience of a new sensation. However, it may also relate to Klein's conception that risk taking and aggressiveness are attributes valued by our society and therefore instilled in members. In

this view the desire to drive fast may be accounted for in social learning theory.

e. Emotions. Aggressive emotions may be aroused by factors within the driving situation itself. Whitlock (1971) points to the generally frustrating nature of driving which may be continually constrained by other traffic. Turner, Layton and Simons (1975) present evidence suggesting that some drivers become angry and frustrated by the behaviour of other drivers. Parry's anecdotal reports of drivers' responses indicate that hand gestures, swearing, light flashing and facial expressions are used by drivers in response to other drivers who irritate them. A large number of Parry's drivers were driven to actually chasing and confronting (often fighting with) the drivers who had irritated them. However such drivers represented the extreme end of a spectrum of aggressive behaviour which may occur in response to frustration.

Increased risk taking behaviour was reported by Ebbesen and Haney (1973) who found that drivers accepted shorter gaps in traffic flow when turning left at a T-intersection after waiting for vehicles in front to turn than when the driver had been in the first position immediately. This behaviour was explained in terms of frustration generated as a result of having to wait in a queue. "All that is required to work off a cheerful mood...is a slow-moving truck that cannot be overtaken on a winding stretch for several kilometres" (Naatanen and Summala, 1976, p. 42). The stronger the emotions generated by the given situation, the greater will the danger be that emotions will make the driving decisions and not the traffic situation (Naatanen and Summala, 1976). Subsequent behaviour may result in increased risk of

crashes which is indicative that some drivers become aggressive when frustrated. The frustration leads to aggression hypothesis would predict that the arousal of emotions in response to frustration may lead to attempts to decrease the frustrating nature as soon as possible. For example, the hurried driver may overtake with only narrow margins. Whitlock (1971) in trying to make sense of aggressive behaviour by 'normal' drivers, has suggested that the 'combative' attitude which arises in difficult driving situations, may have its foundations in the ethological view of territorial rights. That is, drivers become aggressive in defence of their perceived territorial rights. However, both the above views must be considered purely speculative as no firm evidence for either exists, particularly in terms of driving behaviour.

Emotions may also be stirred up by factors external to the traffic situation. Selzer, Rogers and Kern (1968) report that 20 percent of the drivers they investigated who had been involved in fatal crashes had been upset about some incident in the last six hours of their lives. This was also indicated by Holt (1982), Selzer (1969) and Selzer and Vinokur (1974) who reported that emotional crises in the form of quarrels with significant others contribute to an increase in crash and violation rates. The road user who drives when upset or angry may be doing so to blow off emotional steam (Naatanen and Summala, 1976). Such behaviour may be overtly aggressive behaviour (such as suicide or murder) or increased risk taking (such as speeding).

f. Risk taking. Risk taking in driving is the expression of an increased willingness to take chances when driving and include behaviours engaged in purely for the enjoyment of driving dangerously (risk taking for the sake of risk taking). An

English study (Quimby and Watts, 1981) of driver attitudes to safety (for example, speeding, drink driving legislation, seatbelt usage) revealed that drivers sometimes knowingly engaged in dangerous behaviour, although attitudes toward this type of behaviour improved with age. An American study (Schuman, Pelz, Ehrlich and Selzer, 1967) reported that one half of the male drivers they studied in the 16 to 18 age bracket reported taking part in 'daredevil' practices in the previous month. These included racing and taking dares. Approximately 30 percent of the 16 to 18 year old group also reported that they often took chances with friends in cars. The incidence of the above types of behaviour decreased with age although 20 percent of the 23 to 24 age bracket reported daredevil driving and 10 percent reported that they took chances when driving. Pelz and Schuman (1968) reported that two in five of the young drivers they interviewed who were crash and violation repeaters said that they spent at least ten hours a week in motor vehicles for fun. Only one in five of the safe drivers reported this type of behaviour.

This type of driver risk taking behaviour in which risks are taken for fun or thrills most certainly has the appearance of aggressive driving. The extent of the risk incurred and the consequences will be determined by the extent to which the individual is willing to put his or her safety and that of other road users at risk. Klein (1971) in discussing American society contends that societal values place risk taking and aggressiveness high on the list of socially desirable attributes. Klein proposes that Americans do not want as safe conditions as could be achieved by the implementation of current technical knowledge. Klein argued that the values taught by schools and

the mass media reinforce an outdated view of America as a frontier society. These values reflect competitiveness, individual initiative, control over one's environment, masculinity (which implies toughness and aggression), challenge and excitement, and that social rewards can be best achieved through individual achievement rather than cooperative effort. It is likely that these values are also reflected in Australian society. Hampson (1984) discussing the Australian situation comments that society encourages risk taking and competitiveness which is reflected in our driving behaviour. Klein goes on to say that industrialised society minimises risk taking and concentrates decision making into fewer and fewer hands. As a consequence smaller numbers of people can gain feelings of control, individual achievement or a sense of power from their work. In addition, increasing affluence and decreasing work schedules provide people with even greater opportunity for risk taking. In terms of road users, Klein (1971) argues that in a society with these values, drivers, and young drivers in particular, find little manifestation of them in their work activities, but can find them in driving activities. Tillman and Hobbs (1949) make the comment that 'men drive as they live'. However, Shaw (1965, cited in Parry 1968) qualifies this comment when she says that people may also 'drive as they would like to live'. This view may be more appropriate for Klein's argument. It cannot be claimed that all young drivers represent a driving risk because of the motives for risky driving outlined above. Shaw and Sichel (1971) propose that well integrated people will not change their behaviour when they sit behind the wheel of a motor vehicle (as proposed by Parry). However, a poorly integrated person, who could possibly find driving an outlet for

feelings of frustration, conflict and aggression may well undergo a change in behaviour when driving.

The issue of risk taking is highly complex and continues to be the subject of controversy, particularly with regard to questions of drivers' basic motivations for risk taking behaviour. Central to the issue of driver risk taking behaviour is the concept of awareness of risk. Do drivers (adolescents in particular) knowingly take risks while driving? The papers presented above would indicate that some drivers do. However, other analyses of driver risk taking behaviour, while not denying that some drivers do knowingly take risks, argue that other drivers are generally not aware of many of the risks they are taking while driving.

THE SUBJECTIVE RISK OF CRASH INVOLVEMENT

Risk assessment

The difficulty with attempting to measure drivers' subjective feeling of risk is that it cannot be measured directly. Such events are internal and not necessarily available for conscious examination by the individual or by others. Two approaches to the concept of subjective risk are outlined below. Both of these approaches have implications for the prevention and control of aggression in driving, and represent different approaches to solving the problem. The first of these is the concept of risk homeostasis which argues that road users always operate at the maximum level of risk that they are prepared to accept. This theory assumes that the driver is aware and desires the level of risk he or she is taking. The other view is that in everyday driving situations road users do not experience feelings

of subjective risk, but operate as though they were in a totally safe environment. In this situation, the aggressive driver may not be aware that his or her driving represents a high crash risk whereas risk homeostasis theory indicates that the aggressive driver is prepared to put him or herself into high risk situations.

The concept of risk homeostasis

The validity of the assumptions underlying the risk homeostasis concept has profound implications for the prediction and control of the occurrence of crashes which are seemingly the result of aggressive behaviour. The concept that road users attempt to maintain a consistent level of risk has been controversial because of the implications it holds for the effectiveness of safety countermeasures. The theory has been called danger compensation (O'Neill, 1978, Peltzman, 1975) and more recently risk compensation (Wilde, 1982a). The theory of risk homeostasis developed by Wilde from risk compensation has been the focus of attention in the last few years.

The basis of compensation theory is the concept of utility. That is, the idea that the individual, will always act to maximize the expected gains for a given activity. Safety is treated as one of a number of goods (Evans, 1985). Other utility gains (possibly resulting in aggressive behaviour) may be driving faster, getting to work faster and more thrills. In driving, the individual is expected to act to, "optimally adjust his behaviour to maximise his expected gain in the face of a change in the driving environment" (O'Neill, 1978, p. 158). The user is thought to balance the risks involved in having a crash with the benefits of using some of the margin provided by the safety

measure to fulfill his or her other motives (such as driving faster). Aggressive driving may in these circumstances be a reflection of the drivers' desire to maximize his or her utilities, whatever they may be. In this situation risk may be defined as, "the selection of one alternative or course of action from among many in which the consequences of that choice could leave the individual in a worse position than if he had selected otherwise or not selected at all" (Bem, 1980, p. 2). In addition, risk taking relates only to the subjective aspects of risk. Risk taking as an intentional act can only take place if the person involved believes danger to exist (Taylor, 1976).

The type and size of the various tradeoffs made by drivers will depend on the individual. Peltzman (1975) has chosen to call these other driving goals, driving intensity. By increasing safety through the use of countermeasures, we are in effect decreasing the risk price attached to driving intensity. For example, by installing better braking systems in cars, we are encouraging the driver to engage in behaviour that he or she otherwise might not have considered. Utility theory can be used to predict that the crash rate will remain unchanged (Evans, 1985). In risk homeostasis theory, the human is seen as acting in a way that may be understood as a homeostatically controlled regulation process. "At any moment of time the instantaneously experienced level of risk is compared with the level of risk the individual wishes to take and decisions to alter ongoing behaviour will be made whenever these two levels are discrepant" (Wilde, 1982a, p. 20). Safety measures in general, while providing the user with greater opportunity for safety, do not affect the driver's motivation to be safe (Wilde, 1982a). The user will recognise either consciously or unconsciously the

safety benefit provided by a device and will alter his or her behaviour accordingly. The level of risk that the individual driver is prepared to accept is the only factor that will influence driver risk taking behaviour in the long term (Wilde, 1982a). The level of risk accepted by the driver is determined by cognitive and motivational states. These are in turn influenced by other underlying variables such as, long term factors (for example, cultural values), trip specific variables (for example, fatigue, mood) and momentary fluctuations (for example, frustration with other drivers or passengers, day dreaming). The implications for attempts to prevent aggressive driving are extremely important. The risk homeostasis model would predict that individuals who drive aggressively do so because they are operating at the level of risk they are prepared to accept.

A strong empirical base for this theory has yet to be established. While a great deal has been written concerning the theory of risk homeostasis, very few firm conclusions have been drawn. A number of methodological problems exist with studies investigating the validity of risk homeostasis such as lack of external controls in before-after studies, or the presence of uncontrolled variables in studies of risk taking.

Studies investigating risk homeostasis have obtained contradictory results, although the majority of the literature does not appear to support the concept. Studies by Adams, 1981, Hurst, 1979 and Peltzman, 1975 have found an increase in deaths with the implementation of seat belt legislation. This evidence has been interpreted as supporting the risk homeostasis theory. Conybeare (1980) although reporting a decrease in occupant

fatalities, also reported an increase in the number of non-occupant deaths. However, McKenna (1985) disputes the conclusion that Conybeare's findings supports risk homeostasis theory. Although a significant decrease was observed in the number of occupant fatalities, the increase in non-occupant fatalities was not significant. Instead of a net decrease in safety, a net increase was observed. Other studies have also failed to find evidence of risk homeostasis. Hakkert, Zaidel and Sarelle (1980) and Robertson (1977a, 1981) report a decrease in the number of fatal crashes coinciding with the introduction of safety legislation. They also did not report any increases in the rate of non-occupant fatalities as is predicted by the shift in risk hypothesis. In Australia, Cowley and Cameron (1976) and Foldvary and Lane (1974) estimated that the saving in lives was somewhere in the range of 10 to 20 percent below the pre-legislation trend. Muller (1980) and Watson, Zador and Wilks (1980) report that the repeal of motorcycle helmet laws led to an observed drop in helmet use of approximately 40 to 50 percent. Both studies concluded that as a result of the repeal of the laws, there was an increase in the number of fatalities. This was somewhere in the magnitude of 38 percent (Watson et al, 1980).

Two of the major studies which have been cited as evidence for risk homeostasis theory have been severely criticised. Peltzman (1975) regressed traffic death rates on a set of variables which he had postulated would influence a driver's demand for risk taking behaviour in the period 1945-1966 (after which time there was a great increase in the enactment of safety regulations). These factors were; the (economic) cost to the driver of having a crash, increase in income, time related income (for example, taxi drivers), level of alcohol in the blood, age

of the driver, the speed at which the driver is travelling.

It was predicted that there would be a 10 to 25 percent decrease in the occupant fatality rate and a 7 to 20 percent decrease in the total vehicle fatality rate (Peltzman, 1975). The aim of Peltzman's study was to investigate any changes in the fatality rate for the pre-regulatory period compared with the post-regulatory period. Peltzman concluded that there had been no decrease in the fatality rate in the post-regulatory period.

Peltzman's methodology has been severely criticised (Joksch, 1976, Lindgren and Stuart, 1978, Robertson, 1977b) on a number of points. It is argued that the multiple regression model used by Peltzman did not predict the fatality rate accurately for the period prior to regulation. He did not separate the deaths which involved cars subject to the regulations from deaths involving cars not subject to the regulations. Vehicles fitted with seat belts in the year following the passing of seat belt laws were found to have a lower casualty rate when compared with pre-regulation vehicles. Joksch (1976) argues that the fatality rate contradicted published information concerning their crash involvement. When applied to the Swedish situation, the type of analysis used by Peltzman revealed a significant decrease in the fatality rate for car occupants (Lindgren and Stuart, 1980).

Adams (1981) attempted to compare the crash rate of 13 countries with mandatory seat belt regulations with four countries without such legislation. The total road fatalities of all the countries were converted to indices with 1973 (the year of the oil crisis) set at 100. Indices containing the average indices of the countries with laws were obtained and compared against the average indices of the countries without laws. The

crash fatality index of countries with mandatory seatbelt laws was found to drop by 17 percent in the post-regulatory period. However, the index for non-law countries dropped by 25 percent.

A number of criticisms have been levelled at the Adams study. It is argued that only occupants affected by seatbelt legislation should have been used and that a distinction should have been made between occupant fatalities and non-occupant fatalities (motorcyclists, pedestrians etc.). Only those road users affected by the legislation should be expected to show any signs of compensation (Matthews, cited in Hamer, 1981, Tingvall, 1982). The seat belt wearing figures used by Adams were clearly underestimated, a fact which calls into question the validity of his results. Tingvall (1982) divided drivers according to seat belt usage. A clear distinction was made between those drivers who wore seat belts before and after the law was enacted, those belted after the law but unbelted previously, and those drivers unbelted both before and after the law was introduced. Drivers unbelted before and after the law tend to belong to high risk groups (young males, drunk drivers). Tingvall found no evidence for an increase in the fatality rate in the year following the enactment of seat belt legislation. A relevant point may be that in 1975 in Sweden, 44.7 percent of all front seat passengers killed were not wearing their seatbelts.

Evans and Wasielewski (1982a, 1982b) used vehicle headway as a measure of driver risk taking behaviour. The rationale behind this study was that short headways (those less than one second) were indicative of a willingness to take greater risk than the longer headway used (those greater than or equal to one second). This assumption appears to be borne out by the fact that a significant relationship was found between crash involvement and

driver risk taking behaviour. However, in an investigation of the effect of seatbelts on risk taking in two jurisdictions (Ontario and Michigan) one of which had mandatory seatbelt laws and the other that did not, Evans, Wasielewski and von Buseck (1982) found no relationship between driver risk taking and the wearing of seatbelts. In fact, the drivers wearing their seatbelts (in both cities) were more likely to drive with longer headways than those without seatbelts. Evans et al concluded that there was no evidence to support the concept of compensation, but nor was there any directly to refute it.

Rumar, Berggrund, Jernberg and Ytterbom, (1976) measured possible driver risk taking behaviour in relation to the use of studded tyres. The speeds, following distances, and the presence or absence of studded tyres were checked on several thousand vehicles. Contrary to the prediction of risk homeostasis, drivers did not totally offset the safety advantage provided by the use of studded tyres. Furthermore, drivers with studded tyres on their vehicles still drove with a greater safety margin than did drivers of vehicles with unstudded tyres. Given the evidence (Tingvall, 1982) that drivers who do not wear seatbelts tend to belong to high risk groups, (drivers more likely to take risks and be involved in crashes) it may be that those drivers who do not choose to fit their cars with studded tyres are also more likely to belong to the same type of high risk group. The presence or absence of risk homeostasis cannot be measured by a comparison of these two groups.

A number of theoretical issues also present problems for the risk homeostasis theory. Firstly, the model assumes that risk is the controlling factor in driver behaviour (Cole and

Withey, 1982, Slovic and Fischhoff, 1982). In doing so, other costs and benefits would not be accounted for. There may also be a major difference in the influence of active safety measures (a safety measure that directly changes the probability of crash involvement) and passive safety measures (a safety measure that does not change likelihood of crash involvement, but does reduce the severity of the crash when it occurs). The problem with passive safety measures is that no direct compensatory mechanism exists (Slovic and Fischhoff, 1982). It is not possible to drive in such a way that the safety advantage of a padded dashboard is offset. With an improved braking system, it is possible to offset that advantage directly, by braking later than if the system were not as good. This is particularly important considering that most of the work in the area has involved detailed analysis of crash statistics in relation to the introduction of seatbelt legislation. Devices designed to reduce crash frequency have not always worked, but it is not necessarily true that this is the case given safety devices aimed at reducing crash severity. Graham (1982) argues that when the consequences of an act are improbable and are painful to imagine (such as a severe car crash) an individual's actions will not be altered by changes in the margin of severity.

The concept of subjective risk would appear to be far more complex than the risk homeostasis model would imply. The analysis of the problem of subjective risk is made more difficult as there is no direct means to measure it. Nor, when such measures are made can we be certain that the subject's definition of risk is the same as that of the researcher. People are often biased in their interpretation of risk (Slovic, Fischhoff and Lichtenstein, 1980, Tversky and Kahneman, 1974). A number of the

basic assumptions of risk homeostasis are yet to be verified. Most importantly, these concern the ability of road users to perceive risk accurately. The qualitative aspects of risk perception and effects of indirect (passive) versus direct (active) safety measures require further investigation. In terms of aggression in driving, the model implies that the road user is driving at the level of risk he or she is prepared to accept.

Absence of subjective risk

Naatanen and Summala (1974, 1976) and Summala (1986), advance the view that road users for the most part do not experience feelings of subjective risk of being involved in crash while on the road. First advanced by Naatanen and Summala in 1974, this view postulated the existence of a subjective risk monitor which when activated generates varying degrees of subjective risk (or fear) depending on the amount and nature of the risk experienced in the current or expected driving situation. Summala (1986) proposed a zero risk theory of driver behaviour which postulates that drivers tend to adapt to the risks on the road and that their motives drive them towards higher speeds and riskier driving habits.

The zero-risk theory in general describes any situation in which the driver maintains a given adequate safety margin. Driving is seen as an habitual activity based on largely automatic control of safety margins. The driver is not normally concerned with risks, but in most situations knows what he or she must do in order to avoid the possibility of crashes. Instead of regulating some kind of risk measure as in risk homeostasis theory, drivers control safety margins around themselves. "A perceived or anticipated threat to this critical space triggers

the fight or flight response" (Summala, 1986, p. 9). The subjective risk monitor is activated and some kind of immediate escape response is elicited. Another response which Summala (1986) has called the avoidance learning process affects future decision making and behaviour. In the avoidance learning process, the experience of risk or fear is the primary aversive stimulus. "The driver learns which cues anticipate this experience which is of course closely related to objective hazards" (Summala, 1986, p.10). The driver in general tends to both escape and avoid such aversive experiences.

With increasing driving experience it is postulated that the driver acquires an internal representation of the traffic system in addition to internal models of expectancies for specific driving situations (Summala, 1986). These expectancies are more perception-like and deterministic than the real driving situation (Naatanen and Summala, 1976). As a result there develops an inability on the part of the driver to take into account the small stochastic fluctuations in traffic risks in addition to the disappearance of the drivers original fear responses to many driving situations. As a consequence the driver's subjective probability of the outcomes of their behaviour are distorted, resulting in driving with too small safety margins.

As with risk homeostasis theory, this theory has major implications for the approach taken to the control of dangerous and aggressive driving. If the level of subjective risk is almost non-existence, then the driver is able to satisfy any of the other motives he or she may desire to see fulfilled (for example, thrills, fast driving - activities frequently labelled aggressive driving) without the constraint of fear

(feelings of risk). In support of this, Quimby and Watts (1981) observed that road users who drove at inappropriate speeds resulting in greater risk taking appeared to consider the risk to be quite low. Naatanen and Summala (1976) present a number of claims as evidence for their argument. However, whether road users are actually acting in these ways must still be considered open to debate.

In support of their argument, Naatanen and Summala argue that:

1. People do not seem to minimise their exposure to the road environment.

2. Many forms of behaviour on the road appear to indicate a lack of subjective risk.

3. Choice and maintenance of motor vehicles often reflect no concern for safety.

4. Many of those safety countermeasures which have been based on the premise that drivers feel some subjective risk have failed.

5. The individual experience of road users does not seem to contain elements of the subjective risk of crash occurrence.

Naatanen and Summala (1976) consider a number of factors to be responsible for reducing the road user's sense of the subjective risk of having an crash. Research into risk perception has found that many people feel that although the risk of having a crash in particular situations does exist, that it won't happen to them (Svenson, Fischhoff and MacGregor, 1985). It appears that people learn of risks through their own everyday experiences. These include personal experiences with crashes, close calls and those incidents they see occurring or reported in the media. It is also known that drivers often discuss traffic crashes and pay close attention to those reported in the media

(Wilde and Ackersviller, 1977, cited in Wilde, 1982b). When asked to rate the frequency of death of a number of crash types in the United States, it was found that people generally knew which events were most often fatal. However, they seriously misjudged the frequency of events within that framework (Lichtenstein, Layman and Coombs, 1978, cited in Slovic et al, 1980). Traffic crashes were among those factors generally overestimated.

In spite of this, there is evidence to support the notion that people do not feel that they belong to the same population as drivers involved in crashes (Svenson, Fischhoff and MacGregor, 1985). Goldstein (1964) argued that drivers thought that a small group of bad drivers caused all the crashes on the roads. The above points are further supported by evidence which suggests that most drivers feel that they are more skillful and less likely to be involved in crashes than the average driver (Svenson et al, 1985). This has also been reported by other researchers (Preston and Harris, 1965). Black (1966) found that hypnotised subjects were not concerned that there were dangers on the roads. They felt skillful enough to deal with those dangers that did exist on the road. This is in contrast to the opinions held by the subjects when not hypnotised, who felt that there was great danger to be found on the road.

Zuercher, Sass, and Wiess (1971, cited in Naatanen and Summala, 1976) noted that crash-involved drivers apportion their own driving skill a major share of credit for saving peoples' lives in crashes. Griep (1970, cited in Naatanen and Summala, 1976) remarks that this lack of subjective risk may explain why fear-arousing campaigns to encourage drivers to drive more

carefully have failed. Drivers involved in risky traffic situations have also been known to interpret these dangerous situations as being less dangerous or of slight risk (Naatanen and Summala, 1976).

It would appear therefore, that while people overestimate the likelihood of crash involvement, their behaviour implies that they rate the likelihood of car crash involvement as quite low (Naatanen and Summala, 1976). Personal experience would indicate that the driving task does not entail feelings of subjective risk until a situation arises that requires action to avoid a collision. To quote McKenna (1982), "from the armchair there is a clear risk of crash involvement, as the statistics demonstrate, but from the driver's seat there appears to be little experience of these statistics" (p. 873).

The feeling of drivers that crashes do not happen to them is reinforced by the fact that crashes are rare events when compared with the amount of time spent on the road. Drivers may not feel the need to change their driving behaviour (dangerous or not) in view of their experiences. The probability of being involved in a crash on any given trip is quite low (Slovic, Fischhoff and Lichtenstein, 1978). Summala (1986) reports that a Finnish driver on average would experience a fatal crash once in every 40 million kilometres. Each safe trip reinforces the idea that seat belts are not needed. "The expense of buckling up has been saved without bearing any costs" (Slovic et al, 1978, p. 281). On the other hand, the driver who does wear a seat belt is 'punished' for the effort, inconvenience and discomfort without gaining any benefit.

Summala (1986) argues that, as beginners, most drivers at first feel uncertain or fearful in many driving situations.

However, with experience and continued increases in driving skill, such feelings are extinguished. To a large extent, the driver as the operator of the vehicle can determine the nature and degree of the difficulty of the traffic situations he or she should cope with. As such, drivers have a subjective feeling of control when in the driving situation (Naatanen and Summala, 1976). That such feelings may exist is evidenced in the work of Bragg and Finn (1985) who found that subjects, while travelling as passengers in a vehicle, perceived a greater risk than when they drove themselves. It is likely that the qualitative feeling of control over unexpected situations is decreased for the person travelling as a passenger. As an indication of this, LeGarde, Lubman and Hartnett (1971) propose that non-drivers can more readily be persuaded to wear seatbelts than drivers, because the need to wear seatbelts can be determined to some extent by the driver. Naatanen and Summala (1976) generally conclude that the effect of being the driver of the vehicle is to reduce relative risk. As drivers we may feel that we are better able to control any unforeseen events than as passengers. This aspect of control is aided by drivers, because of their experiences on the road, having certain expectancies about the traffic situation ahead.

Other factors also influence perception of risk by drivers. An example of this is lack of supervision on the road. The risk of apprehension for traffic violations is relatively small (Naatanen and Summala, 1976). Traffic violations come to be viewed as risk free, especially if the legal norms for traffic regulations are not accepted. Distortion of perceptual and cognitive processes or underestimation of the physical forces at work may also act to reduce subjective feelings of risk (Naatanen and Summala, 1976).

In addition, other drivers can be seen displaying no concern for the possible risks involved in dangerous driving, with the effect of influencing other drivers (Naatanen and Summala, 1976). The social learning theory of aggression would predict that drivers would imitate the behaviour of others, in particular the behaviour of other individuals important to the driver. Bandura (1983) has proposed three principal sources on which aggressive behaviour may be modelled; the family, the subculture in which the family reside and the mass media. This view supports that of of Carlson and Klein (1970) who found a positive correlation between fathers' and sons' convictions for traffic violations. Bandura (1983) and Eron and Huesmann (1984) are now convinced on the basis of their evidence that television plays a significant role in influencing aggressive behaviour patterns. There are important implications for the way in which driving behaviours are modelled. Some aggressive drivers may in fact model their own particular driving behaviours on the high speed car chases which frequent the small screen, and in which the vehicle (or vehicles) is generally destroyed. However, the hero walks away unscathed.

The view can be supported that there exists a close link between the issues of aggression and risk taking by drivers. This report has considered two quite different approaches to the issue of risk taking by drivers, the controversial theory of risk homeostasis and the zero-risk hypothesis. Further research into the role of the motivational determinants of driver risk taking behaviour and methods of risk assessment by drivers is required.

OTHER FACTORS INFLUENCING AGGRESSIVE BEHAVIOUR

A number of different authors have investigated the inter-relationship between the occurrence of violent and aggressive behaviour and other internal (psychological or physiological) factors and external (environmental) factors. The majority of this review has and will be considering the role of psychological and sociological factors governing aggressive behaviour amongst road users. The literature to be considered in this section will consider factors other than these (for example, organic brain disease, alcohol, marijuana, ambient temperature, noise) which may modify the expression of aggression in driving. The literature on the general effects of these factors is relatively large. However, very little has been conducted in relation to road users. Most of the studies have reported that the expression of aggression is influenced by environmental stressors such as noise (Mueller, 1983), ambient temperature (Bell and Baron, 1981), the consumption of alcohol (Taylor and Leonard, 1983), and brain pathology (Moyer, 1981).

Stress

A number of authors have reported that stressful events may be related to the occurrence of traffic crashes. McMurray (1970) reports that during the six months before and after divorce, drivers in her study had a significantly higher crash and violation rate than the general population. The types of violations more often found at these times included speeding, failure to yield, and close following. Holt (1982), Selzer (1969) and Selzer, Roger and Kern (1965) reported that social stressors in the form of personal crises and quarrels with significant others contribute to an increase in crash and

violation rates. Hampson (1984) reports three in-depth studies of crashes (Mclean, 1981, Sabey and Staughton, 1975 and Treat, 1980) that identified emotional stress as a contributing factor in crashes. The percentage contribution of emotional stress reported by each of these studies was 3.2 percent, 1 percent and 2.1 percent respectively. Selzer and Vinokur (1974) argue that life change and current subjective stress may be more important in the occurrence of road traffic crashes than personality or social factors. Stress may act in a number of different ways such as increasing aggression, or causing distraction. There is some implication in these studies that emotional stress may influence aggressive behaviour, possibly by increasing risk taking, bad temper, or as Macdonald (1964) recorded, triggering suicide attempts.

There is speculation with regard to the reasons why stress may be related to crashes. Increased risk taking while under stress has been suggested (Valentine, Williams and Young, 1977). Another suggestion relates to the discharge of emotion when under stress which result in crashes (Viney, cited in Valentine et al, 1977). This is similar to the concept of discharging of tension postulated by a number of authors to relate to causes of crashes. Drivers with low tension tolerance were postulated to use their vehicles to release tension (Schuman, Pelz, Ehrlich and Selzer, 1967). It appears that risk taking and aggressive behaviour may be influenced by some stressful events, however, the exact relationship has not been determined. Hampson (1984) reports that the exact relationship may be difficult to determine, given the possible variation in definitions and "the indirect relationship between emotional stress and immediate human

actions" (p. 15).

Alcohol

While a complete review lies outside the scope of this study, a number of authors have also suggested that alcohol in addition to psychomotor impairment (impaired motor skills, vision, reaction time), has the effect of modifying the expression of the personality (Goffioul, 1971) or releasing aggressive personality traits (Payne and Selzer 1962). Yates, Meller and Troughton (1987) regard acts of aggression to be a major behavioural complication of alcoholism. They comment that alcohol seems to precipitate violence in some alcoholics. Yates et al (1987) also report on the antisocial personality disorder which is frequently associated with alcoholism. The antisocial alcoholics in this study were more likely to be involved in motor vehicle crashes, fights, marital disputes and suicide attempts than were nonalcoholic patients with antisocial personality disorder.

Mitchell (1985) maintains that the opinion that alcohol consumption impairs judgement and increases risk taking behaviour is controversial and has been since the 1950's. The early studies which popularised the concept actually measured subjective evaluation of performance under intoxication. Mitchell argues that experimental results have been conflicting and that studies have shown that individual differences in the response to alcohol are quite large. Wallgren and Barry (1970, cited in Barry, 1973) have argued that these differences are attributable to different motivational and emotional changes caused by alcohol. Barry (1973) has also reported that according to some atypical reports, alcohol increases aggressive and

nervous moods. More often however, laboratory experiments on humans have shown little evidence for an increase in aggressive behaviour (Barry, 1973). Barry reports that studies of self-rated moods have often reported a decrease rather than an increase in aggression. In conclusion, Barry argues that alcohol can have a sedative and a disinhibitory effect. The sedative effect will cause inattention and sleep, whereas the stimulating, disinhibitory effect (which relates to aggressiveness) can increase driver risk taking behaviour (characterised by impulsive actions) in the form of self-destructive behaviour, increased assertiveness, dissociation from sober driving habits and impaired self criticism (resulting in impaired risk estimation).

This short examination of the literature suggests that there is some relationship between alcohol use and risk taking in driving although it has not been firmly established. Simpson and Warren (1981) argue that the exact causal link between alcohol and crashes can only be inferred from experimental studies. Donovan, Marlatt and Salzburg (1983) in a review article concluded that alcohol serves to increase levels of covert hostility and overt aggression which may be translated into driving-related aggression, speeding, risk taking and sensation-seeking behaviour. However, while violence and aggression would appear to be characteristic of at least some alcoholics, not all alcoholics are aggressive or have crashes while intoxicated (Yates et al, 1987). The behavioural problems associated with alcohol and driving may be the direct result of alcohol and or the result of a more basic problem that has also contributed to the individual's difficulties with alcohol.

Other drugs

The role of drugs other than alcohol in crash causation is receiving increased attention. Brahams (1987) in an article on medicine and the law comments that drugs intended to calm and sedate may produce unexpected aggression or lessening of control. However, the extent to which this view can be accepted is uncertain. Linnoila and Seppala (1985) argue that the effect of antidepressants on driving is unknown, although clinical studies indicate that some impairment of skills occurs. However, they also found that antidepressants may have beneficial effects. Sharma (1976) makes the comment that barbiturate intoxication is often accompanied by aggressive behaviour and lack of emotional control.

Seppala, Linnoila and Mattila (1979) report that cannabis may impair driving to a dangerous degree. While Moskowitz (1976) recognises that marijuana use produces impairment in driving skills, he argues that there appears to be no evidence that driver risk taking is affected. **In fact, he found that subjects** were less willing to take risks when under the influence of marijuana. Subjective reports indicate that marijuana appears to have a sedating rather than stimulating effect (Le Dain Commission, 1972, cited in Moskowitz, 1976). In a study by Pliner, Cappell and Miles (1972, cited in Moskowitz, 1976) subjects under the influence of marijuana were rated as being less aggressive. This conclusion is supported in a review by Seppala, Linnoila and Mattila (1979) who observed that, in laboratory studies, willingness to take risks is reduced. It would appear, therefore that marijuana does not contribute to aggressive displays of behaviour.

Brain pathology

Research into the influence of brain pathology in crash causation appears to be quite limited. The information related here is purely anecdotal. It would seem unlikely that brain diseases play a major role in the occurrence of aggressive behaviour which results in road crashes, however, it may be implicated in a very small number. Maletzky (1973) describes the episodic dyscontrol syndrome. Each of the subjects examined by Maletzky had a history characterised by episodes of violence. Subjects frequently used their vehicles aggressively and admitted to using a car as a weapon or to release tension. The cause of this syndrome, if it exists as a separate disease, is not clear. However, it serves to illustrate that a range of possibly organic factors can influence driving behaviour. Moyer (1981), reports on brain tumours that cause aggressive outbursts if located in a particular part of the brain. Sweet, Ervin and Mark (1969, cited in Moyer, 1981) describe one patient who had displayed hyper-irritability for a number of years. He began to have extremely destructive rages and began to drive his car recklessly. After removal of a tumour from his temporal lobe, these symptoms disappeared to be replaced by more stable and placid behaviour patterns.

Conclusion

In conclusion, this chapter has discussed the view that drivers do not always place safety as their first priority while driving, and has described a number of other motives road users might have for aggressive behaviour when driving. However, this is not to say that other motives for driving behaviour do not exist. In view of this, aggressive behaviour may be generated

when drivers attempt tc fulfill motives other than those of safety first and arriving at their destination. The assessment of risk and the willingness of the individual to be involved in dangerous behaviour may also influence the probability of the driver engaging in risky driving practices. Other factors may also influence aggressive or risky behaviour. There is evidence that stress and alcohol may influence aggressive behaviour, however, there appears to be little information with regard to the effects of other drugs and diseases on aggressive driving behaviour.

CHAPTER 3

METHODS OF MEASUREMENT

For the most part, the concept of aggression in driving has been dealt with by investigation of personality variables. A large number of studies have employed psychometric tests in order to measure or predict aggressive driving behaviour. It is therefore useful at this point to discuss briefly the theoretical basis of such tests and their validity.

THE NATURE AND USE OF PSYCHOLOGICAL TESTS

The traditional function of psychological tests has been, "to measure differences between individuals or between the reactions of the same individuals on different occasions" (Anastasi, 1982, p. 3). One of the major contemporary developments that has shaped present day use of psychological tests occurred in the nineteenth century, when it became apparent that a systematic method of identifying and classifying mental capacities was required.

"A psychological test is essentially an objective and standardized measure of a sample of behaviour" (Anastasi, 1982, p. 22). The rationale behind sampling a relatively small section of an individual's behaviour is the hypothesis that performance on a psychological test (provided the nature and number of items on the test have been correctly chosen) corresponds to another larger area of behaviour. A test's diagnostic or predictive value rests on the degree to which it acts as an indicator of a "relatively broad and significant area of behaviour" (p.22). Psychological tests should therefore be regarded as "behaviour samples from which predictions regarding other behaviour can be

made" (Anastasi, 1982, p. 23-24). Empirical assessment is the only means by which to establish the effectiveness of the measured behaviour's ability to serve as an index of other behaviour.

The American Psychological Association has developed a detailed guide for the assessment of psychological tests. Using the present state of knowledge as a base, this guide represents a summary of recommended practices in test construction administration and evaluation. Recommended practice includes adequate standardization of test stimuli. Standardization should be regarded as a, "special application of the need for controlled conditions in all scientific observations" (Anastasi, 1982, p. 24). The process of standardization includes the formulation of detailed instructions for administering the tests.

An important step in the standardization of test procedures is the development of 'norms'. No previously determined standards of pass or failure typically exist for psychological tests. Generally, an individual's test score is evaluated by comparing it with the scores attained by others on the same test. Norms, therefore, are only the average (or 'normal') performance and are established by administering the test to a large representative sample of the group of people for whom it was designed. This sample is known as the standardization sample. Norms correspond to the performance of typical or average persons, and so may not necessarily coincide with the most desirable or ideal performance (Anastasi, 1982).

Psychological tests are now widely used in many areas to solve a wide variety of practical problems in addition to their use in basic research (for example, the armed forces, schools,

the clinical setting, and business). The area of psychological testing of concern to this literature review is that of personality testing. The assessment of personality is generally concerned with, "affective, non-intellectual areas of behaviour" (Anastasi, 1982, p. 17). In this context the term personality test refers to measures of such characteristics as emotional states, interpersonal relations, motivation, interests and attitudes as distinguished from abilities. Many of the studies to which we will be referring in this review have also conducted aptitude and intelligence tests.

A number of different approaches have been developed in attempts to assess personality. Anastasi (1982) in her book on psychological testing, argues that,

> "all available types of personality tests present serious difficulties, both practical and theoretical. Each approach has its own special advantages and disadvantages. On the whole, personality testing has lagged far behind aptitude testing in its positive accomplishments" (p. 18).

This lack of advancement, she goes on to say, is not because of a lack of research being conducted in the area, but because of the "rather special difficulties encountered in the measurement of personality ..." p. 18). Mischel (1968, cited in Williams, Henderson and Mills, 1974) concluded "that standard personality measures have only low predictive ability with much of the behavioural variance being accounted for by the situation rather than personality traits as traditionally conceived" (p. 107). In addition, the validity of a given test can only be established with reference to the particular use for which the test is being considered. It should be noted at this point that while Anastasi (1982) holds grave reservations with regard to the validity and reliability of the majority of personality measures, she does not recommend that they be discarded altogether. Given that the test

involved has been adequately standardized and employed in the proper manner, psychometric tests may be able to provide useful information, although it may be qualitative in nature. The majority of psychometric techniques are subject to the qualities, experience and training of the test administrators, and other variable characteristics of the testing situation. Studies using psychometric measures discussed in the following sections need to be assessed with care, paying special attention to the methodological practices of the researcher/s.

The next section on psychometric tests and methodology will discuss the types and validity of the various psychometric techniques available to and used by researchers in the area of driver aggression.

PSYCHOMETRIC TESTS USED IN THE MEASUREMENT OF DRIVER AGGRESSION

Psychometric tests used in the investigation of aggression in driving have included; projective techniques, objective techniques (self report inventories), and either psychiatric or more general interviews. The majority of studies appear to have used questionnaire and interview techniques, but projective techniques have also been used extensively. A large number and variety of tests have been employed by researchers in a wide variety of settings. Most have been employed in attempts to identify aggressive and/or hostile personality traits of drivers. In addition to the use of personality tests, the following measures have also been taken:

- intelligence and aptitude tests.
- various psychophysical measures (reaction time, depth perception).

- various psychophysiological measures (galvanic skin response, heart rate).

Intelligence tests used in studies of driver aggression have included, the Shipley Abstraction Test (Quenault, 1968a, b, Quenault and Parker, 1973), Raven's Standard Progressive Matrices (Williams et al, 1974), Weschler-Bellevue Intelligence (Conger, Gaskill, Glad, Hassel, Rainey, Sawrey and Turrell, 1959) and the Gallup Thorndike Verbal Intelligence test (Malfetti and Fine, 1962). Other tests have included the Semantic Differential Test (Malfetti and Fine, 1962) and the Standardized Test of Traffic and Driving Knowledge for Drivers of Motor Trucks (Malfetti and Fine, 1962).

Problems with the use of projective and objective techniques

The use of questionnaire and projective techniques in the measurement of aggression is not without problems. In particular, the degree to which the scores obtained on projective and questionnaire tests actually reflect an individual's propensity to engage in aggressive behaviour requires close scrutiny. The vast majority of these tests do not directly measure aggression but attempt to obtain information regarding hostile feelings and impulses. Terms such as hostility and aggressiveness have been used interchangeably to indicate the individual's propensity for aggression. Kaufmann (1965) has pointed out that the degree to which this can be determined on the basis of test scores depends on the degree to which the subject has some belief that his or her behaviour will actually reach its intended victim. If the individual's subjective probability of their behaviour reaching its goal is zero, then it is not possible to determine whether the individual's actions

would have been different given a greater than zero probability of the aggressive behaviour being successful. In addition, personality tests can be expected to reveal large subcultural as well as cultural differences (Anastasi, 1982). For example the Minnesota Multiphasic Personality Inventory (MMPI) revealed significant elevations on certain scales in other countries when the original Minneapolis norms are used (Dahlstrom and Dahlstrom, cited in Anastasi, 1982). Cultural differences about the type of behaviour considered socially desirable may influence scores. Studies investigating the characteristics of drivers involved in crashes have found conflicting results. This may be due to a number of different factors such as methodological differences and/or the method of implementation and interpretation of tests. No attempt will be made here to provide a detailed review of the methodologies or the findings of these studies, as they will be reviewed in later sections. However, a short discussion of the use of psychometric tests would be appropriate.

Tables 3.1, 3.2, 3.3 and 3.4 provide a summary of the projective, questionnaire and interview techniques employed by various researchers in order to investigate road user characteristics in different countries over the last 30 to 40 years, although the listing is not exhaustive. The majority of studies included in this listing are post-1955. Goldstein (1961) provides a listing of research up to 1957 on human variables in safe motor vehicle operation which includes lists of psychometric tests employed by researchers.

Projective techniques

Projective techniques which have been used in research into driver aggression include; The Rorschach (Malfetti and Fine,

1962), Holtzman Inkblot (Pitariu, 1985), the Rosenzweig Picture-Frustration test (Burkner, 1975). Projective techniques are generally concerned with emotional, motivational, interpersonal and intellectual aspects of behaviour. These types of test typically focus attention on personality as a whole rather than measuring of individual traits. The projective technique originated in the clinical setting and most reflect the influence of psychoanalytic concepts (Anastasi, 1982).

TABLE 3.1 Types of projective tests used in the investigation of driver aggression:

PROJECTIVE TECHNIQUES:	Author/s
Rorschach Test:	Conger et al (1957) Conger et al (1959) Malfetti and Fine (1962) Hamalainen (1973)
Rosenzweig Picture Frustration Test:	Preston and Harris (1965) Burkner (1975)
Holtzman Inkblot:	Pitariu (1985)
Thematic Apperception Test: (TAT):	Conger et al (1957) Conger et al (1959) Malfetti and Fine (1962)
Szondi Test:	Achtnich (1967)
Hand Test:	Panek and Wagner (1986)
The Sentence Completion Test:	Malfetti and Fine (1962)
Sacks Sentence Completion Test:	Conger et al (1959)

According to the exponents of projective techniques, these tests are, "especially effective in revealing covert, latent or unconscious aspects of personality" (Anastasi, p. 565).

Projective techniques are generally distinguishable by the unstructured nature of the task. That is, the tasks designed for use in projective tests generally permit an unlimited variety of

possible responses. Testing procedures are disguised so that the type of psychological interpretation that will be made on the basis of the individual's responses to the test are rarely obvious to the person undertaking the test. The instructions provided to the individual undertaking the test tend to be very general, to allow "free play to individual fantasy" (Anastasi, 1982, p. 564). Test stimuli also tend to be ambiguous for the same reasons. The hypothesis upon which projective techniques are based argues that,

"... the way in which the individual perceives and interprets the test material, or "structures" the situation, will reflect fundamental aspects of her or his psychological functioning" (Anastasi, 1982, p. 564). The individual's responses reflect significant and relatively enduring personality attributes" (p. 588).

When evaluated as psychometric instruments, the majority of projective tests perform very poorly. Anastasi (1982) reports that in spite of the popularity of projective techniques in clinical settings, there is a large and growing body of evidence that indicates that many other factors also influence a given individual's test responses, in particular, temporary states such as those induced by hunger, sleep deprivation, drugs, anxiety and frustration. There is also some suggestion that responses to projective tests may be stimulus specific and therefore of questionable generalizability. Projective tests are also susceptible to falsified responding although perhaps less so than the self report inventories. They also tend to be inadequately standardized in the areas of administration and scoring. Analysis of test responses still appears to rely heavily on the clinical expertise of the test administrator. It may therefore be impossible to compare across test application and across test administrators.

In conclusion, as the value of projective tests lies in the hands of the test administrator, projective tests may serve a more useful purpose as a qualitative aid in interviewing than as quantitative instruments.

Objective techniques

Self report inventories used in research into driver aggression include; Minnesota Multi-phasic Personality Inventory (MMPI) (Brown and Berdie, 1960, Conger et al, 1957), Maudsley Personality Inventory (Quenault, 1968a, b), Guilford-Zimmerman Temperament Scale (Mozdzierz et al, 1975), 16 Personality Factor Questionnaire (Williams et al, 1974). Questionnaires are often referred to as measures of hostility or aggression. However, as noted previously, they are used implicitly as measures of aggressiveness (Edmunds and Kendrick, 1980). Established objective scales are listed in Table 3.2. Scales developed specifically for the purpose of evaluation of driver attitudes and traits are listed in table 3.3. Many of these scales were developed using sub-scales of previously established scales and using items which the researchers felt related to aggression.

A number of approaches have been utilized in formulating, assembling, selecting and grouping items for questionnaires. These include content validation, empirical criterion keying, factor analysis and personality theory. These approaches are not however exclusive of each other, but can theoretically be combined to form a single personality questionnaire (Anastasi, 1982).

Content validation. The inclusion of items in this formulation is based on content validity. That is items which

TABLE 3.2 Types of objective techniques used in studies of driver aggression.

OBJECTIVE TECHNIQUES:	Author/s
Minnesota Multi-phasic Personality Inventory:	Conger et al (1957) Conger et al (1959) Brown and Berdie (1960) Beamish and Malfetti (1962) Hamalainen (1973) Mozdzierz et al (1975)
Minnesota Counseling Inventory	Beamish and Malfetti (1962)
Maudsley Personality Inventory	Quenault (1968a, b) Quenault and Parker (1973)
Guilford-Zimmerman Temperament Scale	Mozdzierz et al (1975), Beamish and Malfetti (1962)
Eysenck Personality Inventory	Williams et al (1974)
Thurstone Temperament Scale	Conger et al (1957)
16 Personality Factor Questionnaire	Williams et al (1974) Quimby and Watts (1981)
Hostility and Direction of Hostility Questionnaire	Williams et al (1974)
Holmes and Rahe Life Events Checklist	Selzer and Vinokur (1974)
Buss Aggression Scale	Selzer and Vinokur (1974)
Zung Self Rating Depression Scale	Selzer and Vinokur (1974)
Dilemmas Of Choice Questionnaire	Gumpper and Smith (1968)
Gibson's Spiral Maze	Shoham et al (1984)
Taylor Anxiety Scale	Conger et al (1957) Shoham et al (1984)
Zuckerman's Sensation Seeking Scale	Shoham et al (1984)
Barrat's Impulsivity Scale	Shoham et al (1984)
Siebrecht Attitude Scale	Conger et al (1957) Preston and Harris (1965) Beamish and Malfetti (1962)
Allport-Vernon Study of Values	Conger et al (1957) Conger et al (1959)

TABLE 3.3. Scales Developed for Individual Studies. Many of the following studies have developed their questionnaires using items which they felt might distinguish between groups with high and low crash frequency.

SCALES DEVELOPED FOR INDIVIDUAL STUDIES	Author/s
	Shoham, Rahave, Markovski, Chard and Baruch (1984)
	Conger et al (1959)
	Mayer and Treat (1977)
	Schuster and Guilford (1964)
	Donovan, Queisser, Salzburg and Umlauf (1985)
	Selzer and Vinokur (1974)
	Selzer, Vinokur and Wilson (1977)
	Sobel and Underhill (1976)
	Conger et al (1957)
	Hamalainen (1973)
McGuire Safe-Driver Scale	McGuire (1976)
Driver Rules and Attitude Checklist	Preston and Harris (1965)
Self Report Driving Questionnaire	Panek and Wagner (1986)
Attitudinal Questionnaire	Quenault, Golby and Pryer (1968)
Risk-taking Questionnaire	Gumpper and Smith (1968)

according to some kind of a priori (but essentially non-theoretical) judgement appear relevant to aggression (Edmunds and Kendrick, 1980). In general, the test designer submits a number of items for judgement by a team of qualified judges. The items upon which the judges were able to agree are retained (Edmunds and Kendrick, 1980). The subject's response to each question is regarded as an index of the actual presence or absence of the

particular attitude or behaviour described in the question. However, Anastasi points out that few tests in use at present rest their claims completely on content validity. Edmunds and Kendrick report that such scales are of little use as a means of measuring aggressiveness. Lanyon and Goodstein (1971, cited in Edmunds and Kendrick, 1980) comment that the usefulness of these techniques depends on the degree to which: the judges were competent to judge themselves with respect to the questionnaire items, the subjects would respond truthfully, and the clarity or ambiguity of the test items.

Empirical criterion keying. This technique involves the development of a scoring key based on some kind of external criterion. The selected test items should be capable of distinguishing between criterion groups. Anastasi (1982) provides the example of the Woodworth Data Sheet in which no item was retained for use in this inventory if 25 percent or more of a normal sample answered it in the unfavourable direction. It was claimed that a personality characteristic occurring with such frequency in a normal sample could not be indicative of abnormality. Subject responses to questions developed using criterion keying are scored in terms of their empirically derived behaviour correlates. The responses to items are regarded as being diagnostic of the criterion behaviour (Anastasi, 1982).

The Minnesota Multiphasic Personality Inventory (MMPI) is the most widely used personality inventory and an example of empirical criterion keying (Anastasi, 1982). The inventory consists of ten scales, eight of which consist of items which were found to differentiate between a specified clinical group and a normal group of 700 people. Limitations of the MMPI include inadequate reliability and the inadequate size and

representativeness of the normative sample (700 Minneapolis adults) (Anastasi, 1982). Many ability tests have nationwide standardization samples. Anastasi argues that differences in MMPI scores could represent nothing more than differences in interpretation of individual items, instructions, cultural differences or may in fact reflect genuine emotional problems. Information regarding demographic variables (age, sex, education, socioeconomic status, ethnic group) should therefore be considered carefully when interpreting an individual's responses. Anastasi goes on to say that the MMPI is a clinical instrument, the proper interpretation of which requires 'considerable psychological sophistication'.

Factor analysis. The desire to obtain a systematic classification of personality traits prompted researchers to turn to factor analysis. An example of factor analysis is the Guilford-Zimmerman Temperament Survey and the Cattell 16 Personality Factor Questionnaire. Anastasi argues that the use of factor analysis allows division of personality inventory items into relatively homogeneous and independent clusters. This should facilitate the study of validity against empirical criteria. The Guilford-Zimmerman inventory is the product of computed intercorrelations between individual items from many personality inventories which were eventually combined into the one survey. This inventory produces separate scores for a number of different personality traits. Each score is based on the responses to 30 different items. The items are expressed in an affirmative form and are generally directed at the subject. The Cattell Inventories represent an attempt at a comprehensive description of personality. Cattell regards factor analysis as a

procedure for discovering and identifying underlying causal traits rather than as a data reduction technique (Anastasi, 1982). Anastasi argues that factors identified through the factor analysis of Cattell may be influenced by social stereotypes, rather than an individual's trait organization. Anastasi concludes that the traits identified by Cattell can only be considered tentatively. The 16 Personality Factor Questionnaire has shown generally low reliability. There is also inadequate information regarding normative samples and other aspects of test construction (Anastasi, 1982).

Personality theory. These types of inventories have usually been developed in the clinical setting and formulated within the framework of different theories of personality.

More so than projective techniques, questionnaire measures of personality are open to faking by subjects. Most items on most personality inventories have one answer which is more socially desirable than the other (Anastasi, 1982). The subject is therefore given the opportunity to fake his or her responses in either direction depending on his or her motivation. For example, a person applying for a job may wish to present themselves in the most favourable way and therefore respond to the more favourable items (Anastasi, 1982). Anastasi reports that there is strong evidence to support the claim that responses on personality inventories can be feigned successfully. Edwards (1975, cited in Anastasi, 1982) has also found that there is good evidence to support the view that the subject may not even be aware that he or she is tending to choose the socially desirable answers. This behaviour may be the result of a desire to 'put on a good front'. The person who chooses unfavourable items may be motivated by a desire to gain attention (Anastasi, 1982).

Techniques have been developed in order to prevent or detect the occurrence of faking. For example the use of some socially neutral response sets, or the use of the forced choice technique.

Several other response sets have been identified which have in the past made interpretation of test results difficult. These include the tendency to answer YES to all questions. This response set is conceived as a continuum, at one end the persistent YES people and at the other end the persistent NO responders (Anastasi, 1982). Another response set is that of deviation (tendency to give unusual responses). These response styles have now come to be regarded as indicators of broad and enduring personality characteristics. Anastasi reports that the responses to items on personality inventories are now regarded as having "broad diagnostic significance, but in terms of their stylistic properties rather than in terms of specific item content" (p. 525). In conclusion Anastasi reports that in addition to the problems outlined above, the behaviour measured by personality inventories may be more changeable than that measured by ability tests. Diagnostic testing she goes on to say should be used as an aid in describing and understanding the individual.

Interview techniques

Brief mention should also be made of interviewing techniques. In the study of aggression these have included informal interviews (Tillman and Hobbs, 1949) as well as structured psychiatric interviews (Conger et al, 1959) Interviews provide two types of information. They provide the opportunity for observation of behaviour (although the range of such behaviour is limited within the interview) and the

opportunity to elicit life-history information (Anastasi, 1982). The individual's previous behaviour acts as a good indicator of what he or she may do in the future (Anastasi, 1982). Good interviewing requires skill in the way in which information is collected and interpreted. Poor interview techniques may lead to erroneous conclusions if important information is not elicited from the interviewee or is not interpreted correctly. A listing of studies discussed in this review which used interview techniques is provided in Table 3.4. Some of these studies used

TABLE 3.4. Lists studies that have utilised interview techniques.

INTERVIEW TECHNIQUES	Author/s
Psychiatric Interview	Conger et al (1957) Conger et al (1959) Macdonald (1964) Hertz (1970) Parry (1968) Selzer (1969) Hamalainen (1973) Sobel and Underhill (1976)
Informal Interview	Tillman and Hobbs (1949)

structured psychiatric interviews, employing trained psychiatric and/or psychological staff. Others used more informal techniques, or a combination of both formal and informal interviews.

Concluding comment

For more detailed information regarding the nature and use of psychometric tests, the reader is directed to Anastasi (1982), and the latest editions of the Standards for the Development of Educational and Psychological Tests and the Mental Measurements Yearbook.

CHAPTER 4

EXTREME FORMS OF DRIVER AGGRESSION

In order to investigate the role of aggression in the causation of traffic crashes, this chapter addresses a number of issues raised in the literature dealing with role of extreme aggression and violence in road crashes. This form of aggression is considered to include any behaviour where the intent was to cause physical and/or psychological harm to oneself (attempted or successful suicide) other roads users (homicide, and other malicious acts) or property. Chapter 7 will deal with the less extreme forms of aggression experienced on the road.

SOCIETAL ATTITUDES TOWARD DRIVING OFFENCES

Clifford and Marjoram (1978) have argued that, "while most people who break the law are considered deviant and are socially ostracised, those convicted of motoring offences are more often still regarded as law abiding citizens and their behaviour is tolerated and even excused" (p. 2). Elliot and Street (1968, cited in Clifford and Marjoram, 1978) consider that the public does not equate the man who kills through dangerous driving with a normal criminal. The difference between traditional crime and driving violations is often stressed by lawyers (Macmillan, 1975, cited in Clifford and Marjoram, 1978). Ross (1960, cited in Clifford and Marjoram, 1978) has suggested that the cause of society's attitudes toward driving offences can be found in the newness of the legislation. Legislation against offences does not originate in prevailing norms of the society. It is possible that the roots of this attitude may be found in strongly held beliefs regarding personal rights and liberties (Whitlock, 1971).

However, independent of societal opinion, many driving offences do result from 'willfulness and malicious' intent on the part of the driver (Clifford and Marjoram, 1978).

THE RELATIONSHIP BETWEEN CRIME AND TRAFFIC VIOLATIONS

The concept of a link between motor vehicle crashes and crime has a long history in the road safety literature. It has been hypothesized on a number of occasions (Clifford and Marjoram, 1978, Porterfield, 1960, Whitlock, 1971) that violence and aggression as a general characteristic of a society is a factor in the rates of death by motor vehicle crash. In societies where there is a high level of violent crime, there will occur a high rate of death by motor vehicle crash (Clifford and Marjoram, 1978). Whitlock (1971) proposes that death by suicide, homicide, violent crime and other forms of accidental death can be regarded as a manifestation of the quality and quantity of aggression in a given society. Whitlock adds that measures of the misuse of alcohol can also be regarded as indicators of the extent of aggression in society. Porterfield (1960) postulated that, "a significant number of drivers of 'death dealing cars' as well as their victims have attitudes similar to those who become involved in suicide and homicide" (p. 897). While an Australian study (Williams, Henderson and Mills, 1974) found no difference in the criminal records of serious traffic offenders and a group of non-traffic offenders, other researchers consider there may be a relationship. In a 1967 European study bad drivers were seen as having criminal tendencies (Achtnich, 1967). Porterfield (1960) argues that if drivers do not have a high regard for their own lives or the

lives of other people, they will most likely have a higher crash rate as well.

Due to international difficulties in defining the concept of violent crime, Clifford and Marjoram in a study of Australian data chose murder offences as the measure of violent crime in their study, as this offence is generally well standardized between countries. They found that it was not possible to say conclusively without further research that a correlation exists between the murder rate and the rates of death by motor vehicle crashes, although their data were to a small extent suggestive of that. It should be noted that road deaths are sudden events and unlike murder are generally caused by a person or persons unknown to the victim (Clifford and Marjoram, 1978).

The relationship between violent crime and motor vehicle crashes has been investigated at the local level and in society at large. Michalowski (1975) reported on 119 fatal crashes in Columbus, Ohio in which the driver was considered to be responsible for the death of another person (who in no way contributed to his or her own death). These incidents are classified as vehicular homicide or manslaughter by negligence. Crashes in which alcohol was implicated were not used. It should be noted that level of risk and exposure were not controlled for. Briefly, his findings were that vehicular homicides occur more frequently in areas of low socieconomic status and a large black population. These areas accounted for 54.6 percent of all vehicular homicides and contained 76.6 percent of the black population (37.5 percent of the total population). Areas of higher socioeconomic status accounted for 17.7 percent of the vehicular homicides but contained 34 percent of the total population and 5.6 percent of the black population. Areas in

which there was a high rate of murder, rape, robbery and aggravated assault also tended to have high rates of traffic violence. A correlation of r = .73 was obtained between vehicular homicides and these other forms of violence. The party held responsible for vehicular homicides was significantly more likely to be male (83.1 %), black (31.1 per hundred thousand - as opposed to 22.6 for whites), young (54.3 percent were under 35), unmarried (52 percent) and of lower socioeconomic status (65 percent were unskilled labour or unemployed) than the population at risk. These characteristics were found to be similar to those involved in other violent crimes. However, Michalowski reported that black vehicular homicide offenders while over-represented in this area, constitute a considerably smaller proportion (23.8 percent) of the vehicular homicide offenders than other offenders of violent crime (53 percent). It has been claimed (DeSilva, 1949, cited in Michalowski, 1975) that black people have less access to cars than the white population and have lower annual mileage. Michalowski commented that if this is the case, the fact that blacks are not over-represented among vehicular homicide perpetrators may be a result of differential opportunity. However, controlling for crash risk and exposure would most likely inflate their involvement rate in vehicular homicides.

Michalowski also observed that the victims of vehicular homicides tend to have similar characteristics to the perpetrators although those held responsible for the crash had prior conviction records for criminal offences significantly more often. These included both criminal offences and traffic violations. Alcohol also made a significant contribution to these crashes with 45.7 percent of offenders revealing some usage

at the time of the crash and 27.9 percent being legally intoxicated. The comparisons made in this study between rates of violent crime and rates of death by vehicular homicide (which would include only deaths caused by negligent drivers) may be more appropriate than a comparison of rates of violent crime and rates of motor vehicle crash deaths (which may include deaths not caused by negligence on the part of the driver). Michalowski's data suggest that there may be a relationship between rates of violent crime and rates of vehicular homicide. However, due to a number of methodological problems, these data must be viewed with caution.

Other writers have found correlations between the number of deaths by motor vehicle crash and homicide (Haight, 1965, cited in Hamalainen, 1973, Porterfield, 1960, Whitlock, 1971). Whitlock (1971) found that measures of violent death and crime (rape, robbery, murder) were correlated positively (and in most cases significantly) with road deaths in 27 world states (including Australia, the United States, Canada, the United Kingdom, Republic of Ireland, New Zealand and other western European countries). In Australia, in the years 1960 to 1964, Whitlock reported significant correlations were found between road deaths and injuries/100 million vehicle-miles and combined suicide and homicide deaths/100,000 population. Significant correlations were also found between road deaths and injuries/100 million vehicle-miles and homicides alone. However, when injuries were excluded, no significant correlations were found between road deaths and homicides or suicides and homicides combined. A negative (non-significant) correlation was obtained between road deaths and injuries and rates of rape and robbery per 100,000 population.

The results of most of these studies suggest that a relationship may exist between rates of death or injury by motor vehicle accident and violent crime. However, given the methodological problems of some studies and the difficulties experienced when making valid international comparisons these results should be regarded with caution. If such a relationship does exist then the basis of the aggressive driving problem must be found in the social norms and values of the given society.

Before going on to consider the more general occurrence of aggression in driving, consideration will now be given to the separate but closely related topics of attempted or actual suicide, culpable driving, and other malicious acts by drivers on the road.

Suicidal intentions are thought to be common in association with depressive mental illness (Henderson, 1971). It has been suggested in the literature that some motor vehicle crashes are actually suicides or attempted suicides. There is a relatively large literature concerning the extent of suicide by motor vehicle.

MOTOR VEHICLE CRASHES AS SUICIDE

Fatalities which are the result of motor vehicle crashes are very rarely certified as suicide by medical examiners (Schmidt, Shaffer, Zlotowitz and Fisher, 1977). Indeed, death by automobile offers almost the perfect opportunity for individuals wishing to commit suicide or even murder with little prospect of detection (Macdonald, 1964). The method of suicide is known to follow the social customs of the period (Henderson, 1971). Macdonald (1964) after interviewing 40 psychiatric patients known

to have attempted suicide or suicide and murder using a motor vehicle reports that the choice of the motor vehicle as the suicide weapon tends to be governed by its availability. Selzer and Payne (1962) suggest that, given the high status of the automobile in western society, suicide by automobile may provide the depressed and frustrated individual with the chance to go out in what he or she may consider to be "a burst of glory" (p. 239).

The motivation of people wanting to conceal evidence of murder is self-evident and the desire to conceal real attempts at suicide (as opposed to attempts designed to seek attention) must also be obvious. The victim may wish to protect his or her family and/or allow them to collect the insurance benefits without problem (Macdonald, 1964, Valentine, Williams and Young, 1977). Valentine et al (1977) also suggest that motor vehicle suicide may allow the suicidal individual to continue to deny that he or she is making a conscious suicide attempt.

Crash rates and suicide. It has been estimated by a forensic pathologist (cited in Schmidt et al, 1977) that at least 10 to 15 percent and possibly as high as 30 percent of all single-vehicle crashes are suicides. Hamburger (1969, cited in Noyes, 1985) reported that 15 percent of the people interviewed by him had considered attempting suicide using a motor vehicle. However, in spite of these comments the actual number would appear to be somewhat smaller than the 10 to 15 percent proposed above. The principal finding of Schmidt et al's 1977 study was that 1.7 percent (3 of 182 cases) of the total of the fatal crashes they considered were suicide. Of these 182 fatal crashes, 111 involved a single vehicle. The suicides represented 2.7 percent of the single vehicle crashes. This is much less than the 10 to 15 percent estimated by the forensic pathologist

in Schmidt et al (1977). The deaths Schmidt et al determined were suicides had been certified as accidental by the medical examiner's office. Of the non-fatal crashes investigated by Schmidt et al, only 1 of 96 cases was finally considered to have been attempted suicide. The man involved at first denied that the crash had been attempted suicide, but later admitted to it. In addition, a study by the California Highway Patrol (1967, cited in Noyes, 1985) identified only 1.6 percent of fatal single vehicle crashes as possible suicides.

Bollen (1983) using regression analysis investigated the possibility that a substantial number of fatal motor vehicle crashes may have a suicide component. The daily patterns of motor vehicle crash and suicides for the United States in 1972 to 1976 were investigated. He found that motor vehicle fatalities tended to peak on Saturdays, in the summer months and on holidays. Suicides were found to be highest on Mondays and on non-holidays. A small negative correlation was found between motor vehicle fatalities and suicides. Motor vehicle fatalities and suicides were found to trough and peak on opposite days. The greatest similarity between motor vehicle crashes and suicides was that the motor vehicle fatality rate and the suicide rate were both high on New Year's Day and in summer and spring but were generally low in winter.

The study conducted by Schmidt et al (1977) consisted of an investigation of a total of 182 fatal crashes (111 single vehicle and 71 multiple vehicle) each resulting in one or more fatalities in Baltimore County in the U.S.. Ninety-six non-fatal crashes were also investigated. This sample was matched with the drivers from the fatally injured sample on the following factors; day of

week and approximate time of crash, level of alcohol intoxication, and proportion of single vehicle collisions. All were drawn from the same geographic area. The presence of other drugs was also tested for but were not found to be present. Co-operation of relatives and friends was obtained in order to carry out a psychological autopsy of the victims. These involved questionnaires and structured interviews. Psychological autopsies generally involve an evaluation of the personality and psychological components of the deceased driver. Such 'autopsies' also typically include social history, and health factors as well as judgements regarding the drivers' depressive-suicidal, sociopathic, homicide, impulsive, paranoid and overtly psychotic tendencies (Valentine, Williams and Young, 1977). One problem with this type of study is that it requires relatives and friends to make judgements after the event about the individual's state of mind. Given the fatal nature of the crashes considered, relatives may be more inclined to accept the possibility of mental disturbance than they would before the crash or if it had not occurred.

A number of studies (Crancer and Quiring, 1970, Hamalainen, 1973, Macdonald, 1964, Selzer and Payne, 1962) have investigated the personality characteristics and driving records of individuals hospitalised for suicidal gestures. In general, these studies have found that their subjects had a greater crash rate than the general population. This appears to be a fairly robust finding. Only one study (Kennedy et al, 1971, cited in Noyes, 1985) appears to have found no significant difference in the accident rate (including traffic crashes) of people who have attempted suicide and those who have not. Crancer and Quiring (1970) in a study of 915 people hospitalised for suicidal

gestures had a statistically higher crash rate that the general population. They also had more violations for drunken driving, reckless driving, driving while suspended and negligent driving. This finding is also reflected in those obtained by Schmidt et al (1977). Eelkema, Brosseau, Koshnick and McGee (1970) found no significant difference in the number of suicide attempts between drivers who had experienced single vehicle crashes and drivers involved in other types of motor vehicle crashes. However, a significant difference was found in the number of suicide attempts between patients with single vehicle crashes and those who had not experienced a crash.

Characteristics of suicide attempters. A number of researchers have introduced psychoanalytic theory into discussion of the causes of some motor vehicle crashes. Jackson (1957, cited in Valentine et al, 1977) suggests that suicide has its foundations in Freud's conception that the suicidal person becomes self destructive as a means to ridding him or herself of intolerable guilt. Various other researchers have postulated that many motor vehicle crashes may be a result of either conscious or unconscious self destructive forces and suicidal tendencies (Adams, 1970, Hamalainen, 1973, Selzer and Payne, 1962). Pokorny (1975, cited in Valentine et al, 1977) stated that "self destructive trends are expressed through increased risk taking behaviour, faulty vehicle maintenance, driving while intoxicated, driving while under emotional stress and so forth" (p. 25). Selzer and Payne (1962) argued that support for the role of unconscious motives was provided by the observation that the drivers in their study generally viewed their crashes as fortuitous.

In contrast, others have been more sceptical about linking suicidal tendencies with such factors. For example Tabachnick (1973, cited in Selzer et al, 1977) found that significant personality differences are to be found between known suicide attempters and survivors of motor vehicle crashes. This result was also reflected in the data of Shaffer et al (1972, cited in Selzer et al, 1977). They found that, while both successful male suicides and male fatal crash victim groups were considerably more deviant than the general population, there were a number of reliable differences indicating more deviancy in the suicide sample than the crash sample. These results therefore lend little support to the idea that a significant proportion of these crashes were attempts at (unconscious) self destruction.

Macdonald (1964) considered only individuals known to have attempted suicide or murder using a motor vehicle. He observed that 25 percent of his patients had character disorders such as hysterical, passive aggressive, and sociopathic personality disorders. Only a small number of patients were psychotic or schizophrenic, but all were psychiatric patients. Half of Macdonald's patients had made their attempt on impulse following fights or arguments. Schmidt et al (1977) found after the event that the victims of both the fatal and non-fatal crashes were rated by their friends and relatives as having above average levels of psychopathology and social aggressiveness.

The link with alcohol. Selzer and Payne (1962) investigated the possibility that alcohol in combination with suicidal tendencies may be implicated in crash occurrence. In this study of 60 men undergoing psychiatric treatment, Selzer and Payne observed significant differences in crash rate between two groups of suicidal and non-suicidal men. These two groups did not

differ in the number of miles driven or their socioeconomic background. The 33 suicidal men included 17 alcoholics and 16 non-alcoholics. This group as a whole accounted for significantly more crashes (89) than their 27 non-suicidal (13 alcoholic and 14 non-alcoholic) counterparts who accounted for 36 crashes. It is of interest that within the 33 member suicidal group by far the majority of crashes (63) were accounted for by the alcoholic sub-group. The 16 suicidal non-alcoholics had a total of 26 crashes. While these data were not analysed statistically, they may indicate a substantial effect of alcohol. Selzer and Payne suggested that crashes in which alcohol intoxication is a feature may be due not only to the impairment of driving skills associated with intoxication but also, "because of its potential for reducing the controlling and conforming function of the super ego, thus releasing aggressive and self destructive impulses" 1962, p. 240). Donovan, Marlatt and Salzburg (1983) also concluded that alcohol may serve to increase levels of covert hostility and overt aggression which may be translated into driver related aggression.

Preventing suicides. Macdonald (1964) suggested that the extent of attempted and actual suicide by vehicular crash may be concealed from the authorities and the public in general, because of the difficulty in assessing the true level. However, from the available evidence the problem of suicide appears to be relatively small in comparison with the causes of other motor vehicle crashes. Noyes (1985) estimates that the number of crashes that are suicides is probably less than five percent. However, given the evidence of Selzer et al (1977) and other evidence presented the figure may be as low as two to three

percent.

Preventing the few motor vehicle suicides that do occur may prove extremely difficult. Macdonald (1964) points out that the potential victims are generally unlikely to come forward for help until it is too late. Macdonald suggested that the authorities (police and doctors) should be made aware of the presence of such a problem in order to initiate early psychiatric evaluation. He recommended that crashes should not be simply dismissed as being due to alcohol, fatigue or speed. The presence of skidmarks or the use of seatbelts may be used to disguise possible suicide attempts. Macdonald reports one case in which a young woman when attempting suicide had worn her seat belt in order to dispel any suspicion that she had committed suicide. Many road safety investigators, however, would be reluctant to agree with such speculations concerning suicide as they appear to be based on very little evidence.

CRIMES OF VIOLENCE ON THE ROAD

The literature on extreme forms of aggression (such as homicide or other outward directed aggressive acts) in driving is relatively small in comparison with the literature on suicide by motor vehicle. Michalowski (1975) argues that negligent driving, while not necessarily demonstrating intent does reveal a willingness to risk violent outcomes. The comment that many driving offences are not without willful and malicious intent was illustrated most forcefully recently with reports of shootings on Los Angeles freeways by apparently irate motorists (Perrett, 1987). Motorists have reported being shot at for cutting in front of another vehicle, and for similar supposedly bad mannered and/or dangerous acts. Perrett reported that the police have

indicated a general increase in levels of discourtesy, as drivers take out their frustrations on the other vehicle or the other driver. This type of behaviour represents a deliberate intent on the part of the perpetrator to cause damage to persons or property, if not to commit murder. Macdonald (1964) reported on ten psychiatric patients who admitted in three cases to attempted murder and in seven to both attempted murder and suicide. Fortunately, these events represent the extreme end of the spectrum in terms of motor vehicle crashes and appear to be relatively uncommon in occurrence.

Parry's (1968) study is notable for the extreme nature of the aggressiveness reported by some of the subjects in the study. Parry's general hypothesis was that drivers displaying aggressive driving behaviour are liable to have more crashes, while drivers in a state of anxiety are also more liable and that a combination of anxiety and aggression may lead to an increase in the rate of crashes. A selection of 382 drivers (279 males and 103 females, ranging in age from 17 to 70) were sampled and a questionnaire developed for the purpose was administered. Responses to questionnaire items were scored as being more or less aggressive and more or less anxious. The questionnaire was also followed up by a sentence completion task and an interview. This involved only 55 of the drivers from both extremes of the scores for aggression/anxiety. The 30 high extreme drivers initially chosen for interview (27 were finally used) were found to account for 24.2 percent of all the recorded (self reported) crashes. The 30 low extreme drivers initially selected (23 were finally interviewed) accounted for 1.7 percent of all the recorded crashes.

Parry provided examples only of comments made by subjects found to be high in aggression and anxiety. These highly aggressive sounding subjects were remarkable for their anti-social attitudes towards other drivers. Driving actions such as giving chase to other vehicles when annoyed, deliberately edging another vehicle off the road, accelerating when another vehicle was trying to pass, driving into other vehicles in a temper, intimidating other drivers on the road (in one instance the driver admitted to intimidating learners in order to assist their learning to drive) appeared to be commonplace. However, Parry's study illustrates the problems with many questionnaire techniques in that they do not measure aggressive behaviour or necessarily even tendencies to be aggressive. They can only measure the feelings or attitudes of hostility or aggression which may or may not be predictive of the way the individual will act in a real driving situation. There is also no guarantee that subjects are not faking responses, although Parry's subjects were not slow in justifying their behaviour.

Parry relied upon subject estimates of crash rates. In addition, he did not appear to set a time limit on the number of years to be included in the estimate. Parry concluded that high aggression increased crash liability. The most aggressive drivers, those showing the most overt aggressive characteristics were typically although not exclusively male and in the 17 to 35 age bracket. The younger age groups (17 to 34 years of age) were also most liable to crashes. Aggression was found to have a greater influence than anxiety on crash rate. Given that Parry chose drivers from the extreme ends of his aggression and anxiety scales, it is perhaps not surprising that the anti-social attitudes and (reported) behaviours expressed by his highly

aggressive drivers were obtained.

Parry used three sampling methods to obtain drivers; random sampling of drivers in the area, selecting every 10th vehicle on a major road in the area and using a sample of drivers who voluntarily returned the questionnaire that had been posted to them. No significant differences were found in the responses of drivers obtained through the three sampling methods used. On the basis of this, Parry concluded that the attitudes and characteristics of his sample of low and highly aggressive drivers could be considered representative of the driving population. However, there is insufficient evidence that this is the case. Although Parry asked subjects to state miles driven, years driving, and frequency of driving, he did not appear to control for these factors when drawing conclusions. Given that few other studies have reported such extremes of attitudes and reported behaviours as the high aggression/anxiety sample described by Parry, it is unlikely that such people are typical of the majority of road users and are, in fact, quite rare.

CHAPTER 5

LESS EXTREME FORMS DRIVER AGGRESSION

A large number of studies have investigated the effects of different driver characteristics (social, psychological or psychophysiological) on the occurrence of motor vehicle crashes and traffic violations. A significant percentage of these studies have evaluated the role of aggressive personality traits in driving crashes through the use of psychometric testing. Thus in contrast with chapter 2, this section concentrates less on the motives for aggressive behaviour displayed by 'normal' members of the driving population. The emphasis is placed instead on the way in which aggressive personality traits may influence rates of crash involvement of drivers.

A major influence in the study of personality factors in road traffic crashes is the concept of 'accident proneness' (as it is always referred to in the literature) (Farmer and Chambers, 1939, Greenwood and Woods, 1919, cited in McKenna, 1983). Early investigations into personal factors and accidents originate at least in part from this work (Tsuang, Boor and Fleming, 1985). In view of the impact the concept has had on the investigation of personality factors of drivers, the concept of accident proneness will be discussed. This will be followed by a review of the role of personality factors in crashes and the general psychological and social characteristics of drivers most at risk of being involved in crashes.

THE CONCEPT OF ACCIDENT PRONENESS

Historically, the concept of accident proneness originated in the work of Greenwood and Woods (1919). They investigated

accidents among workers in a munitions factory in Britain during the First World War. These early investigators examined and compared the distribution of accidents with alternate hypothetical distributions which were based on different assumptions about the causes of accidents. If the chance of having an accident is the same for each individual, then the distribution produced would be a Poisson distribution. However, if the accident probability was unequal for different individuals, then another distribution such as the negative binomial could be expected (McKenna, 1983). Accidents were found to be unevenly distributed with a relatively small proportion of the workers having most of the accidents. They went on to hypothesise that personality differences could account for this distorted distribution. However, such a conclusion was not justified on the the basis of the evidence presented (Henderson, 1971). For instance, no personality tests had been performed.

The term accident proneness appears to have been coined by Farmer and Chambers (1939, cited in Henderson, 1971). They used the term to refer only to personal factors. Farmer and Chambers also found an uneven distribution of accidents. With the use of psychological testing they claimed that they had established the existence of accident proneness. Henderson reports, however, that these tests were of doubtful validity. Only one proved to be significantly related to accidents. This was not a test of personality. Even so, the study has been reported as evidence for the existence of personality differences between crash repeaters and non-crash involved drivers.

A consistent definition of the concept of accident proneness has not been employed by the many researchers in the

area (McKenna, 1983, Shaw and Sichel, 1971). Thus, it is not surprising that several approaches to accident proneness have developed. The first treats accident proneness as a single personality trait or type, while another considers it as a multiple series of characteristics (McKenna, 1983). Other researchers have described accident proneness very broadly as 'a tendency to have accidents' (Shaw and Sichel, 1971). This tendency is regarded as a global characteristic, generalising across different environments. If a person is to be considered accident prone "he must be susceptible to accidents 'under all circumstances' or at 'all times'" (Shaw and Sichel, 1971, p. 13). Wong and Hobbs (1949, cite in McKenna, 1983) concluded that "accident tendency was a lifelong characteristic and that it appears to invade all aspects of life". Finally, several authors have postulated that accident proneness refers to innate, unchanging characteristics of the individual (Hale and Hale, 1972, cited in McKenna, 1983). However, this latter view must be considered an extremely controversial position as there is effectively no evidence to support it.

Shaw and Sichel (1971) contend that whatever the definition ascribed to accident proneness, the basic underlying principle which all interpretations hold in common is that, "even when exposed to the same conditions some people are inherently more likely to have accidents than others.....people differ in their innate propensity for accidents" (p. 14).

In general the concept of accident proneness has fallen from favour. The concept has been criticised on statistical grounds (McKenna, 1982, 1983). McKenna (1983) reports that the negative binomial fit may be derived from assumptions which do not involve differential risk of having an accident. Some

individuals in any given group would be expected to have more accidents purely by chance (Joseph and Schwartz, 1975, cited in Noyes, 1985). The interpretation of negative binomial fit as evidence for accident proneness requires the absolute control of non-personal factors such as exposure to accident risk and biases in accident reporting. Such a distribution could also be obtained if some people are more exposed to risk than others (McKenna, 1983).

Another approach to accident proneness has been to investigate the consistency of accident involvement (McKenna, 1983). An accident prone person who is involved in an accident in one period of time would be predicted to be involved in an accident in another period of time (Hakkinen, 1958). Correlation coefficients between the two periods have been used as a test of accident proneness. Sichel (1971, cited in McKenna, 1983) points to the difficulty in interpreting correlation coefficients from a bivariate negative binomial distribution. Different distributions may produce identical numerical correlations; however, these correlations may have very different characteristics. The composition of the crash repeater group is also known to change from one time period to the next (Burg, 1970). In addition, variation in exposure to risk between individuals could be sufficient to produce significant correlations. Mintz and Blum (1949, cited in McKenna, 1983) point out that even if distributions are based on chance it is possible to ascertain that a few people are responsible for a large number of accidents. It is expected by chance that some individuals will have several accidents, some will have no accidents and some will have only a few accidents.

These criticisms and others have led to accident proneness falling generally into disfavour. It is obvious that a great deal of conceptual confusion surrounds the concept of accident proneness. McKenna cites a number of authors who reject the concept of accident proneness as a unitary personality characteristic (Haddon, Suchman and Klein, 1964, cited in McKenna, 1983), while not rejecting the view that a range of different psychological factors can influence crash involvement. It is clear that Haddon et al considered accident proneness to be quite distinct from the concept that a number of different psychological factors contribute to crash occurrence (McKenna, 1983). The circularity of definitions of accident proneness have also been criticised (Cameron, 1975, cited in McKenna, 1983) when it has been used both to explain patterns of accident involvement and then as a causal explanation of the same pattern it has just been used to describe. Most importantly, the concept has failed to provide a means by which to predict individual accident involvement.

DIFFERENTIAL ACCIDENT INVOLVEMENT

More recently attempts have been made to replace accident proneness with an upgraded concept. McKenna (1982, 1983) proposes that a new term 'differential accident involvement' be used to replace accident proneness, the advantage of using such a term being the absence of the historical confusion surrounding the definition of accident proneness. This confusion has resulted in researchers accepting and/or rejecting different concepts all of which have been labelled accident proneness (McKenna, 1983). In the view of McKenna, differential accident involvement represents an alternate approach to the study of

individual differences in accident causation. The concept of accident proneness represents a particular position. He also argues that the new concept would be based on psychological testing rather than on statistical modelling and would therefore avoid the disputes surrounding the meaning of particular distributions.

The central issue of the differential accident involvement approach would be to consider whether or not it is possible to identify or predict accident-involved individuals using psychological tests (McKenna, 1983). He also argues that no assumptions regarding the stability of accident involvement or the shape of the distribution need to be made. While differential accident involvement is based on psychological testing, McKenna points out that the concept of accident proneness relies on statistical modelling and is arrived at through a process of exclusion. "An attempt is made to control all factors relating to risk exposure, accident reporting etc.. If a result then occurs it is attributed to something else - this something else is called accident proneness. Accident proneness is thus defined not by what it is, but by what it is not" (McKenna, 1982, p. 70). McKenna also argues that accident proneness implies that accident involvement is necessarily a stable phenomenon. Contrary to this statement, some authors have also postulated that accident proneness may exist for shorter periods of time (McGuire, 1976). To sum up, differential accident involvement, while representing an attempt to free the area of accident research from the semantic confusion surrounding the concept of accident proneness does not appear effectively to provide a new direction for research. Within the concept of

accident proneness, researchers have already allowed for factors such as short term accident liability and have investigated the role of personality factors using personality tests. The approach of differential accident involvement therefore, may not provide new directions in the prediction of the personal factors relating to accident involvement.

PERSONAL FACTORS RELATED TO CRASHES

Methodological issues

Studies comparing driver characteristics (in particular aggressive characteristics) of so called crash repeaters and crash free drivers have obtained equivocal results. The explanation for such inconsistent results most probably lies in differing and/or (more likely) inadequate methodology. This point has been reiterated by a number of other authors (Conger, Gaskill, Glad, Hassel, Rainey and Sawrey, 1959, Haddon, Suchman and Klein, 1964, cited in Henderson, 1971). Some of the methodological problems with studies of personality of crash repeaters include;

Variation in exposure. Failure to control for variations in crash exposure (for example, Porterfield, 1960). This includes not only controlling for the distance travelled by the drivers under investigation, but also controlling for homogeneity of the risks the drivers are exposed too. Mileage is known to increase crash rate. This measure should be a fundamental control implemented in studies of this kind.

Control groups. Absence of an adequate control group (for example, Brown and Berdie, 1960). While most studies appear to have matched their control groups with the crash repeater group on the basis of a number of socio-demographic factors, they

have failed to mention the extent to which the drivers are exposed to the risk of collisions and in the case of studies involving traffic violations, the extent to which drivers are liable to be apprehended.

Sample size. Small numbers of subjects (for example, Malfetti and Fine, 1962).

Stability of personality traits. Haddon et al (1964, cited in Henderson, 1971) also add failure to discriminate between characteristics that are stable over time and those which change. The concept of the personality traits implies a certain amount of stability over time (Williams, Henderson and Mills, 1974). It is difficult to see how traits which are not stable over time can be identified with any accuracy. In addition, determining whether changes in performance on personality tests are the result of changes within the individual or to situation specific factors (such as changes in test administration) may be extremely difficult to assess.

Validation of results. With the exception of a few studies, most have not attempted to cross validate findings with different populations.

Objective measurement. Lack of objectivity in the measurement of driver characteristics. For example, the use of inadequately standardised tests. In addition the use of self report methods presents participants with the opportunity to falsify information about their crash involvement and attitudes in general. A few studies have attempted to prevent such occurrences by verifying subject reports with the authorities and personal contacts of the subjects (Selzer et al, 1977, Tillman and Hobbs, 1949). People are known to underestimate their level of crash involvement.

Tillman and Hobbs (1949) and Quenault (1968a) report that crash repeaters in their studies tended to underestimate the extent of their crash involvement.

Williams, Henderson and Mills (1974) found that a significant number of traffic offenders, in comparison with a control group, reported a major emotional disturbance in their lives in a short period before their crash or offence. This may have been reported by offenders in explanation of their offence (Williams et al ,1974). Whether these events happened or were fabricated cannot always be determined nor can their personal significance.

Studies that have used projective techniques have often not provided adequate descriptions of the tests themselves or the method/s by which they were administered. A small number of studies (Conger et al, 1959, Malfetti and Fine, 1962 and others), are notable for the detail in which they have obtained their information and the information provided in the actual paper.

Reliability of crash criteria. Lack of reliability in the crash criteria employed (see Burg, 1970). The number of crashes assigned to each subject will depend on the definition employed. Crashes have been categorized in a number of different ways. This can depend upon the availability of crash data from road traffic authorities and the police. Some studies for example have used only crashes involving fatalities. Other studies have also only included crashes for which the driver has been held responsible (for example, Michalowski, 1975).

In general, research has concentrated on analysing crash data and characteristics of victims. A smaller number of studies have investigated the data for traffic infringements and

violations. Most researchers acknowledge the limitations of using crash records as an indicator of driving performance. Some authors (for example, Selzer et al, 1977) have limited their studies to crashes that have involved fatalities in an attempt to ensure the presence of accurate records.

Understandably, obtaining accurate violation and infringement rates is more difficult than obtaining crash information, as such events are not always detected or reported. While minor crashes may not always be reported, the more severe crashes should be reported more consistently, especially if the police are involved. **When traffic violation records have been** used, the well kept records of bus and freight companies have sometimes been used.

In analysing violation data, we should also be wary of possible bias in official crash records, not only in terms of which records have been recorded, but also the possibility of discrimination in the prosecution of drivers. For example, Klein 1972, quotes a study by Huessenstamm (1971) in which 15 adolescents with good driving records received a total of 33 citations within 17 days of affixing bumper stickers of the Black Panther movement on their vehicles.

Personal characteristics of crash involved drivers

The literature to be reviewed below on the involvement of personality factors in traffic crashes and violations can generally be categorized into two main groups according to whether the study deals with individual personality factors (using personality test results and/or psychiatric evaluation) or social/demographic characteristics. Studies of the personality characteristics of drivers have dealt with aggression directly as

a personality variable. Studies of social and demographic characteristics have investigated the relationships between crash repeaters and possible social deviancy.

An extensive number of studies have been published dating back to the earliest studies on 'accident proneness'. These studies have differed widely in the methods used and in the quality of the work. The reader should take note of the criticisms of these types of studies made above. In addition, a number of literature reviews have been published (McGuire, 1976, Valentine, Williams and Young, 1977, Tsuang et al, 1985, Noyes, 1985).

Personality factors

Early studies. One of the earliest and most cited studies is that of Tillman and Hobbs (1949), who appear to have coined the phrase that, "a man drives as he lives" (p. 329). This comment encompasses the view that certain personal characteristics of drivers make them more or less likely to be involved in crashes. Most of the information in the Tillman and Hobbs study was obtained by Tillman who spent approximately three months with 20 high crash and 20 low crash drivers of a taxi firm, travelling in their cars and talking to them and attempting to check their stories with associates and friends. The investigator would have been aware whether each driver was of the low or high crash type. Additional evidence was obtained from the police, juvenile court, and other social agencies, although it appears that most of these data were of the self report type. However, the authors noted that only three cases of lying were detected. Tillman and Hobbs concluded that in the taxi driver group, individuals with high crash rates were characterised by aggressiveness and inability to

tolerate authority. In terms of their driving habits, the high crash group became easily distracted when driving, and annoyed at other drivers. Eleven of the twenty reported a history of aggressiveness as children. The family background of the driver was suspected as the origin of these traits.

In another frequently cited study, Conger, Gaskill, Glad, Hassel, Rainey, Sawrey and Turrell (1959) conducted a detailed evaluation of 10 high and 10 low (road) crash involved airmen. This was part of a four year investigation. A previous paper (Conger, Gaskill, Glad, Rainey, Sawrey and Turrell, 1957) reported the results of cross validation studies. However, this study also suffered from small sample sizes. The 1957 study consisted of an initial sample of 110 drivers (15 no crash, 35 moderate crash, 15 high crash and 35 unclassified subjects). The cross validation sample consisted of 154 drivers (25 no crash, 25 moderate crash, 15 high crash and 89 unclassified subjects). The high crash group were defined as those who had had two or more crashes for which they had been held responsible in the previous four years. The low crash group consisted of subjects who had incurred no crashes (officially recorded, or in their own estimation) in the previous four and a half years.

Of a number of tests administered (For example, MMPI, Thurstone Temperament scale) only three scales of the Allport-Vernon Scale of Values discriminated between high and low crash groups in both the initial and cross validation samples. These were those dealing with aesthetic, theoretical and religous issues. However, religous values was the only scale significant to the 0.05 level. The no crash subjects were more oriented toward religous values than they were toward aesthetic or

theoretical values compared with the high crash subjects. Mayer and Treat (1977) however, using questions on pro-religous values adapted from the Allport-Vernon-Lindzey study of values failed to find a significant difference between crash involved and crash free drivers although the crash involved group did score lower on this scale.

The 10 high and 10 low crash airmen in the Conger et al (1959) study were selected from and representative of a pool of 264 subjects. A number of psychometric tests, a psychiatric examination, and psychological reports were employed to assess the subjects. The data from these measures were rated by independent judges on number of different dimensions or variables predicted to be related to crash frequency. An important methodological precaution was taken in that examiners were not made aware of the crash status of individual subjects.

It was found that in comparison with non-crash involved subjects, crash repeaters were significantly less able to control hostility, more indifferent to the rights of others, preoccupied with fantasy satisfaction, fearful of loss of love and support and less able to tolerate tension. At least two of these dimensions are directly related to aggression. Little tendency was observed for crash involved and crash free subjects to belong to any particular clinical character type (for example, paranoid, schizoid, obsessive etc.).

Conger et al's (1957) conclusions are at variance with the findings of McGuire (1956, cited in McGuire, 1976) who found that scores on the MMPI significantly differentiated his high and low crash groups. McGuire's sample size was somewhat larger than the 30 (15 no crash and 15 high crash) used by Conger et al (1957). It consisted of groups of 67 high crash men and 100 low crash

men. The populations employed by the two studies were apparently similar, one being taken from a naval base and the other from an airbase. Brown and Berdie (1960) also obtained a significant difference using the MMPI. The MMPI was administered to male drivers when they were freshmen in college. Six years later, their official driving records were checked and compared to their earlier scores on the MMPI. There were three groups of drivers. One hundred high crash drivers (five or more violations and three or more crash), 100 low crash drivers (no violations and no crashes) and a middle group containing drivers with crashes and violations between the above two. Questionnaire responses from 80 percent of these drivers indicated that differences in mileage between the crash groups were not significant.

Only two scales of the MMPI were found to distinguish the two groups and only a small significant correlation was obtained. Brown and Berdie speculate that this may be because the groups had contained drivers with a number of different personality types. For example, one driver may be extremely hostile, his driving behaviour motivated by the desire to show up other drivers. Another driver may always be in a hurry. The end result will be that elevated scores on one scale of the MMPI may be cancelled out by depressed scores on the same scale by other drivers with a different personality profile (Brown and Berdie, 1960).

Other studies. A number of studies have obtained results similar to those of Tillman and Hobbs and Conger et al. Their findings will be reviewed briefly below, keeping in mind that a number of these studies have methodological problems of the type described earlier in this section. McGuire (1972, cited in

McGuire, 1976) administered a variety of tests and questionnaires to a larger group of people applying for driver's licences in Mississippi. After two years, each person's driving record was investigated by means of an interview. The group was then divided into validation and cross validation groups of approximately 1,363 people. Subjects completed the McGuire Safe Driver Scale and the items were correlated with crash frequency. McGuire indicated that crash frequency correlated with aggressiveness, prestige seeking, and an orientation towards competitiveness. Selzer, Rogers and Kern (1968) studied 96 drivers involved in crashes involving fatalities (some of which involved the driver) and compared them with a control group selected from the general driving population. Using chi square analysis, significantly more of the crash involved drivers exhibited paranoid thinking, suicidal or depressive tendencies. While there was no significant difference with regard to the occurrence of violent behaviour between the two groups, the violence of the control group was reported to be less severe. Those in the fatal crash group who exhibited any of the above behaviours had significantly more crashes than their control counterparts.

Australian studies. An Australian study (Williams, Henderson and Mills, 1974) investigated 100 motorists convicted of serious traffic offences in Hobart. Subjects were matched on age, sex, suburb and driver's licence type with control subjects. A variety of psychological tests were administered; a questionnaire regarding biographical background, intelligence test (Standard Progressive Factor Questionnaire), Hostility and Direction of Hostility Questionnaire, the General Health Questionnaire and the Eysenck Personality Inventory. While no significant effects were

obtained using the Eysenck Personality Inventory, the Cattell 16 Personality Factor questionnaire revealed the following: the traffic offender group were found to be more impulsive, to have a lower social conscience, and were more likely to have minor psychiatric symptoms such as anxiety and depression.

European studies. The small number of European studies available (Achtnich, 1967, Alonso-Fernandez, 1966, Burkner, 1975, Burner, 1973, Schenk and Rausche, 1979) appear to have found similar results to those obtained in the United States. As English translations of these studies were not available, only a brief description will be provided. Husmann (1967, cited in Signori and Bowman, 1974) reported that the Szondi test was able to differentiate between habitually good and bad drivers. Achtnich (1967) using the same test studied 35 habitually bad drivers and a control group. Achtnich reported that poor drivers exhibited masochistic tendencies, latent repressed aggression, demand for power, inadequacy, demonstrative needs, an immature sexual image, and weak egos. A German study (Burkner, 1975) investigated the validity of the Rosenzweig Picture-Frustration test as a measure of the aggressiveness of convicted drivers. The results disclosed that convicted drivers were inclined to direct their aggression towards the environment, whereas the control subjects tended to constrain their aggression. Burner (1973) proposed that the automobile be viewed as an extension of self, and characterised crash involved drivers as belonging to one of three categories: drivers who did not feel subjective risk and drove at speed, drivers who wished to dominate, and aggressive drivers. Burner suggested that the cause of these characteristics may be related to either situational or

personality variables.

Control of aggression. A number of studies have suggested that inability to control feelings of hostility and anger or to tolerate tension may contribute to a higher rate of crash involvement, rather than the strength of aggressive feelings per se (Conger et al, 1959, Hertz, 1970, Signori and Bowman, 1974). In the study by Conger et al, while the ability to tolerate tension (measured in psychiatric interview) in crash drivers was significantly lower than in crash free drivers, the quantity of underlying hostility measure failed to reach significance. Schuman, Pelz, Ehrlich and Selzer (1967) indicated that the young male drivers they studied appeared to use the automobile to express impulses. Mayer and Treat (1977) found that their group of crash involved subjects (18 to 19 year old students) scored significantly higher on measures of impulsivity. They also found a significant relationship between attitudes towards driving to reduce tension or as the author puts it to 'blow off steam' and crash record. Klein (1974, cited in Mayer and Treat, 1977) suggested that poorer drivers have less control over risk taking impulses while driving and were therefore "more likely to allow driving to serve as an emotional release" (Mayer and Treat, 1977, p. 1). These findings are consistent with the frustration-aggression hypothesis (Berkowitz, 1962) which would predict that certain individuals at least would use driving as a means to reduce tension. Social learning theory would indicate that if the individual has not learned adequate means of coping with tension, driving may become an outlet for these feelings. Tillman (1960, cited in Donovan et al, 1983) reported that members of a group therapy session who had been involved in crashes often reported a feeling of rage while driving their

cars, particularly when they had felt a loss of their sense of identity. Coinciding with the comments of Burner (1973) the vehicle was seen as an extension of themselves. The medium of driving in which they have a sense of mastery and power becomes a means of channeling feelings of anger.

Negative findings. On the other hand, a positive relationship between personality variables and crash rate has not always been found. A number of studies have not identified differences between crash involved drivers and their crash free counterparts. A British study by Quenault (1968a, 1968b) using the Maudsley Personality Inventory found no significant differences between two groups of 50 subjects, one convicted of careless driving, the other chosen at random from the same population. Selzer and Vinokur (1974) concluded that life changes and current levels of personal stress appear to be statistically more important that any demographic, personality, and social maladjustment variables. Preston and Harris (1965) administered the Rosenzweig Picture-Frustration test and the Siebrecht Attitude Scale to 50 drivers hospitalized due to motor vehicle crashes. The Siebrecht Attitude scale had been used previously and found to be a valid measure of driver attitudes when tested in driver education programmes. It had not been used to measure differences between crash free and crash involved drivers. The crash involved drivers were paired with 50 other drivers on the basis of sex, age, race and education. The two groups were also comparable in terms of most other socioeconomic factors. None of these control subjects had had a crash in the previous five years. The crash group had a higher traffic violation rate than the control group. However, performance on the written tests did

not reveal any differences between the two groups. Neither group was better informed on the road laws, which coincides with the findings of Malfetti and Fine (1962), who observed that their sample of exceptionally safe drivers did not necessarily have a detailed knowledge of the road traffic regulations. Malfetti and Fine (1962) concluded that it was not the amount of knowledge that was important, but the way that knowledge was used. Quimby and Watts (1981) using the Cattell 16 Personality Factor questionnaire found only one personality factor (which measures the degree to which the person reflects established values) to be correlated with crash history.

Safe professional drivers. Malfetti and Fine's 1962 study is worthy of note as it appears to be the only study to investigate in depth the characteristics of known safe professional drivers. This study's most serious flaw is the small subject sample used (N = 6). However, in spite of this problem the study provides detailed information (if only descriptive) on the characteristics of drivers making up the safe group. The six subjects were obtained through the National Safety Council Safe Driver Awards. Initially a questionnaire was developed to obtain biographical and driving record information from 5,244 of the award winners. The accuracy of information was checked as closely as possible from company records. Malfetti and Fine developed a profile of the average award winner from these data. The safe driver reflected a picture of social stability and conformity. The driver is about 59 years of age, married and has two children, He has been a professional driver for approximately 30 years and has generally worked for the same employer (sometimes two) during this time. The safe driver has never had a traffic violation, and has had only one preventable and one non preventable crash

as a professional driver.

Drivers were then ranked to discover which of them had the safest driving record. The top six drivers then underwent a series of psychological and medical tests. The psychological tests included, the Rorschach, the Thematic Apperception Test, and the Sentence Completion test. The Semantic Differential test and the Gallup-Thorndike intelligence tests were also employed. Drivers were found to be of average intelligence.

Psychologically, Malfetti and Fine considered the six drivers to be generally non-aggressive with a high level of impulse control. They appeared to require a high degree of security in terms of social and work environments and planned conservatively and cautiously. While driving, they did not appear to be disturbed by bad manners or poor driving. The drivers seemed more concerned to deflect possible threats, rather than to retaliate. In terms of driving, they appeared 'somewhat compulsive' about safe driving, cautious and concerned both for other drivers and the placement of the vehicle on the road. While these data are only descriptive, it provides an interesting contrast to that obtained by studies investigating the characteristics of crash repeaters.

Non-aggressive characteristics of crash involved drivers. Several studies have addressed the question of whether road users frequently involved in crashes are necessarily responsible for their occurrence. Tillman and Hobbs (1949) argued that those with the highest crash rates had a greater proportion of blameless crashes than did low crash drivers. They commented that the habits of some high crash drivers left them unprotected in the event of the unexpected.

The comments of Tillman and Hobbs are of interest with respect to a series of studies by Quenault in the 1960's (1967a, 1967b, 1968a, 1968b). Quenault investigated the actual driving behaviour of drivers who had been convicted of careless driving in the previous three year period. One group of seven professional drivers (1967b) and two groups of 50 drivers convicted of careless driving (1967a, 1968a, 1968b) were investigated. These latter groups of 50 drivers were paired with drivers from the same geographic area who had not been convicted of careless driving. No significant differences were found between the groups on the following factors; age, occupation, number of years driving, driving experience, type of vehicle driven, sex, marital status, and number of times the driving test was taken before passing. Significant differences were observed on the average annual mileage (careless driving group travelling twice as far) and the number of crashes encountered by the two groups (careless drivers had three times as many crashes and six times as many convictions). The source of the difference in mileage was attributed to the fact that more of the convicted drivers used their cars for both business and pleasure than for pleasure alone. Subjects drove around a twelve mile route in normal traffic conditions under the observation of two observers neither of whom knew whether the driver belonged to the careless driving group or the the control group.

Quenault (1968a, 1968b) divided her sample into four groups according to their observable driving behaviour. One of these groups (the dissociated active group) appeared similar to the aggressive driver described in many other studies. The dissociated active drivers, in descriptive terms, were more likely to be unpredictable, impatient and edgy. This group did

not appear to be completely aware of some aspects of relevant information when driving. They took risks actively and consciously and caused near crashes. The other group (the dissociated passive group) appeared to be totally unaware of what was happening around them. They did not take active risks, nor did they appear to change their behaviour in the face of changing situations. Due to this, dissociated passive drivers sometimes found themselves in situations with which they could not cope, causing near crashes or crashes.

Chi square analysis was used to investigate any differences between the careless driving group and the control group. The careless drivers were significantly more likely to engage in risky behaviour. They were less likely to use their rear vision mirrors, more likely to overtake than be overtaken, use unnecessary manoeuvres and have near crashes. Twenty percent and 32 percent respectively of the careless drivers were found to belong to the dissociated active or dissociated passive driver groups respectively. In comparison, only seven percent and 20 percent respectively of the control group were classified as dissociated active and dissociated passive driver groups. This data suggest two groups, of drivers one reckless (whose behaviour may be aggressive and impulsive in appearance) the other passive (whose behaviour does not imply aggressiveness). It would appear that the careless drivers may be liable to have crashes either by taking too many risks (in which case these drivers may cause crashes) or by showing rigid behaviour patterns (instead of directly causing crashes, perhaps crashes happen to them).

Parry (1968) and Shoham, Rahav, Markovski, Chard and Baruch (1984) have suggested the existence of a driver group whose

behaviour reflects strong feelings of anxiety who may be liable to road traffic crashes. This driver is not aggressive in the way that has been discussed in this literature review, he or she does not engage in risky driving and is not impulsive or sensation seeking. However, the possibility of the existence of two such separate groups (impulsive and anxious) remains unexplored for the most part. The presence of such a group in the crash repeater group would act as a confounding variable in studies investigating aggressive traits amongst crash repeaters.

Social characteristic of crash involved drivers

Certain demographic features are associated with increased risk of being involved in a crash. These include; age less than 25, education of less than 12 years, being a semi skilled or unskilled worker, single marital status (Hyman, 1968, cited in Donovan, Marlatt and Salzburg, 1983). Quimby and Watts (1981) also observed that drivers of high performance vehicles and high insurance categories who tended to be in a higher socio-economic group were less involved in crashes than drivers of low performance vehicles. Williams et al (1974) found that in spite of controlling for similarity in educational standing and home suburb, non-violation subjects in their study had a higher socio-economic status. Also significant in the Williams et al study was that more of the offender group reported being taught by a driving instructor than a family member.

Using chi square analysis, Tillman and Hobbs (1949) found significant differences between high and low crash groups on a number of social and biographical factors. Crash involved individuals were more likely to report conflict between parents

and that one or both of the parents was overly strict. Difference in employment record was not significant, although reports of being fired differed significantly (with crash involved drivers reporting greater frequency of being fired). The crash involved drivers appeared to have many acquaintances but few friends, and generally attempted to be the centre of attention whenever possible. This is in contrast with the findings of Conger et al (1959), who did not observe significant differences in friendship patterns between the two crash groups. The high crash drivers in the Tillman and Hobbs study reported sexual promiscuity significantly more often than their low crash counterparts. They also showed few feelings of guilt and did not indicate a strong sense of responsibility towards their families. At school, high crash drivers reported truancy and discipline problems. Of drivers who had served in the armed forces, the high crash drivers were more frequently found to be absent without leave than the low crash group.

One problem with the Tillman and Hobbs study is that they failed to use a double blind procedure. Information regarding the crash record of individuals and their psychological and social characteristics was collected by the same person who may have had predetermined impressions of high crash drivers. In addition, other interpretations which constitute value judgements were also used in the personality profiles of the subjects. For example, terms such as "filthy language" or "personal dress tended to be eccentric" when describing the high crash group represent the researchers' own values. While these descriptions of the drivers are called personality profiles, it must be remembered that they are not free of the social norms and values of the experimenter. A 'culture free' personality profile may be

very difficult to obtain. This should also be taken into account when examining the data from studies which have developed their own questionnaires.

As Tillman and Hobbs' (1949) taxi drivers could not be described as a representative sample of the driving population, information was also obtained on 96 male, high crash drivers chosen from the general driving population and compared with 100 control subjects of the same age and sex with a low crash record from the same population. The names of both groups were checked against the records of a number of social agencies; the Juvenile court, the Adult court (for offences not relating to traffic violations), the Family Service bureau, two children's aid societies, public health and venereal disease clinics and the local credit bureau. The data have been reported here in Table 5.1. Information regarding the number of agencies with which each driver had contact was also obtained. In the high crash group, two were known to all sources, three to four sources, nine to three sources, sixteen to two sources and 32 to one source. None of the crash free drivers was known to more than one agency.

Table 5.1. Percentage contact of crash involved and crash free drivers with social agencies. Drivers chosen from the general driving population of London, Ontario. (N = 96, crash group, N = 100, crash free group). Adapted from Tillman and Hobbs, 1949).

	Credit Bureau	Public Health and VD Clinic	Adult Court	Juvenile Court	Known To At Least One Agency	
High-crash drivers	34.3	14.4	34.3	16.6	66.0	%
Crash-free drivers	6.0	1.0	0.0	1.0	9.0	%

The fact that Tillman and Hobbs' crash-involved drivers

were known to so many social agencies implies a fair degree of disruption in the families of those drivers as well as a degree of social deviancy. This coincides with the findings of a number of other researchers. McGuire (1972, cited in McGuire, 1976) observed that in his group of 2,727 drivers the crash involved drivers were more likely to have a family history of disruption and conflict.

McGuire (1956, cited in McGuire, 1976) compared two groups of 67 male drivers. One group had admitted to at least one crash in the previous two years for which they had also incurred a moving violation. The other group had reported that they had not incurred any traffic violations of any kind since beginning driving. The two groups were matched on mileage in the previous two years, driving experience, age and marital status. Subjects were administered the MMPI, the Bell adjustment scale and the Kuder Preference record. McGuire concluded that the crash involved drivers were less mature, less intellectual in their tastes and interests, had lower levels of aspiration, were not socially well adjusted and expressed poor attitudes to the law and driving.

The Mayer and Treat (1977) study investigated 30 crash free (control) and 30 crash involved (three or more crashes in the last three years) 18 and 19 year olds. The two groups were matched for age, sex and most importantly annual mileage. A series of short questionnaires was designed for the purpose. The crash group on Mayer and Treat's measures of social maladjustment scored significantly higher on juvenile delinquency, negative attitudes, antisocial tendencies, and external locus of control (assigning responsibility for events to sources outside of

themselves). Mayer and Treat regarded the measure of citizenship (voting frequency, church attendance etc.) to be marginally significant ($p < 0.10$). The measure of pro-religous values adapted from the Allport-Vernon-Lindzey Scale was not significant. The conclusions reported above are not in keeping with the comments of Parry (1968) who observed that many drivers admitted undergoing a change when they sat behind the wheel of a car. Generally good citizens were seen to become selfish, aggressive and dangerous when behind the wheel of a motor vehicle. However, the above findings indicate that the individual's general lifestyle reflects upon driving behaviour and subsequent crash record.

Measures of intelligence. A number of studies have investigated the intelligence of crash repeaters in an attempt to form an overview of the types of individuals who have repeated crashes. The findings of these studies will be reported very briefly for this reason. The studies discussed in this review have not found any significant differences between levels of intelligence (as measured by intelligence tests) in crash free and crash repeater subjects. This has been the case, even though a number of different tests have been employed. These include; Conger et al (1959) who assessed intelligence using two tests (the Wechsler-Bellevue adult test and the Shipley-Hartford vocabulary scale). Similar results were obtained by other researchers. For example; Quenault (1968a, b) using the Shipley Abstraction test and Williams et al (1974) using Standard Progressive Matrices.

HIGH RISK OF CRASH DRIVER GROUPS

The previous section investigated the general personality and biographical characteristics of known crash repeaters. It would appear that certain personality characteristics are common to the crash repeating group. This group of drivers as a whole represents a high risk (of crash) group. However, it is possible to subdivide this group into more distinct and homogeneous groups. These include; people who drive while intoxicated, young drivers and the mentally ill. It should be noted that these three categories are not distinct but reveal substantial overlap and can be considered sub-groups of the one high risk group of drivers. In addition, some high risk drivers do not fit into any of the three categories to be outlined. A review of each of these categories follows.

Characteristics of drivers who drink and drive

Although drinking would appear to increase the risk of being involved in a crash, it is not a guarantee that a crash will take place (Gusfield, 1985). Gusfield argues that by "singling out 'alcohol involvement' as the cause of crashes, we leave unstated and untested the hypothesis that without the presence of alcohol the crash would not have occurred and that alcohol is the only element in the causal process that is capable of being changed" (p. 71). While the fundamental conclusion of the overwhelming majority of research is not being challenged (that for every group or set of conditions increased alcohol use increases the risk of crashes) (Gusfield, 1985), a number of studies have investigated the contention that it is not alcohol alone which necessarily causes crashes, but alcohol in combination with other factors such as personality and social

background. This may be especially important given that alcohol may influence aggressive behaviour.

Zylman (1975) in a literature review on the influence of alcohol in traffic crashes argues that only 30 percent rather than 50 percent of all crashes involve alcohol and that relatively few alcoholics are high risk drivers. He argues that it is not alcohol alone that leads to crashes but a combination of personality characteristics (alienation, hostility, aggression, and/or transient traumatic experiences) and alcohol. Zylman (1974, cited in Zylman, 1975) suggests that in 70 percent of crash cases, personality, situational, or environmental factors are more important than alcohol, even though they may have been drinking. It should be noted at this point that while these conclusions and those to follow may have some intuitive appeal, they are not based on sound conclusive evidence. Further detailed research is required before any of these conclusions can be accepted.

Social-demographic characteristics of drinking drivers. Bradstock, Marks, Forman, Gentry, Hogelin, Binkin and Trowbridge (1987) report on the sociodemographic characteristics of drinking drivers based on Behavioral Risk Factor Surveys (BRF) at the U.S. national level. While BRF Surveys have been reported to be under-estimates of actual rates (Malin et al, cited in Bradstock et al, 1987), Bradstock et al report that the BRF Surveys are not critically biased in other ways. BRF Surveys are population based, random telephone surveys. A total of 22,236 interviews were completed. Drink driving was reported by 6.1 percent of the adults in the U.S., made up of 9.2 percent (a significant proportion) of males and only 3.3 percent of women. Fell (1982,

cited in Gusfield, 1985) also reports that 85-90 percent of all people arrested for drunk driving are men. A significant decrease in reported drink driving was found with age. Eighteen to 24 year olds had the highest levels of drink driving, while the lowest levels occurred amongst those over 64. No differences were observed between the drink driving habits of people with no high school and people with higher than high school education. Men who reported that they tended not to use seatbelts had drink driving rates of 11.3 percent compared with 6.1 percent of men who said that they almost always used seat belts. Although this difference was significant for men, there was only a trend in this direction for women. Smokers who consumed more than one packet of cigarettes per day were twice as likely to report drinking and driving than their non-smoking counterparts. People who admitted to consuming five or more drinks on at least one occasion in the previous month (binge drinkers) reported higher proportions of drink driving than those who did not. Chronic alcohol users (an average of two or more drinks per day) reported higher rates of drink driving than those who were not chronic drinkers. Significantly more men than women reported that stress in interpersonal relationships made them more likely to drink and drive. In addition, individuals who reported that they were more likely to drink and smoke than exercise in response to stress were significantly more likely to drink and drive. It would appear that many of the drivers in this study who reported drinking and driving, also engage in other risk related activities. The levels of risk accepted and the risk assessment of these individuals may help explain why they engage in drinking and driving activities.

Personality of drinking drivers. In an interesting study, Donovan and Marlatt (1982) attempted to identify through the use of cluster analysis personality sub-types of drivers who drive while under the influence of alcohol. The results will be reported in some detail as the study provides an example of how various personal factors including aggression, can interact to influence a behaviour known to be significantly implicated in road crashes. The subjects were 172 men recruited from an alcohol related education programme. Subjects were of lower middle class status (determined on the basis of academic and occupational status) and either married (40.9 percent), divorced (29.8 percent) or separated/divorced (28.1 percent). Only 24.2 percent of the subjects admitted to having a drinking problem. However, 99.3 percent of the drivers consumed five to six drinks per occasion at least once in a while. Forty two percent of the subjects drank 45 or more drinks per month. More than half of the subjects could have been classified as heavy drinkers (five or more drinks on more than one occasion a week). The subjects reported an average of fifteen drinking occasions per month, with about ten of these occasions involving five or more drinks.

Cluster analysis was used to analyse the scores of driving-related attitudes, personality and hostility measures in order to define possible sub-types within this population. Five distinct groups were identified. The group of drivers with significantly fewer crashes and violations (Cluster 2) was also found to consume significantly less drinks per occasion than any of the other groups. In addition this group were considered to be the most well adjusted emotionally, and to have the lowest levels of depression and driving related aggression or sensation seeking. They were also significantly less likely to take driving risks.

On the other hand, the group of drivers found to have significantly more crashes and convictions (Cluster 4) than Cluster 2 individuals, in addition to drinking significantly more, were also found to be significantly younger. They also revealed greater levels of driving related aggression, competitive speed, sensation seeking, hostility and irritability. However, they displayed only moderate levels of depression and emotional instability. Another group (Cluster 3) while not revealing particularly hostile or poor driving attitudes, were characterised by the highest levels of depression and resentment. They also had low levels of assertiveness and emotional adjustment. These individuals were found to have significantly fewer crashes and convictions than Cluster 4 individuals. However, in comparison with Cluster 2 individuals, drivers within Cluster 3 had significantly more crashes and violations.

In terms of drink driving, Donovan (1980, cited in Donovan, Marlatt and Salzburg, 1983) reports that the driving-risk index of the drink driving group is about nine times greater than that of the average driving population. However, it would appear that some individuals may get into more trouble than others while driving. Those drivers who have a high level of hostility and who will drink heavily on a particular occasion typify the highest level of overall driving risk within Donovan and Marlatt's conceptualisation. Also at high risk are individuals characterised by depression, resentment and low levels of perceived personal control, emotional adjustment and assertiveness. Selzer, Payne and Westervelt (1967, cited in Donovan et al, 1983) commented that the high risk driving behaviours exhibited by individuals in the above categories while

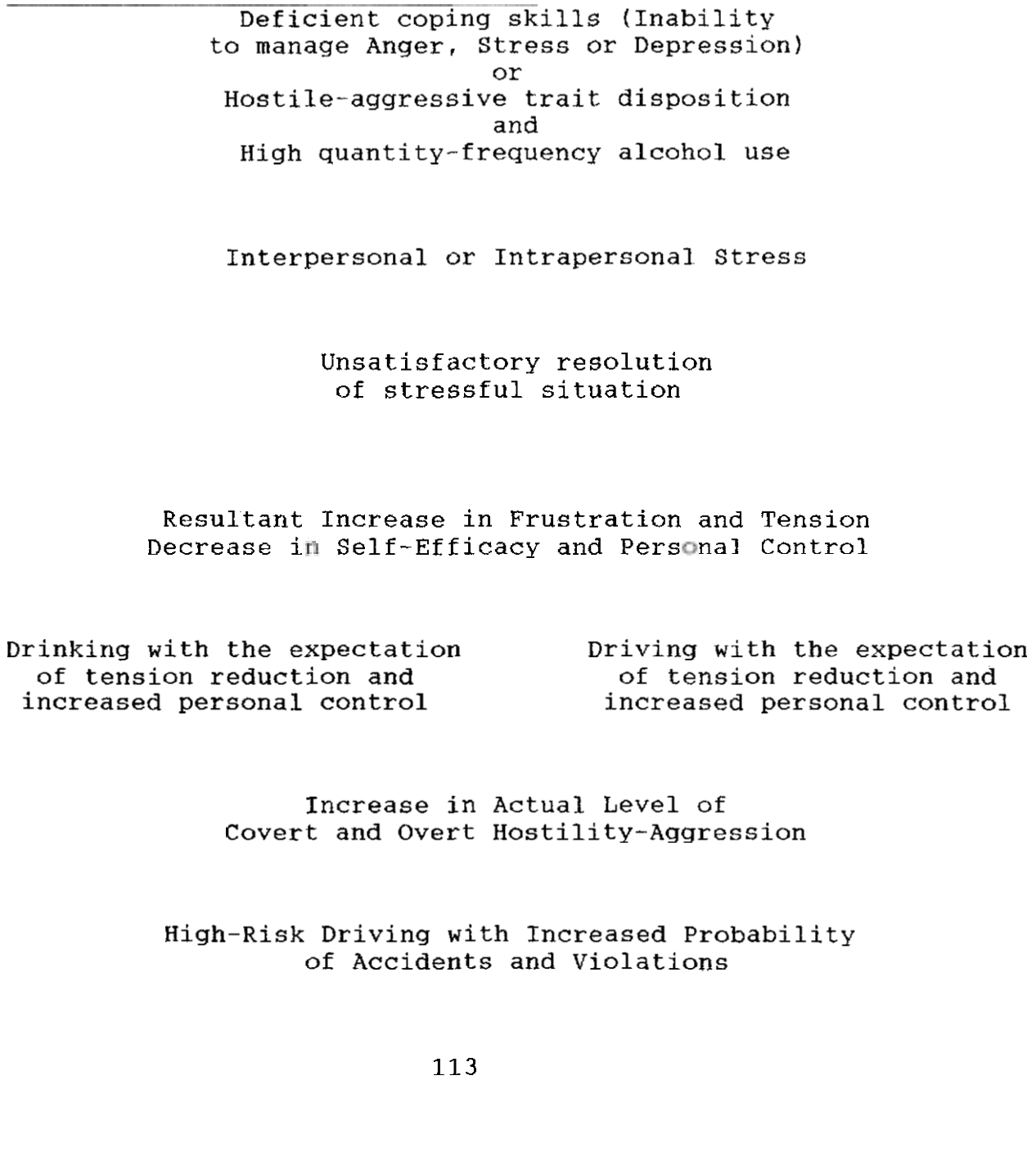
under the influence of alcohol may represent a method by which to express underlying psychopathology in the absence of more adaptive coping methods. It would appear that individuals who drink and drive do not represent a homogeneous group. Selzer, Vinokur and Wilson (1977) note that this may be a reason for the lack of success of most treatment programmes.

Mozdzierz, Macchitelli, Planek and Lottman (1975) reported significant differences between alcoholics with high and low crash and violation records on scales of the Guilford-Zimmerman Temperament survey and on the MMPI. Their results also indicate that it is possible that two groups of drivers may be present in the driving population. One is a high risk group characterised by impulsivity, recklessness and irresponsibility. The low crash-violation group of alcoholics were submissive, and more cautious, with greater concern for responsibility. Mozdzierz et al concluded that the high crash group may contribute more than other alcoholics to the crash statistics because of temperament and personality characteristics. Donovan, Quiesser, Salzburg and Umlauf (1985) compared a group of non-alcohol involved high crash drivers with a group of alcohol-involved high crash drivers. No significant differences were observed between these two groups on the personality measures employed. Both of these groups differed significantly from a group of drivers chosen from the general population. However, a number of demographic differences were observed. The alcohol-involved group were significantly older, less well educated and of lower social position than the high risk group. The high risk group also perceived that they had less personal responsibility for crashes and had higher amounts of driving related aggression. These two groups may represent sub groups within the

same population of high risk drivers.

Donovan et al (1985) consider that alcohol, personality and attitudinal factors may independently contribute to increased crash risk. The interaction of any of these factors within the same person may act to increase their influence. Donovan, Marlatt and Salzburg (1983) present a cognitive-behavioural model of high-risk driving (figure 1) which attempts to integrate the

Figure 1. Hypothetical cognitive-behavioural model of the influence of social skill deficits, heavy alcohol use and hostile-aggressive personality on high-risk driving. From Donovan, Marlatt and Salzburg (1983)



factors cited above (drinking behaviour, personality traits, acute emotional stress, driving related attitudes and the availability of appropriate coping skills) and high-risk driving. However, while this model is interesting, it is not yet based on firm evidence. Further research is required in order to validate or invalidate the model. They argue that,

"the individual who appears to be at maximal risk for accident involvement is a young man characterised by a high level of underlying hostility and an aggressive disposition who drinks heavily and frequently, and who is deficient in those social skills involved in the appropriate expression of anger and the management of stress, frustration or depression" (p. 415).

When faced with acute emotional distress, such an individual does not have the skills required to cope with the situation. The stress arising from this situation will be perceived as a loss of personal control. To these individuals, alcohol and the automobile may represent methods of coping with these feelings. The model suggests that drinking and driving serve as a means of regaining or increasing feelings of personal power and control.

Characteristics of young drivers

The problem of young drivers is essentially a problem limited to young males (Henderson, 1972). Very little research has examined the characteristics of young female drivers, possibly because they have not proved to be a high risk group.

Pelz and Schuman (1971) have found that young male drivers are more likely to be involved in motor vehicle crashes between the ages of 16 and 24. Coppin, Ferdun and Kirkham, (1965, cited in Cummings, 1975) found that for young women drivers, crash rate was significantly related to driving experience (the number of months the licence had been held). However, for similarly defined groups of young men, it was age that was found to be significantly related to crash rate. They concluded that

intrinsic components of age (such as level of maturity) are important factors in crash rate of young male drivers. Pelz and Schuman (1971) also observed a similar difference in the crash characteristics of young male and female drivers. Waller (1970, cited in Cummings, 1975) found that young male drivers with traffic violations and/or crash records were typical of their age group of males. However, young female drivers involved in crashes or with violations were not typical of crash free female drivers.

The role of alcohol. Cameron (1982) indicates that a large proportion of alcohol and non-alcohol involved crashes involve drivers under the age of twenty-five. This is the case even when differential exposure to traffic crashes has been controlled for. In a recent review, Mayhew, Donelson, Bierness and Simpson (1986) concluded that young drivers who drive after drinking had a greater risk of crash involvement than older drinking drivers, although the young drivers were less likely to drink and drive. Mayhew et al make the suggestion that the higher crash risk of young drivers may be due to inexperience with drinking and/or driving. However, they also consider feasible the possibility that personal and social characteristics may contribute to increased risk.

Cameron (1982) also noted, despite limited data being available, that behavioural correlates of drinking and driving problems indicate some association between feelings of rebellion, hostility and alienation and an increase in the number of traffic violations and crashes. Jessor (1983, cited in Tonkin, 1987) suggests engaging in risky behaviours in general serves to help "take control of one's life, express opposition to adult

authority...deal with anxiety, frustration, inadequacy" (p. 216) in addition to being pleasurable to the young person. Earlier work on the role of personality and social factors in crash causation (Schuman, Pelz, Ehrlich and Selzer, 1967) revealed that a strong relationship did exist between exposure (number of miles driven in the previous year) and crash experience. However, motivational factors were also found to be important. Schuman et al found that 40 percent of 16 to 20 year old drivers they studied reported driving to blow off steam after arguments. However, reports of this behaviour became less frequent with increasing age. Feelings of anger and frustration were also reported by young drivers in response to obstacles (for example, repeated red lights) when driving. However, these feelings also declined with age. Schuman et al (1967) also reported that the time between ages 16 and 22 was a period of frustration and anxiety in which the motor vehicle was perceived as an outlet for the expression of these feelings.

Drivers with high crash rates in the Schuman et al study were also more likely to own their own vehicle, be employed rather than attend school or college, have only a high school education and be of lower socio-economic status. Poor school adjustment, low academic achievement, and number of cigarettes smoked were among the better predictors of crash frequency (Harrington, 1972). However, the degree to which crashes could be predicted on the basis of biographical information was very low. The conclusions drawn by these studies are consistent with those made by others (Beamish and Malfetti, 1962, Pelz and Schuman, 1968).

Symbolic status of motor vehicles. Klein (1972) hypothesises that for adolescents, the car symbolises power,

autonomy and status. Young men learn that 'real men' are tough, ingenious and prepared to take risks. However, their freedom is severely restricted by parents, schools and the law. The motor vehicle may be the only area in which the young driver can be in control (Klein, 1972). It has been suggested that the idea of obtaining a driver's licence is a marker of transition into the adult world (Klein, 1972, Tonkin, 1987). Carlson and Klein (1970) hypothesised that the familial socialization of young male drivers may be of significant influence in forming driving behaviour over institutional socialization. The son learns specific driving behaviours from watching his father drive. They also learn what Carlson and Klein have called the familial 'lifestyle' which includes attitudes to authority, conformity, aggression, self perception, relationship to the social environment, the concept of status, perceptions regarding the status of automobiles. The values adopted by a given family do not necessarily correspond to those of society in general. Institutional socialization includes schools, police, and court system through which society's values are taught and enforced. These institutions attempt to encourage behaviour seen as socially desirable - in this instance good driving behaviour. In support of this hypothesis, fathers of sons with higher conviction rates were also found to have significantly more convictions.

Other groups at risk: The mentally ill

It has been already established that the rates of suicide by motor vehicle crash are most likely relatively small (less than 5 percent) in comparison with other factors. However, as a group the mentally ill would appear to represent a high risk sub-

group of the driving population. It is difficult to ascertain with certainty the relative rates of crashes amongst the mentally ill as many of the studies in the area have not met some of the evaluation criteria. As with a number of the studies on personality and crashes, studies investigating the crash rate of the mentally ill have failed to implement basic methodological controls such as controlling for distance travelled, or variations in risk. Gibbens (1968) in a book on medical aspects of fitness to drive comments that, except for special circumstances, there is little evidence that a psychotic illness increases crash risks. He also comments that mental illness of all types tends to reduce the individual's interest and activity. Such patients would be less likely to drive and would therefore be less exposed to crash risk. These thoughts are echoed by Henderson (1971) who states that at any one time the numbers of mentally ill people driving motor vehicles is likely to be relatively small. However, as Henderson (1971) points out, this observation does not rule out the argument that mental illness may be related to crashes. Indeed, there is some evidence available to support this position.

Noyes (1985) states that within the sub-group of mentally ill patients the risk of crashes is higher than in the general driving population. Waller (1965, cited in Noyes, 1985) found that the crash rate of mentally ill people known to the California Department of Motor Vehicles had twice as many crashes than the age adjusted sample without known illness. Crancer and Quiring (1970) found that 915 drivers hospitalised for suicidal gestures in the years 1963, 1964, 1965 had a significantly higher crash and violation rate than a comparison group of drivers from

the general population. The group also had significantly more violations for drunken driving, reckless driving, driving while suspended, and negligence.

Eelkema, Brosseau, Koshnick and McGee (1970) found that discharged mental hospital patients as a group had a higher crash and violation rate per hundred driver years than a comparison group from the normal driving population. Psychotic and psychoneurotic patients had a greater crash ratio, although after they had been discharged from hospital, their crash rate was found to be lower than that of the matched comparison group. Buttiglieri and Guenette (1967, cited in Noyes, 1985) also observed that the rate of crashes tended to decrease after release from hospital. As Eelkema et al (1970) did not control for distance travelled, it is unclear whether the decrease in crashes was due to a decrease in the distance driven by mentally ill patients after hospitalisation or some other factor. Patients with personality disorders had the highest crash rates and showed little improvement after release from hospital. However, these results were also confounded as the number of miles driven was not controlled. Single vehicle crashes were almost solely found amongst the experimental groups.

Type of mental illness. A number of studies have found that not all categories of psychiatric patients are over-involved in crashes. Increased crash rates were found amongst neurosis sufferers (Crancer and Quiring, 1969, cited in Noyes, 1985) and people with personality disorders (Eelkema et al, 1970). Schizophrenics, on the other hand, did not differ significantly from the general population (Crancer and Quiring, 1969, cited in Noyes, 1985). A number of studies have also observed that alcohol problems are also implicated with substantial number of

mentally ill people (Crancer and Quiring, 1970, Eelkema et al, 1970). Alcohol abuse amongst psychiatric patients may make a considerable contribution to crash rate and therefore tends to confound attempts to assess crash rates. A Finnish study has indicated that after controlling for drug abuse, patients with psychiatric histories may have a similar crash rate to the rest of the population (Maki and Linnoila, 1976).

PREDICTING AGGRESSIVE DRIVERS

The potential value of research into the personality and social characteristics of problem drivers lies in establishing effective means of predicting crash liability. It is currently possible to identify certain groups in the community who are at greater risk of being involved in motor vehicle crashes than the general community. It can also be said that, there may be some consistency in the personality traits of multiple crash drivers. However, there appears to be no personality test which has been found to predict individual crash liability satisfactorily, before the event.

Interview techniques. A number of the studies discussed in the previous section utilized psychiatric interviews in attempting to distinguish between crash free and crash involved drivers. This technique represents an after-the-event method of detecting personal factors affecting motor vehicle crashes. Hertz (1970) argues that the structured goal directed psychiatric interview may prove a useful diagnostic tool for the detection of personal factors influencing crash frequency. However, such techniques are extremely difficult to standardize adequately as the training and personal qualities of the interviewer are also

crucial. An interview may lead to incorrect conclusions if important information is not extracted or if that information is not adequately or properly interpreted (Anastasi, 1982). Interview techniques must therefore be considered extremely limited in terms of individual crash prediction, and would be difficult to apply on a widespread basis.

Personality tests. While a number of studies have produced positive results in identifying the personality characteristics of crash involved drivers, the methodological problems of these studies prevent any firm conclusions being drawn. These problems have included small sample sizes and inadequate control for variations in risk and exposure. Research in the area of aggression has included few cross validation studies. The study by Conger et al (1957, 1959) is one of the few to discuss the results of cross validation studies. As a consequence, the literature does not reflect a systematic development, with researchers in general applying either different established personality tests or developing their own tests. These tests have either been developed on the basis of previous research, using factors the researchers considered may influence driving behaviour, or using sub-scales from already established tests. As most of these studies do not appear to have been cross validated, it is not possible to judge which measures could be successful in discriminating aggressive drivers. Of the established tests a number of scales on the MMPI were found to discriminate between high and low crash drivers in a number of different studies. The MMPI would appear to have been one of the most successfully employed tests, although it failed to survive in cross validation by Conger et al (1957). The 16 personality factor questionnaire was found to significantly discriminate

between high and low crash drivers on at least one scale in two different studies (Quimby and Watts, 1981, Williams, Henderson and Mills, 1974). McGuire (1976) reported success in cross validation with his Safe Driver Scale. Of the other personality tests employed in the studies discussed, they would appear to be balanced between positive and negative results.

These tests are indirect measures and as a consequence establishing their validity is difficult. As these characteristics have been identified as personality traits, they imply a certain amount of stability over time (Williams, Henderson and Mills, 1974). However, much of the behavioural variance has been found to be accounted for by the situation rather than the personality traits. An important question in view of this result would be to ask what is the personality test actually measuring.

This area of research has been characterised by inadequately designed and conducted studies. The validity of much of the research must therefore be questioned. Many authors have levelled similar criticisms at studies of personality characteristics of drivers (Conger et al, 1959, Valentine et al, 1977, Williams et al, 1974). A few of these studies (Conger et al, 1957, 1959, Tillman and Hobbs, 1949) have been criticised as they were based on statistically extreme samples. The findings may therefore not generalise to the larger population. While the term accident proneness with all its conceptual difficulties, has for the most part been put aside, the research presented above continues to embody the notion that some individuals, by virtue of their personal characteristics, are more likely to be involved in crashes than others. These

personal characteristics may be permanent and/or temporary, due to emotional stress and/or familial upbringng, alcohol and social values.

Henderson (1971, cited in Valentine et al, 1977) maintains that the study of the pathological characteristics of crash involved drivers is not productive as these traits appear to change with time, age and situation and do not aid in effective crash prevention. The idea that more aggressive people who display their aggressiveness in the way that they drive will have more crashes than non-aggressive people has intuitive appeal. However, these studies do not appear to add significantly to our collective knowledge about the causes of crashes.

CHAPTER 6

CONCLUDING DISCUSSION

It would appear from the literature that, while considerable research has been conducted into the role of aggression in driving, few firm conclusions can be drawn. The problems experienced in the research of driver aggression can be attributed, in part, to the complexity and vagueness of some of the concepts involved. Both the dependent and the independent variables are difficult to define (Lucas, 1970). Crash and violation frequency are often difficult to establish accurately due to incomplete official crash records. In addition the criteria applied to distinguish crash repeating drivers and drivers with low crash frequency has varied considerably between studies making comparison difficult. The relevant personal and social characteristics of drivers in relation to the occurrence of driver aggression have appeared to be difficult to identify. In addition, measurement of these factors is necessarily indirect. The instruments used in attempts to measure the underlying factors related to driver aggression are notorious for their lack of validity and reliability. None of the measures employed have been shown to be able to predict crash involvement on an individual basis.

Drivers at high risk of crash involvement exhibit a broad range of personal and social characteristics. It is possible to divide this overall group into more distinct sub-groups. These categories are not mutually exclusive but reveal substantial overlap. They include people who drive under the influence of alcohol, young drivers (particularly young male drivers) and possibly the mentally ill. Some drivers do not fall into any of

the above categories of high risk drivers identified. Drinking drivers and young drivers are known to have crash and violation rates above that of the normal driving population. The evidence, although not conclusive, suggests that the high crash rates of these drivers are significantly related to hostility and aggression. In particular the suggestion has been made that some of these individuals are less able to control aggressive impulses or tolerate tension.

The crash rate of young drivers tends to decrease with increasing age. A number of studies have suggested that this results not only from increasing experience but also from increasing maturity. It is postulated that these young drivers feel less need to engage in dangerous and risky driving as they grow older. Alcohol plays a significant role in motor vehicle crashes and is to some extent a confounding variable in studies on aggression in driving making the differentiation of the effects of personality and alcohol difficult. This point has also been noted by other reviewers (Valentine et al, 1977). There is now evidence that alcohol may influence the occurrence of aggressive behaviour. The mentally ill would also appear to a group at risk in the driving community. A proportion of this problem may relate to attempted suicides by motor vehicle crashes. However, probably less than five percent (most likely 2 to 3 percent) of crashes can be attributed to attempted suicides (Noyes, 1985). It also appears likely that the mentally ill are less likely to drive than other groups in the community and therefore the proportion of these drivers involved in crashes is somewhat reduced as a result.

The general high risk group of drivers has also been

described as having high levels of hostility and aggression. Of these high risk drivers, a very small number may be sufficiently disturbed or deviant to attempt suicide, murder, or malicious damage on the road, although no clear statistics have been produced to verify this statement. Evidence that the rates of road crashes are related to the crime statistics of the country is inconclusive. While there is a volume of research which concludes that aggression plays a significant role in increased crash and violation rates, as with drinking drivers and young drivers, firm conclusions are not warranted. Many of the studies in this area have been beset by methodological problems related to;

- inadequate control for variations in exposure and hazard level
- small sample sizes
- use of inadequately standardised tests
- failure to validate findings with different populations

No single personality trait has been identified which satisfactorily distinguishes the high crash driver from the low or crash free driver. Personal factors which have been identified as associated with motor vehicle crashes include generally high levels of aggression and hostility, competitiveness, less concern for others, poor driving attitudes, driving for emotional release, impulsiveness and risk taking. A background of social disruption and deviancy appears to be more common amongst high crash and/or violation drivers who have exhibited aggressive attitudes or responses.

While people who exhibit such behaviour patterns are undesirable as drivers, members of the 'normal' driving population are also seen to exhibit aggressive (looking)

behaviour. It has been postulated that the motives of drivers do not only consist of a desire to get from A to B in the safest possible way. Drivers may engage in risky driving practices in order to fulfill these other motives. These motives include those suggested above in relation to crash repeating drivers (thrill seeking, desire for speed, having fun, discharging tension) but may also include others such as attempting to enter a busy traffic stream, keeping up with the traffic stream, getting somewhere more quickly, frustration or bad temper.

INVOLVEMENT OF CRASH REPEATERS

The attention focussed on the role of aggression in driving and the personality characteristics of repeated crash and conviction-involved drivers appears unwarranted given the likely contribution of these factors in crash causation. Aggressive or (without the assumption of intent) risk taking behaviour would appear to have a high profile in terms of observable on-the-road behaviour. Subjective experience would indicate that dangerous driving is quite frequent. The authorities regularly complain in the media about the poor attitudes of drivers in general (see for example 'The Age', Saturday, 10 October, 1987) and the role they may play in crash causation. Even if it were agreed that aggressive personality traits (hostility toward authorities and other drivers) are a causal link in repeated crashes and/or violations, the effect of removing these individuals from the driving population would appear to be comparatively small. That crash repeaters constitute a small proportion of the driving population has been known for many years. Forbes (1939, cited in McGuire, 1976) found that a small percentage of the population

may have a high proportion of the crashes in one time period. However, in the next period of time, that same percentage of crash repeating drivers will be largely composed of different individuals.

Hampson (1984) cites a 1975 study by Sabey and Staughton who report that of the human factors identified as being involved in road traffic crashes only 0.6 percent can be attributed to frustrated or aggressive behaviour. The less strong definition we proposed which encompassed driving acts aggressive in appearance, such as reckless driving or irresponsibility, accounted for only 1.6 percent of the human factors identified as contributing to motor vehicle crashes.

Burg (1970) in a six year study of the crash and violation rates of 7841 drivers found that the majority of drivers involved in crashes had never been involved in crashes before. It should be noted that only California Department of Motor Vehicles records were used. These records are known to be an underestimate of the true number of crashes (Burg, 1970). The Robertson and Baker (U.S.) study (1975) found that only six percent of drivers involved in fatal crashes had more than eight convictions in all the years prior to the crash. Burg (1970) found that the removal of all drivers with one or more crashes over a three year period would eliminate 19.8 percent of drivers and 29.6 percent of the crashes occurring in the subsequent three year period. Eliminating drivers with two or more crashes over a three year period would dispose of only 3.9 percent of drivers and 8.0 percent of crashes. The elimination of drivers with three or more crashes (0.8 percent of drivers) would prevent only 2.0 percent of crashes. Burg concludes that traffic safety efforts would be more usefully directed at the so called 'normal

driver'. As indicated above, it would appear that the composition of the crash repeater group is not constant from year to year. Henderson (1971) determined from Burg's data that "if a three year, triple crash involvement crash history is used as a predictor of crash involvement for the next three years, the prediction would be correct in less than 50 percent of cases" (p. 46). A study by Peck, Coppin and McBride (1967, cited in Robertson and Baker, 1975) found that the crash population from year to year is largely a changing one. "Of those drivers who were crash involved in 1961 and 1962, 86.8 percent were crash free in 1963. Conversely, the previously crash free drivers accounted for the vast majority of the crashes in 1963" (p. 121).

FOUNDATIONS OF AGGRESSIVE DRIVING

Any initiatives to attempt to cope with aggression in driving must necessarily depend on the theoretical approach adopted. While few researchers would dispute that a biological base to aggressive behaviour exists in humans as well as in other animals, such an approach would appear to offer little hope to road safety authorities attempting to combat aggressive driving. There can be little doubt that there is a substantial learning component (at least in the ways and situations in which aggression is expressed) to aggressive behaviour.

A number of researchers have attempted to relate aggressive driving behaviour to theories of aggression. Whitlock (1971) speculated that aggressive behaviour exhibited by apparently normal adults may be accounted for in the terms of violation of perceived territorial rights and the Lorenzian view that humans have a drive for aggression. Where once, aggression was used in

defence of the home, as the numbers of car owners increase, aggression may come to occur "in furtherance of the driver's sense of property rights" (Whitlock, 1971, p. 133). In particular, Whitlock suggests that, to the young male driver, who in general owns little real estate, the motor vehicle becomes a "symbol of power and prestige, a part of one's territory to be defended by aggressive displays whenever its integrity is threatened or breached" (p. 133). Whitlock suggests that the territorial explanation for aggressive driving may relate more to members of the 'normal' driving population than the deviant driver who may be unable or unwilling to control his or her aggression. Another possible explanation offered by Whitlock (1971) is that the automobile essentially isolates the driver from other road users. In a sense then, many of society's restrictions are diminished. In addition, the design of the automobile offers "a certain amount of immunity from retaliatory action" (Whitlock, 1971, p. 128). Drivers may therefore feel less restrained about revealing aggressive dispositions.

Other researchers (Naatanen and Summala, 1976) have suggested that the frustration-aggression hypothesis may account for the occurrence of aggressive behaviour in some instances. For example, a number of researchers have suggested that the need for impulse expression (for example, Selzer and Payne, 1962), or the inability to control hostility (for example, Conger et al, 1959) may cause drivers to use their motor vehicles to reduce such tension. The frustration-aggression hypothesis would propose that individuals need to discharge feelings of frustration. An individual who has not been taught appropriate ways of coping with frustration or distress may indulge in dangerous and aggressive driving in a futile attempt to take

control. Given the often frustrating nature of driving, it may not be surprising that some drivers are aggressive in response to the difficult traffic situations they face every day.

Most of the speculation relating to the basic causes of aggression in driving supports the notion that social norms and values play an important role. In view of this, the next section will be devoted to a discussion of the role of society in crash causation. It may be that social values influence attitudes toward aggressive driving and behaviour. Learning may also influence the situations and the means by which feelings of frustration and aggression are expressed. However, all of these comments must remain speculative in the absence of conclusive evidence. The bases of aggression in driving are highly complex and most likely occur as a result of a combination of biological and social factors. At present, the comments relating aggression in driving to highly complex theories of behaviour must be judged to be preliminary and highly speculative. Detailed research is required before any conclusions could be drawn.

The role of society

It was earlier argued that society for the most part regards people who break the law as deviants. However, this does not appear to extend to people convicted of motor vehicle offences (Clifford and Marjoram, 1978). It was postulated that the legislation against traffic offences does not originate in prevailing norms of the society. Henderson (1971) has argued that countermeasures initiated to prevent dangerous driving habits must be sanctioned by society if they are to be effective. Preventive measures may have decreased effectiveness if people in general do not regard traffic offences as criminal behaviour.

Hampson (1984) comments that it seem likely that society as a whole determines the level of safety margins. He goes on to argue that society encourages risk taking and competitiveness. Henderson (1972) remarks that the high crash rate of young male drivers is related to the essential structure of society and the high social values placed on speed and mobility. Any advances in alleviating this problem requires reaching some understanding of society as a whole.

Henderson (1972) and Klein (1976) both comment that the influence of the mass media on driving behaviour and its role in counteracting educational efforts had never been properly researched. The motor vehicle has been claimed to have symbolic meaning, for instance, it represents freedom and privacy (Slater, 1970, cited in Klein, 1976). The advertising of motor vehicles with few exceptions appears to reflect social values other than those of driving as a means of transport. Advertisements emphasise status, speed, excitement and freedom to name just a few. Henderson (1972) provides an example from a motoring magazine;

"And the next move goes something like this: the guy in the front slaps on the brakes going into a tight left hander. But there's no need to brake the..., flick back to third, the tacho flips to 4700 and the tail slides out. Hold it with fingertip correction on the wheel, a little more pressure on the throttle. The clock says 60, and you're around, through and gone - and Fred's behind you still on the brakes..." (p. 17).

Henderson (1971) above argued that society must come to see drunken driving as socially deviant as 'urinating in George Street'. This must also be the case if attempts are to be made to decrease the frequency of aggressive, competitive driving behaviour. In Klein's (1971) view, the individual's behaviour and experiences may have powerful effects on his or her driving

behaviour. If as a society we emphasise values such as competitiveness and aggressiveness, individual initiative, autonomy, challenge, excitement and risk taking, then all facets of behaviour including driving will reflect these values.

Eron and Huesmann (1984) argue that they have found a direct positive relationship between aggression and traditional masculine attitudes (which involve aggressiveness). They argue that social learning plays an important role in reinforcing aggressive behaviour patterns. As aggressive behaviour is learned early in the child's life, this would take place primarily in the home. They go on to argue that if children (regardless of sex) learn prosocial ways of solving problems, they will be much less likely to adopt aggressive tactics. Given that (as the frustration-aggression hypothesis would propose) individuals need to discharge feelings of frustration, an individual without the requisite skills to come to terms with frustrating or upsetting events, may find alternative outlets for these feelings (such as risky driving) in order to cope.

The findings of Eron and Huesmann are closely related to Carlson and Klein's (1970) conclusion that driving behaviour is learned primarily through the home and not through external institutions. Carlson and Klein argue that driver education (a major form of institutional socialisation) will "only be effective in so far as it is able to modify inadequate familial socialisation" (p. 24). In their judgement, education in general has not resolved this problem.

The above comments on the role society plays in the development of aggressive driving behaviour must remain, as with the earlier comments on the foundations of aggressive behaviour, in the realm of theory. Further detailed research is required to

examine the relative role of biological and social factors in the foundations of aggression in driving. Until that time these comments must remain speculative.

STRATEGIES FOR COPING WITH AGGRESSIVE DRIVING

Screening drivers

One of the first possible approaches to coping with aggression in driving may be to screen drivers suspected of having problems (including mental illness and drivers under emotional stress). Noyes (1985) argues that physicians would be able to aid in the prevention of motor vehicle crashes if they were aware of the psychiatric factors related to impaired driving ability. Nathan and Turner (1974, cited in Noyes, 1985) screened 100 drunk drivers, fifteen of whom required immediate psychiatric intervention. Noyes argues that patients commonly consult physicians in times of stress. The physician needs therefore to be aware that personal crises may result in an increase in physical danger. Gibbens (1968) suggests that physicians be alert for drivers suffering from mental breakdown and for signs of mental deterioration in elderly patients if they have any unexplained crashes. Gibbens also argues that drivers of heavy goods vehicles and public service vehicles should not be permitted to drive if they have suffered a psychotic breakdown, or have personality disorders. However, these drivers may be detected only after they have already experienced a crash. A relatively small literature proposes that mentally ill drivers should be discouraged if not prevented from driving.

Modifying driver behaviour

Not surprisingly, attempts to modify driver attitudes and

behaviour have concentrated on enforcement and education. Naatanen and Summala (1976) present a strong argument for the role of motivational factors in driving. A large motivational component of safe driving behaviour would imply that modification of human behaviour may be productive in decreasing crash rates (Henderson, 1971). However, attempts to alter driver behaviour have been largely unsuccessful (Henderson, 1971). The motivational components of driver behaviour are highly complex. It would almost certainly not be fruitful to suggest (as did Brown and Berdie, 1960) that crashes could be reduced simply by calling to the attention of the individual that he or she has a pattern of characteristics associated with high crashes. Attempts to influence driver motivation include enforcement programs and driver education programs (in the form of mass media campaigns and high school programs).

Enforcement

Enforcement in learning theory terminology may be viewed as a negative reinforcer, a stimulus that a person would attempt to avoid (Shinar, 1978). The laboratory and road environments are quite different. Avoidance training may be effective in the laboratory, however, on the road may be less so (Shinar, 1978). According to Shinar the reason for this is primarily because feedback and negative reinforcement in the laboratory can be fairly immediate. However, on the road, due to limitations in funding, the monitoring of driver behaviour by the authorities is not systematic. As a result, much dangerous driving may go unnoticed and therefore unpunished.

Brown and Copeman (1973) argue that greater attention should be given to the design of sanctions as a method of conveying

societal values. "Ideally sanctions would delineate the bounds of acceptable behaviour (Brown and Copeman, 1973, p. 243). They also argue that the strength of sanctions should correspond to the driver's perception of the relative seriousness of the offence. The concept of enforcement implies that individual drivers are able to change their behaviour in the direction desired by society. Henderson (1971) also argues that to be effective, countermeasures such as enforcement must be sanctioned by society. However, there is evidence that the driver groups at whom many of these enforcement programs are directed will not change their behaviour regardless of the strength of the threat of punishment (Henderson, 1971). Henderson argues that 'deviant' drivers form a sub group the members of which perceive advantages in their driving behaviour. These drivers therefore do not wish to change their behaviour. Robertson and Baker (1975) present evidence that a percentage of drivers who have their licences suspended, revoked or refused may continue to drive. Five percent of 1447 drivers involved in fatal crashes in Maryland in 1970 and 1971 were found to to be driving without a valid licence. In addition, of 294 people who had at some time been denied a licence, 23 percent were found to have received at least one conviction for a motoring offence during the time their licence had been suspended. Ross (1976, cited in Shinar, 1978) has indicated that no changes in the rate of fatal crashes involving drunken driving were observed after a law leading to automatic imprisonment and loss of driver's licence was introduced.

Driver education

A large literature exists in relation to driver education,

however, only a relatively small selection would appear to be directed at influencing driver attitudes and consequentially modifying potential aggressive tendencies.

In view of the work of Naatanen and Summala (1976), Hampson (1984) suggested that driver education might be able to emphasise the fallibility of drivers, rather than its present role of training to increase driver skill. "Public education by mass media might direct attention toward informing drivers of the errors they are likely to commit, and teach them to adjust their safety margins accordingly. Henderson (1971) remarks that society retains a basic faith in the power of education to influence human behaviour. The area of driver education can be divided roughly into three sections; driver education courses for learner adults or high school students, driver education for those identified as problem drivers, and mass media campaigns.

Driver education courses. A large amount of research has been conducted on the value of driver education and improvement courses, in particular high school driver programs. However, the majority of this research has been methodologically poor (Shinar, 1978). Conley and Smiley (1976) found that the type of driver education (high school, commercial, no formal education) the individual had undertaken failed to significantly differentiate crash and/or violation involved drivers and drivers without crashes or violations. Similar results were also obtained by Coppin, Ferdun and Peck (1965, cited in Shinar, 1978) and Asher and Dodson (1971). Harrington's (1972) results relating to driver education differed from these only on the basis of conviction rate (which decreased) and crash rate (which decreased for females only).

The influence of driver improvement programs on the attitudes held by drivers was investigated by Edwards and Ellis (1976). They administered the Siebrecht Attitude Scale to drivers who participated in the Texas driver improvement training program and compared driving performance (as measured by the number of crashes and violations in the period of twelve months before and after the program). Only male drivers between the ages of 17 and 24 showed any improvement in attitudes after they had been through the driving program. This group also had a significant decrease in the number of violations incurred after the training program. However, no difference was observed in their crash rate.

Peck and Harano (1973, cited in Peck, 1976) concluded that warning letters, group meetings and individual counselling sessions had the effect of reducing the frequency of traffic violations amongst negligent drivers for approximately six months. After this time, the effects were found to dissipate. McGuire and Kersh (1969, cited in Henderson, 1972) found that the most improvement in crash rate occurred when crash repeating drivers were given interviews with trained driver analysts who used a non-punitive approach.

Fear arousal. Fear arousal has also been used in attempts to influence driver behaviour. Legarde, Lubman and Hartnett (1971) and Beach (1966, cited in Lucas, 1970) studied the effects of fear arousal on mood and attitude. LeGarde et al (1971) after showing a highway safety scare film found an increase in aggression, depression and anxiety after the film had been viewed as measured by the Nowlis Mood Adjective Checklist. While female subjects were more affected than male subjects, they returned to pre-film mood levels more quickly than male subjects. Beach

(1966, cited in Lucas, 1970) hypothesised that high-threat messages will fail to cause an observable attitudinal or behavioural change because drivers are motivated to avoid the message and its recommendations. Beach showed a film with either low-threat (policeman performing routine duties) or high-threat (shots of dead and dying bodies near wrecked vehicles, complete with sound track) insertions. Attitudes were measured before and after the films were viewed. No significant differences in attitude were obtained between either group after they had viewed either the low-threat insertion or the high-threat insertion. However, when both groups were considered as a whole, certain attitude changes were observed particularly those mentioned negatively in the films.

Publicity campaigns. Publicity campaigns which have attempted to alter or influence driver attitudes have met failure in reducing crash rates (Wilde, 1971, cited in Naatanen and Summala, 1976). Naatanen and Summala (1976) suggest that the reason for this failure is that a causal relationship between driver attitudes and crashes has yet to be firmly established. Griep (1970, cited in Naatanen and Summala, 1976) suggests for example, that a poor attitude toward the police may be a result of having been convicted for an offence. Poor driving attitudes and subsequent behaviour tend to satisfy the driver's 'extra motives' in addition to reflecting a lack of subjective risk on the part of the driver. Finally, the views about correct driving behaviour espoused by traffic safety experts may not be the same as those in the general community or sections of the community. In addition, as the driver already feels safe on the road, cooperating with traffic safety campaigns brings little personal

gain (Naatanen and Summala, 1976). The behaviour promoted by such campaigns also require the expending of effort for little perceived gain (Naatanen and Summala, 1976) and which in the majority of cases offer no immediate payoffs for engaging in the behaviour.

Dissuading drivers from drinking. Given that alcohol has been implicated in aggressive driving, reduction in drinking behaviour may produce some benefit. In recent years, increasing attention has been given by authorities to the possibility of using informal social controls in order to prevent drinkers from driving (Pandiani and McGrath, 1986). The Presidential Commission on Drunk Driving (1983, cited in Pandiani and McGrath, 1986) underscored the importance of informal interpersonal social controls. Pandiani and McGrath suggest that public education campaigns in interpersonal techniques should be designed to encourage bystanders to attempt to convince drinkers not to drive. Pandiani and McGrath found that bystanders were already more likely to attempt to dissuade women and drinkers between the ages of 46 and 61 from driving. The degree of intoxication and mood also influenced the likelihood of intervention. Drivers who had reported feeling anxiety or fear at the time indicated attempts had been made to dissuade them from driving. Much smaller numbers of those who had felt sad, happy, angry or had reported no predominant mood had indicated that someone had attempted to convince them not to drive. Henderson (1971) argues in relation to public education concerning drunks and drink driving that research has failed to consider social and cultural undertones in drinking and driving customs.

DIRECTIONS FOR FUTURE RESEARCH

As the problems of aggression in driving have been judged to be closely related to the basic value structure of society, any attempts to decrease the level of such behaviour may require a broader understanding of a range of societal values. Donelson (1985) has argued that research-based knowledge and understanding of the sociocultural factors that play an important role in the causation of alcohol-related motor vehicle crashes could provide a "basis for developing a technology of social change" (p. 89). An approach has been developed by the Injury Research Foundation of Canada, which encompasses the concept of community based initiatives to drinking and driving. This may also be the case for areas relating to aggression in driving. Other writers (Donovan et al, 1983, Henderson, 1971, Wilde, 1973) have also argued that the sociocultural context requires further investigation in order to understand the personal processes at work in crash causation. However, as Klein (1971) comments, while at the individual level, many people may prefer to emphasise co-operation rather than aggressive competition, given the present state of education and the mass media, such changes will take a long time to be adopted by society as a whole. In view of this, more research is also required to identify the reasons for the general lack of effectiveness of driver education and publicity campaigns.

A discussion of risk taking was undertaken in this review because the argument has been made that aggression and risk taking are closely related. It was recognised that risk taking may not be indicative of intent to cause hazardous driving conditions, even though it may have the appearance of aggressive

behaviour. Given the difficulty of determining intent the basis of this risky driving was investigated. Two different conceptualizations of the basis of risk assessment by drivers were discussed. Both would indicate different origins for aggressive behaviour. If drivers drive at the level of 'crash' risk they desire, the basic motivation of the driver to be aggressive requires assessment. On the other hand, drivers may not be aware that their driving puts themselves and other road users at risk. In this case the study of risk taking and risk assessment by drivers may be a more productive line of research than attempting to identify aggressive personality traits. Further research in this area is required in order to determine the mechanisms of risk assessment. Given that aggressive driving and risk taking may be indistinguishable on many occasions, further investigation into the assessment of risk by different driver groups may reveal evidence of importance in combating aggressive driving behaviour.

Further understanding of the context in which aggressive driving takes place is required. However, the study of the personality and social characteristics of crash involved drivers may not be productive as these traits have been found to change with time, age and situation and cannot yet be used to predict accurately the crash history of individual drivers. Even in the long term this area may not be fruitful in terms of countermeasures, especially given the difficulties surrounding the gathering of adequate data. Henderson (1971) argued that action is required to collect and store at the national level, the driving history (including total crash involvement) of all licence holders. However, more knowledge is required about what personal and social factors influence 'normal' driving behaviour.

Any further research investigating the possibility of a causal link between aggression and road traffic crashes using personality tests would need to include stricter methodological controls than those previously applied. In addition, validation of the results of previous studies that have obtained significant effects using personality and attitude tests is necessary. Adequate standardization of the personality tests employed is also required. Given the apparently small number of drivers involved in multiple crashes and the difficulty involved in investigating empirically the role of personality characteristics, social norms and values on aggressive behaviour, it may be more productive (in terms of countermeasures) to concentrate on other areas of road crash research.

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