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
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 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 religious issues. However, religious values was the only scale significant to the 0.05 level. The no crash subjects were more oriented toward religious values than they were toward aesthetic or
theoretical values compared with the high crash subjects. Mayer and Treat (1977) however, using questions on pro-religious 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 a 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 than 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 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 sense 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 characteristics 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).

<table>
<thead>
<tr>
<th></th>
<th>Credit Bureau</th>
<th>Public Health and VD Clinic</th>
<th>Adult Court</th>
<th>Juvenile Court</th>
<th>Known To At Least One Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-crash drivers</td>
<td>34.3</td>
<td>14.4</td>
<td>34.3</td>
<td>16.6</td>
<td>66.0 %</td>
</tr>
<tr>
<td>Crash-free drivers</td>
<td>6.0</td>
<td>1.0</td>
<td>0.0</td>
<td>1.0</td>
<td>9.0 %</td>
</tr>
</tbody>
</table>

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-religious 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
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)

<table>
<thead>
<tr>
<th>Deficient coping skills (Inability to manage Anger, Stress or Depression) or Hostile-aggressive trait disposition and High quantity-frequency alcohol use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interpersonal or Intrapersonal Stress</td>
</tr>
<tr>
<td>Unsatisfactory resolution of stressful situation</td>
</tr>
<tr>
<td>Resultant Increase in Frustration and Tension Decrease in Self-Efficacy and Personal Control</td>
</tr>
<tr>
<td>Drinking with the expectation of tension reduction and increased personal control Driving with the expectation of tension reduction and increased personal control</td>
</tr>
<tr>
<td>Increase in Actual Level of Covert and Overt Hostility-Aggression</td>
</tr>
<tr>
<td>High-Risk Driving with Increased Probability of Accidents and Violations</td>
</tr>
</tbody>
</table>

113
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 upbringing, 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
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 seems 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 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
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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