ORIGINAL ARTICLE

Personality factors as predictors of persistent risky driving behavior and crash involvement among young adults

Pauline Gulliver, Dorothy Begg

Objectives: The aim of this study was to examine the relationship between personality factors assessed during adolescence and persistent risky driving behavior and traffic crash involvement among young adults.

Design: Data for this investigation were drawn from the Dunedin Multidisciplinary Health and Development Study, a longitudinal study of a cohort born in Dunedin, New Zealand.

Subjects: The study population was 1037 young people born between 1 April 1972 and 31 March 1973.

Main outcome measures: The main outcome measures were persistent risky driving behaviors and crash involvement, collected in a face-to-face road-safety interview at ages 21 and 26.

Results: The only outcomes for which there were sufficient numbers of females were a driver involved in any crash and a driver involved in an injury crash. Univariate logistic regression revealed that there were no significant predictors for either of these outcomes. For the males, at the univariate level, aggression, traditionalism, and alienation were the personality scales most frequently associated with risky driving behavior and crash risk. After adjusting for driving exposure, only high levels of aggression predicted being a driver involved in a crash, and alienation predicted being a driver involved in an injury crash.

Conclusion: These results suggest that road-safety interventions seeking to deter young adult males from persistent risky driving behavior need to be directed at those who do not endorse traditional views, are aggressive, and feel alienated from the rest of society.

People aged 15–24 years are at the highest risk of motor-vehicle traffic crashes in New Zealand.1 In the USA, Canada, and the EU, road crashes are the most common cause of death among those aged less than 25 years.2 Evidence has suggested that as adolescents “come of age” for learning to drive, they demonstrate risky attitudes towards dangerous driving practices, such as speeding and not wearing a seat belt.3 These riskier attitudes may be the result of a general over-confidence that young people have with regard to their driving ability4 and an overestimation of their ability to recover from error, should one occur.5 Not all young people, however, engage in risky driving behavior. Therefore, to develop interventions that will effectively target the high-risk group, the personality characteristics of those most likely to engage in these behaviors need to be elucidated and taken into consideration when developing road-safety campaigns.6

Several studies have examined the personality factors that relate to involvement in dangerous driving behavior or crash involvement. From a prospective study of high school students in Canada,7 Beirness and Simpson reported that students aged 13–19 years who showed less attachment to traditional values and displayed less attitudinal intolerance of deviance, were more likely to be involved in a crash.8 In a study conducted in the UK, West reported that novice drivers who experienced a motor-vehicle crash in the 3 years immediately following their driving test had “inattentive” and “impatient” characteristics, compared with drivers who did not crash.9 Dahlen and colleagues have shown that sensation seeking, impulsiveness, boredom proneness, and driver anger predicted crash-related conditions (eg, losing concentration, having a minor loss of control, having a “close call”), and aggressive and risky driving behavior in young American adults (median age 19 years).10 In a series of investigations conducted in Dunedin, New Zealand to identify the characteristics of persistent risky drivers,11 Begg and Langley reported that high levels of aggression and low constraint (a super-factor in the Multidimensional Personality Questionnaire (MPQ)) predicted persistent risky driving behaviors such as driving fast for the thrill of it, driving faster than 120 km/h on the open road, and following closely behind slower drivers.12 Low levels of constraint have also been shown to be a risk factor for males for persistent driving after using marijuana11 and for traffic crashes.13

The MPQ is a measure of personality factors, developed and standardized with non-clinical populations, that has been established as a predictor of a range of health-risk behaviors such as problem alcohol use, cannabis use, dangerous driving, violent crime, and unprotected sex.6 The MPQ contains three super-factors (constraint, negative emotionality, and positive emotionality), each of which contains several scales (table 1).6 Constraint, the super-factor that has been consistently associated with driving behaviors, is made up of three factors, traditionalism, harm avoidance, and control. Individuals with low levels of constraint are characterized as impulsive, incautious, and endorsing a radical social environment.6 While it has been assumed that impulsivity and incautious behavior are the sub-scales “driving” these results, at this stage, it is unknown which aspects of the constraint super-factor predict crash involvement.

The aim of the present study was to investigate each personality trait measured by the MPQ to determine which factors predicted persistent risky driving behavior and involvement in traffic crashes in young adults.

METHOD

The study population was the Dunedin multidisciplinary health and development study (DMHDS), which is a longitudinal study of the health, development, attitudes, and behavior of a cohort of 1037 people born at the only obstetric hospital in Dunedin, New Zealand between 1 April 1972 and 31 March 1973.

Abbreviations: DMHDS, Dunedin Multidisciplinary Health and Development Study; MPQ, Multidimensional Personality Questionnaire.
1973. Members of this cohort have been assessed at two-yearly intervals from age 3 to 15 years, and again at 18, 21, 26, and 32 years. The DMHDS is characterized by follow-up rates of 90–95% and the wide variety of studies included at each assessment. A full description of the cohort and the DMHDS is provided elsewhere.34

Although all of the data presented in this investigation are based on self-report, validity is considered to be somewhat higher than would be the case in a one-off survey of a community or school. The cohort members have a long history of reporting sensitive information without breach of confidentiality35 and are familiar with the process. In addition, there is a high level of agreement between cohort crash reporting and traffic crash reports recorded by the New Zealand police.36

Outcome measures
These data were obtained from study members who participated in a road-safety interview at the age 21 and 26 assessments. The road-safety interview was a face-to-face interview, conducted by a trained interviewer using a standardized questionnaire.

Risky driving behaviors
Information was sought on how many occasions, in the past month, study members had: (1) driven a car when they thought they perhaps had too much to drink to be able to drive safely, or (2) driven a car within 2 h of using marijuana. If the behavior had occurred once or more, study members were categorized as “risky”. Study members were also asked how often they: (3) drive fast just for the thrill of it or (4) drive faster than 120 km/h on the open road. Response options for these questions were: never, rarely, occasionally, fairly often, often. The responses of “often” or “fairly often” were categorized as “risky”. Study members who scored at the 25th percentile or below were categorized as “low”, those who scored between the 25th and 75th percentiles were categorized as medium, while those who scored at the 75th percentile or above were categorized as “high”.

Exposure: age 21 and 26
At ages 21 and 26, a measure of traffic exposure was obtained by asking participants how far they would usually drive in a week. Response options for the age 21 and 26 assessments ranged from 1 (0–25 km/week) to 5 (greater than 100 km/week). Response categories for each assessment period were summed to produce an estimate of exposure over the two periods. Distance traveled was then categorized into low (less than 50 km/week), medium (50–200 km/week), or high (greater than 200 km/week).

Statistical analysis
Univariate relationships between each of the explanatory and outcome variables were explored using logistic regression. As crash risk may be a function of distance driven, for crash outcome variables, multivariate analyses were conducted to assess the strength of the association between the predictors and the outcome after adjusting for exposure to driving. The data collected for this study were obtained over three phases (ages) of a longitudinal investigation. Data from all study members present at each phase were used for the univariate analysis, while only members with complete data for all phases were included in the multiple logistic analysis.

RESULTS
Of the study members who participated in the age 18, 21, and 26 assessments, 969 (93% of the cohort) participated in all three assessments and are included in the present study. Of these, 477 (49%) participants were female and 492 (51%) were male.

Table 2 provides a description of the number of study members for each outcome variable. The only outcomes where there were sufficient numbers of females to undertake a reliable analysis of potential predictors were a driver involved in a crash or a driver involved in an injury crash (table 2). Logistic regression revealed that personality factors did not predict either of these outcomes, and so no further analysis were conducted for the females.

As driving exposure is a crash risk, the relationship between personality characteristics and exposure was assessed (table 3). Driving exposure was associated with traditionalism, well-being, and social closeness. For each of these personality variables, there was a higher proportion of those with a low

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**Table 1** MPQ scale descriptions (from Caspi et al)45

<table>
<thead>
<tr>
<th>MPQ scale</th>
<th>Description of a high scorer</th>
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</thead>
<tbody>
<tr>
<td>Constraint</td>
<td>Desires a conservative social environment; endorses high moral standards</td>
</tr>
<tr>
<td>Traditionalism</td>
<td>Averts excitement and danger; prefers safe activities even if they are tedious</td>
</tr>
<tr>
<td>Harm avoidance</td>
<td>Is reflective, cautious, careful, rational, and planful</td>
</tr>
<tr>
<td>Control</td>
<td>Avoids excitement and danger; prefers safe activities even if they are tedious</td>
</tr>
<tr>
<td>Negative emotionality</td>
<td>Hurts others for own advantage; will frighten and cause discomfort for others</td>
</tr>
<tr>
<td>Aggression</td>
<td>Feels mistreated, victimized, betrayed, and the target of false rumors</td>
</tr>
<tr>
<td>Alienation</td>
<td>Is nervous, vulnerable, sensitive, and prone to worry</td>
</tr>
<tr>
<td>Stress reaction</td>
<td>Works hard, and enjoys demanding projects and working long hours</td>
</tr>
<tr>
<td>Positive emotionality</td>
<td>Desires a conservative social environment; endorses high moral standards</td>
</tr>
<tr>
<td>Achievement</td>
<td>Is sociable, likes people and turns to others for comfort</td>
</tr>
<tr>
<td>Social Potency</td>
<td>Is forceful and decisive; fond of influencing others; fond of leadership roles</td>
</tr>
<tr>
<td>Well-Being</td>
<td>Has a happy, cheerful disposition; feels good about self and sees a bright future</td>
</tr>
<tr>
<td>Social closeness</td>
<td>Desires a conservative social environment; endorses high moral standards</td>
</tr>
</tbody>
</table>
level of driving exposure that also reported low levels of these personality characteristics.

The results of the logistic regression for the males are presented in tables 4–6. For the substance use outcomes, no personality traits were associated with unsafe drink driving. Lower levels of traditionalism (odds ratio = 0.24 (95% CI 0.10 to 0.57)), harm avoidance (odds ratio = 0.36 (95% CI 0.16 to 0.80)), and control (odds ratio = 0.28 (95% CI 0.12 to 0.62)), as well as higher levels of aggression (odds ratio = 8.80 (95% CI 3.31 to 23.41)) and alienation (odds ratio = 3.14 (95% CI 1.36 to 7.25)), predicted persistent driving after using marijuana (table 4).

For the risky driving behavior outcomes, higher levels of aggression predicted persistent driving fast for the thrill of it. Lower levels of traditionalism (odds ratio = 0.40 (95% CI 0.20 to 0.79)) and higher levels of aggression (odds ratio = 1.81 (95% CI 1.46 to 5.38)) and well-being (odds ratio = 2.06 (95% CI 1.05 to 4.02)) predicted persistent driving faster than 120 km/h on the open road (table 5).

For males, the same procedure was used to examine the association between each of the personality factors and crash involvement. At a univariate level (data not shown), similar personality traits predicted being a driver involved in any crash and being a driver involved in an injury crash. High levels of aggression (any crash, OR = 2.09 (95% CI 1.28, 3.40); injury crash OR = 2.29 (95% CI 1.09, 4.81)) and alienation (any crash OR = 1.74 (95% CI 1.00, 3.08); injury crash OR = 4.30 (95% CI 1.42, 12.99)) predicted both of these outcomes. Low levels of traditionalism predicted involvement in an injury crash (OR = 2.88, (95% CI 1.19, 6.98)). Interaction between the personality predictors was investigated. However, likelihood ratio test comparison of each logistic model with and without the inclusion of interaction effects revealed no improvement. After adjusting for exposure to driving, aggression was the only predictor of involvement in a crash, while alienation and traditionalism both independently predicted involvement in an injury crash (table 6). Analysis of the receiver operating characteristic curves for each of the models revealed a moderate level of classification accuracy (c-statistic for driver involved in any crash = 0.66, c-statistic for driver involved in an injury crash = 0.69).

**DISCUSSION**

The current study examined the relationships between personality measured in late adolescence and persistent risky driving behaviors between 18 and 26 years for males. Unlike previous studies that have examined relationships between the higher-order MPQ scales and driving behaviors, the current investigation sought to examine the relationships between the individual personality traits measured by the MPQ and risky driving behaviors and the potential outcomes of risky driving behaviors, that is a driver involved in a crash or a driver involved in an injury crash as a young adult. Aggression (driver involved in any crash), alienation, and traditionalism (driver involved in an injury crash) were associated with crash risk.

Aggression and alienation belong to the negative emotionality super-factor, while traditionalism, harm avoidance and control belong to the constraint super-factor. Although low levels of constraint have previously been identified as a predictor of substance use and driving and risky driving behavior in males, the present investigation suggests that the specific factors within this super-factor that predict risky driving behaviors are dependent on the outcome being measured. For example, all three factors were associated with persistent driving within 2 h of using marijuana, while only low levels of control were associated with persistent driving fast for the thrill of it, and low levels of traditionalism and harm avoidance were associated with persistent driving over 120 km/h on the open road. Contrary to expectations, after controlling for exposure to driving, only traditionalism was associated with crash involvement.

It is of interest that previous investigations of the relationships between the MPQ super-factors and risky driving behaviors have not established a relationship between negative emotionality and any of the outcome variables used in this study. These investigations have, however, included another measure of aggression (measured as part of a self-report delinquency scale), which has been shown to be a predictor of non-alcohol or drug-related risky driving behaviors in males.

The inclusion of this alternative measure of aggression may have masked the effect of the negative emotionality super-factor. In the current investigation, the MPQ factor of aggression was one of the most consistent predictors of these outcomes, being identified as a predictor of all outcome variables except persistent driving after drinking too much and being the driver involved in an injury crash. The other negative emotionality factor was alienation, which was associated with persistent driving within 2 h of using marijuana and being involved in an injury crash.

A significant body of research points to a link between aggression and dangerous driving practices. For example, using the DMHDS data, Caspi et al identified that those who recorded a higher aggression score at age 18 were more likely to drive after drinking, travel as a passenger with a drinking driver, and not use their seatbelt. Unfortunately, the authors only controlled for gender in their multivariate model, and did not investigate gender differences at the univariate stage. The results of this study extended those of Caspi et al to show that...
aggression is also associated with persistent risky driving behavior as well as being the driver in a crash. The Driver Anger Scale has been associated with crash-related conditions such as loss of concentration, loss of control, and having a “close call”, as well as non-aggressive risky driving behaviors such as speeding and driving without a seatbelt. In an earlier study, Hemenway and Solnick reported that “youth and possibly ‘quite enjoy the buzz they get’. Alternatively, they may look forward to the ‘buzz’ and get themselves involved in situations where an aggressive driving incident is more likely.”

There is a smaller body of research reporting a link either between alienation or traditionalism and crash involvement. In an investigation of the attitudinal predictors of “interpersonally aggressive” violations on the road, Parker and colleagues suggested that those who get involved in aggressive driving behavior more often develop less negative affective attitudes and possibly “quite enjoy the buzz they get”. Alternatively, they may look forward to the “buzz” and get themselves involved in situations where an aggressive driving incident is more likely. Parker also presented another suggestion, that there are certain people who choose to present themselves as drivers who commit driving violations. Such people, considered to have mild levels of social deviance have been reported to have an aggressive driving style, which has been linked to more active accidents (where the driver is to blame). It is possible that those who scored high according to the alienation factor and/or low on the traditionalism factor may have misrepresented themselves as persistently dangerous drivers, resulting in a spurious relationship between alienation/traditionalism and crash involvement. However, the personality measures and risky driving behaviors or outcomes were measured in separate interviews (at age 18 and age 21 and 26, respectively). In addition, research by Underwood and colleagues suggests that those with mild levels of social deviance do have more aggressive driving styles and, as such, are at higher risk of crash involvement.

The MPQ scales of alienation and aggression have been shown to be correlates of abnormally high levels of delinquent acts in 18-year-olds, and as predictors for multiple risk behaviors including unsafe sex, dangerous driving habits, participation in violent crime, and alcohol abuse in 21-year-olds. Moffitt et al. describe those involved in high levels of antisocial behavior throughout the early part of their life (“life-course persistent”) as having high levels of negative emotionality and callousness. It is possible that the outcome variables measured for this investigation represent an extension of the antisocial behavior in which this group engage. If so, it is unlikely that they will divert from this path of dangerous driving behavior and may well go on to become “hard core offenders” in whom it may be extremely difficult to change their behavior.

One limitation of this study was the rough estimate of driving exposure. The driving exposure measure was designed

### Table 3: Chi-squared analysis of relationship between personality factors (age 18) and exposure (age 21–26), males only

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Low n (%)</th>
<th>Medium n (%)</th>
<th>High n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>38 (44)</td>
<td>47 (21)</td>
<td>32 (26)</td>
<td>117</td>
</tr>
<tr>
<td>Medium</td>
<td>53 (40)</td>
<td>112 (49)</td>
<td>69 (30)</td>
<td>294</td>
</tr>
<tr>
<td>High</td>
<td>40 (30)</td>
<td>76 (37)</td>
<td>35 (31)</td>
<td>151</td>
</tr>
<tr>
<td>Medium</td>
<td>46 (27)</td>
<td>75 (36)</td>
<td>50 (31)</td>
<td>171</td>
</tr>
<tr>
<td>High</td>
<td>47 (38)</td>
<td>46 (37)</td>
<td>36 (37)</td>
<td>129</td>
</tr>
</tbody>
</table>

### Table 4: Results from the univariate logistic regression to identify personality predictors (age 18) of persistent driving after substance use for males

<table>
<thead>
<tr>
<th>Exposure</th>
<th>Low n (%)</th>
<th>Medium n (%)</th>
<th>High n (%)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>25 (44)</td>
<td>76 (40)</td>
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to be an indicator of those who would be at the highest risk of being involved in a crash simply because they were exposed to more time on the road. It was not designed to be a highly sensitive indicator of the increase in crash risk for each unit increase in time spent driving. As such, we believe that this measure served the purpose for which it was designed.

A second limitation of this study was the inability to explore this issue for females. The small size of the cohort, combined with the small proportion of females who are involved in risky driving behaviors, prevented this analysis.

**IMPLICATIONS FOR PREVENTION**

This, and previous investigations, have highlighted the importance of certain personality determinants of risky driving behaviors and crash involvement for males. Given that those at risk do not endorse traditional values, are aggressive and feel alienated from society, interventions should be directed towards this group to prevent persistent involvement in these behaviors and their outcomes. Such interventions should branch out from mainstream advertising and tap in to the culture of this group of society, perhaps by focusing on the world-wide web or other alternative forms of media. If personality traits can be identified at a young age, perhaps they could be targeted before these individuals start driving, to try and prevent them developing these behaviors.

**ACKNOWLEDGEMENTS**

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Personality and risky driving behavior

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Competing Interests: None

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SPECIAL ANNOUNCEMENT

Barry Pless—a celebration of his editorship of Injury Prevention

Barry Pless’ term of office as Editor of Injury Prevention is ending. He has edited the journal since its foundation in 1995, and was involved in its development before the first issue.

To celebrate his huge contribution, a festschrift is being presented in Merida, Mexico, to coincide with the 9th World Conference on Injury Prevention and Safety Promotion.

The festschrift, which is being organized with assistance from the ISCAIP (International Society for Child and Adolescent Injury Prevention), will immediately follow the ISCAIP Conference on Friday 14 March 2008 (for details of the ISCAIP Conference, visit http://www.iscaip.net).

There is no charge for attendance, but pre-registration is required to allow us to manage numbers. Final details of the program, timings, and venue will be published in due course. If you would like to attend, please contact Mike Hayes (mike.hayes@capt.org.uk).