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## **THE PSYCHOLOGICAL PREDICTORS OF WORK ACCIDENTS AND DRIVING CONVICTIONS IN THE TRANSPORT INDUSTRY**

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### **ABSTRACT**

The present study aimed to identify both cognitive and non-cognitive psychological measures that may be significant predictors of work related injuries within the transport industry. Sixty male transport drivers' participated. The participants were required to complete the Driver Behaviour Inventory (Gulian, Matthews, Davies & Debney, 1989) the revised edition of the NEO Personality Inventory (Costa & McCrae, 1992) the Occupational Stress Inventory (Osipow & Spokane, 1992) and the General Health Questionnaire (Golberg, 1984). As hypothesised those participants who reported higher levels of stress both lifestyle and occupation related also reported a higher incidence of accidents and reporting of compensation claims. There was no indication of a relationship between extraversion and/or neuroticism with increased work injury or reported convictions. Exploratory findings suggest that individuals presenting more workers compensation claims as a result of injury and driving convictions report higher levels of conscientiousness and agreeableness and higher levels of excitement seeking. The cognitive information processing measures included the Inspection Time Task (Vickers, 1970) which is a measure of early information processing and components of the Multidimensional Aptitude Battery (Jackson, 1984) including a set of five performance tasks and one verbal task. As hypothesised those participants who performed better perceptually and who recorded higher spatial awareness, tend to report less work related driving accidents. The results are discussed in terms of selection tools and intervention programs for this 'at risk industry'.

### **INTRODUCTION**

Millions of dollars are spent annually on compensating accidents that occur within the workplace. The current study examines the relationship between cost and incidence of work related injury within the transport industry in Australia and psychological variables. Specifically, the present study aimed to identify the psychological measures that may be significant predictors of work related injuries within the transport industry, targeting short and long-haul truck drivers including a further smaller sample of forklift drivers.

#### **The Cost of Work Related Injury**

The cost of work related injury in Australia is of a high magnitude in both social and economic terms and of particular interest are those industries where employees in potentially dangerous situations or substantial physical strain. These occupations are of special concern, in regard to their potential for injury, and

ultimate costs, both to the industry and employee. One of the industries included in this special group is the transport and storage industry, which is the focus of the current research.

### **The Transport and Storage Industry**

In 1992-1993 the transport and storage industry recorded in Australia 14,600 new cases of workers compensation, 48 cases for every 1,000 wage and salary earners, 29 cases for every million hours worked in Australia (ABS, 1996). In terms of cost, the Australian Federal Office of Road Safety estimated there to be over one thousand heavy vehicle crashes per year in urban areas throughout Australia costing the industry \$100 million per year (Australasian Transport News, 1996). In 1993-1994 the transport and storage industry recorded the highest percentage of fatalities (17.9%) and was one of the major occupational groups with the largest number of compensation occurrences (Worksafe News, 1996).

Obviously the development of strategies to decrease accidents and injuries in the transport and storage industry would potentially save millions of dollars per year on work related accident compensation claims. Thus, the present research attempted to systematically investigate potential psychological contributors to this problem.

### **Accident Proneness: The Conceptual Framework**

The concept of accident proneness has had a long and debatable history. It is estimated that 90% of accidents can be attributed to human error. This human component in accident involvement is difficult to study because of the lack of consensus on what defines accident proneness (McKenna, 1982; Lardent, 1991). The theoretical framework on which this research is based accepts the construct differential accident involvement as opposed to a theory of accident proneness. Accident proneness defines itself by stating there is a set of unitary set of personal characteristics that will result in accidents under any set of circumstances. The construct 'differential accident involvement' defined by Lardent (1991) is characterised by the notion that there are a set of personal characteristics that predispose one person more than another toward an accident outcome and that these personal characteristics can be distinguished on the basis of psychological tests. To date there is some research evidence indicating the validity of psychological variables in predicting accident outcome ( Cattell, Eber & Tatsouka, 1970; Hilakivi et al, 1989; Arthur & Grazziano, 1996)

### **Personality Constructs and Accident Involvement**

A wide ranging group of personality factors have been shown to be related to accident prone behaviour. A generic profile and regression equation developed by Cattell, Eber and Tatsuoka (1970) entitled "freedom from accidents" has formed the basis of subsequent research focussed on predicting accident involvement in a number of industries. The "freedom from accidents" profile was developed using The Cattell 16 Personality Factor Questionnaire (16PF). Cattell has stated the factor M (abstractedness), suggesting that individuals high on this factor have less self control and may not externally evaluate their driving behaviours. In addition, other factors may be important. For example, Factor C, low ego strength measures the degree to which an individual feels a lack of control over their life and lack of foresight to make right choices. Factor E & F, high dominance and high liveliness may play a role in favouring greater risk taking, aggression and impatience in dealing with certain situations (Russell & Karol, 1994).

Subsequent research employing The Cattell generic profile has resulted in varied conclusions. Lardent (1991) used Cattell's profile to assess the differences between a group of Phantom fighter pilots who "crashed" versus those deemed to be "safe". It was concluded that this particular group is in clear opposition to Cattell's generic profile and constitute a special case, where conventional views of accident behaviour do not apply. What is clear from this study is that there are identifiable patterns of personality characteristics that set apart those having accidents from those who are not, and that this information can be drawn from standard psychological tests. These results are confirmed by previous research by Hilakivi et al (1989) who examined the frequency of automobile accidents among a group of military serviceman. They concluded that although some contrast existed between their results and Cattells' generic profile, the 16PF clearly differentiated workers who have accidents from those who do not.

## **Personality Assessment**

Russell and Karol (1994) administered both the NEO PI-R (Costa & McCrae, 1992) and the 16PF to 257 undergraduates in an attempt to illustrate the correlations between the two personality scales. They concluded that strong parallels exist between the two personality scales. For the purpose of present research the NEO PI-R has been employed to investigate personality contributors to differential accident involvement. The NEO PI-R is widely regarded as a test of personality with wide ranging application in both clinical and non-clinical settings, although it has been not widely used in the area of accident research (Costa & McCrae, 1992). The relationship between the dimensions of the five-factor model and driving accident involvement has been investigated in only one other study by Arthur and Grazziano (1996); they proposed specifically that conscientiousness would be inversely related to driving accident involvement. They found that individuals who rate themselves as more self-disciplined, responsible, reliable and dependable are less likely to be involved in driving accidents (p 593 ). Previous research by Barrick and Mount (1991) concluded that in personnel selection, the most useful factor in the five-factor model is conscientiousness. Arthur and Grazziano (1996) suggest that an advantage of the five-factor model is that it may ultimately provide a more systematic and comprehensive approach to the study of personality and its relations to overt behaviours like driving accident involvement. (p.596 ).

## **Stress in the Workplace**

A special aspect of working life, which has implications for stress-related health problems, is accidents at work. Hartley and El Hassani (1994) have proposed that stress is a result of job demands exceeding the cognitive resources available, therefore leading to a performance decrement in driving skills. They suggest that “the stress may arise from many sources, including driving demands, job demands such as meeting delivery schedules, preoccupation or worry about domestic and occupational matters, poor vehicle design and poor mental and physical health” (p.221).

General literature has pointed to a number of different factors that may contribute or cause occupational stress. Isherwood, Adam and Hornblow (1982) suggest that the impact of life event stress leads to a series of problems such as psychiatric or physical illness and accident susceptibility. Matthews, Dorn and Glendon (1991) confirm this view examining specifically the impact of ‘daily hassles’ on individual differences in driving stress. It was suggested that a high incidence of daily hassles could predispose a driver to have adverse emotional reactions to traffic related stressors.

Alternatively it is posited that certain behavioural or personality styles may increase the vulnerability to an accident. Warshaw (1979) suggests that ‘personality acts as a modifier in the perception and subsequent reaction to a stressor, and thereby implicated in accident vulnerability’ (P.69). Sutherland and Cooper (1991) suggest that the way an individual responds to stress is the product of the situation and what person variables that individual brings with them to the situation. Research has primarily focussed on personality characteristics such as extraversion-introversion and neuroticism. Sutherland and Cooper (1987; 1991) conclude that individuals high in neuroticism report significantly more accident involvement than those in low neuroticism, report more stress and lower levels of well being. Furthermore, extraverted individuals report more accidents than their introverted counterparts. There were no significant differences reported between the two groups for reported stress or mental well-being.

## **Cognition and Information Processing Characteristics and Accident Involvement**

There has been much work on the four categories previously mentioned concerning driving accident involvement, however previous research often fails to combine both cognitive and non-cognitive factors such as personality and stress as predictors.

O’Toole (1990) examined the risk factors for mortality from motor vehicle accidents (MVA) in army training comparing those who had died from a MVA with a random sample of survivors using data from survivor records. It was generally agreed that driver error is one of the most important contributors to MVA, whether they are caused by perceptual errors in processing, personality or cognitive processing or some combination of these. Shinar (1993) examined individual differences in drivers attention and information capacity, he proposed that driver inattention and deficiencies in information processing have been shown to be major factors in accident causation. Shinar regards the driver as a human information processor in a negative feedback loop model where the driver’s actions are based mainly on visual inputs

which are the combined effects of environment and the driver's immediately previous actions. This led to individual differences in attentional and information processing capacities that would account for differential accident involvement" (p.219).

Deary and Stough (1996) propose that generally two approaches are used in research when looking at cognitive ability. Firstly physiological correlates of conventional IQ scores ie: psychometric intelligence and various brain imaging techniques. Secondly, the associations between scores on psychometric tests and performance on basic psychological indices. These associations will promote a more definite understanding of differences cognitive abilities, if it can be shown that there are individual differences in basic cognitive processing that are correlated with higher level abilities as measured by mental tests. They actually have argued that of all information processing tasks Inspection Time (IT) has been the most successful, correlating most highly on performance on standard psychometric tests. It seems suitable to use such a measure as IT, which specifically detects early visual information processing along with standard test, of mental ability, exploring attention, memory and perceptual style.

### **Driving Accident Prediction**

As previously stated the human and financial costs associated with driving accidents are high. Elander, West and French (1993) stated that many constructs are related and are relevant to driving behaviour and no single ability, skill, or variable will predict all aspects of driving. Arthur, Barrett and Alexander (1991) agree and further state that of the several approaches predicting accident involvement four categories seem to predominate and these are; personality, cognitive ability, information-processing and demographic variables. The current study further extends these four categories by including occupational and lifestyle stress, working environment and driver behaviour and attitudes. toward their own position. To date there has been research that suggests that these predictors can strongly influence job performance (Isherwood, Adam & Hornblower, 1982; Matthews, Dorn & Glendon, 1991; Hartley & El Hassani, 1994).

### **Research Aim**

The current research aim is to investigate differential accident involvement within a group of transport industry workers, where differential accident involvement refers to both the incidence of accidents, the number of claims reported and accident costs. It is proposed that the psychological antecedents underlying differential accident involvement can be adequately assessed using a set battery of psychological tests. Based on previous research the current aim will focus on the relationships between personality, occupational stress, cognitive ability, information processing, general and accident involvement. It is proposed that these variables will be highly predictive of the incidence of accidents and the number of workers compensation claim.

### **Research Hypotheses**

The research hypotheses are:

That there will be a difference between transport industry workers who have had accidents at work and those who are 'accident free' and that these differences can be explained by a group of underlying psychological antecedents namely, personality, stress, cognitive ability, information processing and general health. Specifically,

1. The incidence of accidents will positively correlate with increased occupational and life event stress.
2. The incidence of accidents and convictions will positively correlate with increased neuroticism and/or extraversion.
3. The incidence of accidents and convictions will negatively correlate with increased conscientiousness.
4. The incidence of accidents and convictions will correlate negatively with cognitive ability and information processing ability.

## METHOD

### Assessment Devices

#### ***The Occupational Stress Inventory (OSI)***

The OSI, (Osipow & Spokane, 1995) measures three dimensions or domains of occupational adjustment: occupational stress, psychological strain, and coping resources. The OSI was developed for two reasons firstly to develop generic measures of occupational stressors that would apply across different occupational levels and environments. Secondly to provide measures for an integrated theoretical model linking sources of stress in the work environment, the psychological strains experienced by an individual as a result of work stressors, and coping resources available to combat the effects of stressors and alleviate strain (Osipow & Spokane, 1992)

#### ***The General Health Questionnaire (GHQ)***

The GHQ, (Goldberg & Williams, 1991) examines two major classes of phenomena: inability to carry out one's normal 'healthy' functions, and the appearance of new phenomena of a distressing nature. For the purpose of the present research the 28-item version of the GHQ was used as a screening device to detect psychiatric disorder within the sample. The GHQ primarily detects disorders of less than two weeks duration; therefore, it is very sensitive to transient disorders, which may remit without treatment. The four sub-scales aim to detect somatic symptoms, anxiety and insomnia, social dysfunction, and severe depression.

#### ***The Revised NEO Personality Inventory (NEO PI-R)***

The NEO PI-R, (Costa & McCrae, 1992) is a concise measure of the five major domains of personality and some of the more important traits or facets that define each domain. The five domains that comprise the NEO PI-R include Neuroticism (N), Extraversion (E), Openness (O), Agreeableness (A), and Conscientiousness (C). Each of the five domains comprises six facets providing a 30-facet scale to allow a comprehensive personality assessment. For the purpose of current research, Form S, was employed (self-report) as opposed to the alternate observer rating form (Form R). The NEO-PI-R self report form is a 240 word questionnaire, responses are made on a 5-point Likert-type scale ranging from strongly disagree to strongly agree.

#### ***The Driving Behaviour Inventory (DBI)***

A slightly altered version of the DBI (Gulian, Matthews, Glendon, Davies & Debney, 1989) formed the basis of the current research. Items of the DBI were selected on the basis of face validity to measure several dimensions of driver stress. Comprising 79 questions covering the following areas: personal background (6 items), vehicle use in relation to work (12 items), driving history (10 items) and attitudes toward driving (51 items). A further two sections were incorporated, working conditions (9 items) including questions on vehicle comfort and shiftwork and a final section on exposure to life stresses (15 items), such as death in the family or hospitalisation.

#### ***The Multidimensional Aptitude Battery (MAB)***

The MAB (Jackson, 1984) provides a convenient objectively-scoreable measure of general aptitude or intelligence in the form of a profile containing five verbal and five performance subtest scores. For the purpose of the current study and due to the task requirements of driving, the five performance subtests were used and a single verbal subtest. The MAB was designed to allow for group testing as opposed to individual administration. It has been concurred by other authors (Matarazzo, 1972) that individual testing in 'normal populations' has in general no advantage in yielding higher predictive validities. The MAB consists of two groups of scales, verbal (information, comprehension, arithmetic, similarities, vocabulary) and non-verbal (digit symbol, picture completion, spatial, picture arrangement, object assembly). These are presented in separate booklets to allow for separate administration. The MAB employs five-choice multiple-choice items for all subtests with seven minutes to complete each subtest. The MAB yields a Verbal IQ, a Performance IQ, and Full Scale IQs.

### ***Inspection Time (IT)***

Inspection time measures the speed of intake of information. The task itself has two parallel vertical lines, with one being longer than the other. The two lines are joined at the top by a horizontal bar. There are two forms one has the long line on the left one has the long line on the right. The sizes of the vertical lines differ allowing for no discriminative difficulty. The exposure time of the stimulus can be limited by allowing participants to view the lines for a limited time period. As the exposure time decreases the accuracy of judgement decreases. A backward mask to disallow processing information in iconic storage follows the stimulus. To estimate inspection time stimuli are presented in a random fashion using a range of durations, typically from a few hundred milliseconds to 10 milliseconds or less. The participant is required to state whether the long line appears on the left or right, under no time pressure. The correctness of participants' judgement is taken; no measure of reaction time is required (Deary & Stough, 1996).

### ***Cognitive Failures Questionnaire (CFQ)***

The Cognitive Failures Questionnaire (Broadbent, 1982) measures self reported failures in perception, memory and motor function. CFQ is a 25-item questionnaire, respondents answering on a 5-point Lickert type scale ranging from 'never' to 'very often'. All response scales are labelled in the same direction.

### **Participants**

Participants were 58 male transport industry workers ( $\underline{M}$  = 35.79 years,  $\underline{SD}$  10.13 years). The range of employment length with the company varied between two months and 13.5 years, ( $\underline{M}$  = 55.13 months,  $\underline{SD}$  = 39.85 months). The majority of participants were employed in a full time capacity (85.7%), the remainder on a casual basis (8.9%). Of the 58 participants, 83% were employed as heavy vehicle drivers, the bulk of them local drivers with the exception of interstate drivers (9.4%), the remaining 17% were fork lift drivers. The level of driving experience was 10 years or more for the majority of participants (69.7%)

### **Accident Variables and Conviction Variables**

Eleven accident variables were collected for analysis. For the purpose of analysis the construct differential accident involvement was defined by the three variables: incidence of accidents, number of work compensation claims and costs incurred as a result of vehicle accidents. Conviction variables including speeding convictions, dangerous driving convictions and driving under the influence convictions were derived from the self-report measure DBI. The remaining six variables related to previous work accidents including, seriousness, responsibility and preventability of last accident, length of time since last accident and change of driving style post accident.

### **Procedure**

The present research involved three sessions, which focussed on personality, occupational stress, and cognitive variables such as information processing and general aptitude. The protocol was administered across three sessions, each of one hour duration. Each session tested approximately five participants, whom completed the protocol over three days.

## **RESULTS**

### **Demographics**

In terms of accident involvement in the workplace thirty of the participants (53.6%) reported being involved in 1-3 work accidents during their working career, 13 participants (23.2%), reported being involved in no work accidents at all, and 6 participants (10.7%), reported 4-6 work accidents. The remaining participants did not indicate the number of work accidents they had been involved in and so were excluded from analysis.

### **Comparison of groups**

One way analysis of variance (ANOVA) indicated that there were no significant differences between groups (forklift drivers, local heavy vehicle drivers, interstate heavy vehicle drivers) for either the accident variable set or the number of driving convictions reported. The remaining analyses dealt with the sample as

a single group and did not differentiate between forklift, local or interstate heavy vehicle drivers. Alternatively for the purpose of looking at the mean scores for the domains of the NEO-PI-R, the MAB subtests and the OSI facets the groups were divided into “accident free” and “accident reported”.

### Working Conditions

Correlational analyses were performed examining the relationship between working conditions and accident and conviction variables. Working conditions referred to the level of stress associated with temperature, noise, glare and design of the vehicle driven. It also included shifts worked, hours of sleep, work schedule, penalties associated with not keeping to a schedule and hours driven in a day. There were no significant correlations between the set of accident variables or conviction rates with the vehicle driven or the task of driving itself. Significant positive relationships were found between the number of hours driven within a 24 hour period and the incidence of accidents and costs incurred as a result of a workplace accident. These results indicate that as the number of hours driven within a 24 hour period increase the number of accidents and cost of accidents increase.

### The Relationship between Accident Variables, Convictions and Psychological Inventories

Correlational analyses were carried out to examine relationships between psychological variables (personality, stress, general health, general aptitude, information processing and cognitive failures) and accident and conviction variables, because of the large number of correlations undertaken a more stringent alpha was employed in the present study ( $p = .01$ ). Psychological variables included: four subscales of the GHQ, three domains of the OSI, five domains of the NEO PI-R, a single LSQ total, 6 subtest scaled scores of the MAB, a single CFQ total and a single IT total. A number of significant correlations were indicated between the psychological variables; personality, stress, general health, general aptitude, cognitive failures, inspection time and accident and conviction rates.

**Table 1**  
**Correlation Among Accident Variables and Psychological Inventories**

	Accid 1	Accid 2	Accid 3	Acci d4	Accid 5	Accid 6	Speed	DUI	Dang	Cost	CI No
<b>Ghqa</b>	.080	.216	.018	.252	.230	.145	<b>.346*</b>	.030	.165	-.030	.674
<b>Ghqb</b>	.095	.337	-.153	.165	.383	.164	.226	-.111	-.045	-.164	.497
<b>Ghqc</b>	-.136	-.250	.131	.223	-.023	.027	-.016	-.064	-.349	.028	-.394
<b>Ghqd</b>	.201	.073	-.234	.011	.104	.008	-.122	-.223	-.136	.010	.040
<b>Orq</b>	.117	-.040	-.243	.240	.074	-.129	-.097	.045	.043	.231	.198
<b>Psq</b>	.372	.186	-.205	.043	-.033	.139	.058	.157	.154	.350	.566
<b>Prq</b>	-.032	-.068	-.128	.108	-.130	-.301	.071	.096	.096	.024	-.356
<b>Lsq</b>	-.093	.112	.006	.164	.013	.039	-.187	.098	.098	.063	-.204
<b>Neon</b>	.226	.259	-.239	.087	.341	.071	.176	-.130	-.059	.047	.474
<b>Neoe</b>	-.212	-.275	-.052	-.333	-.114	-.355	-.237	-.107	-.049	.178	-.047
<b>Neoo</b>	-.133	.007	.082	-.149	<b>-.417*</b>	-.167	<b>-.416*</b>	-.168	<b>-.355*</b>	-.055	.166
<b>Neoa</b>	-.010	-.142	.045	.074	.013	.228	-.191	.052	.006	-.140	.231
<b>Neoc</b>	-.120	.154	-.061	.149	.157	-.002	-.348	-.013	.181	-.012	<b>-.702*</b>
<b>It</b>	-.031	.068	.212	-.025	.080	.072	.104	.106	.126	.028	-.146
<b>Cfqt</b>	.399	.556	-.104	.179	-.082	.390	-.148	-.055	.061	.149	-.029
<b>Ds</b>	-.229	-.289	.116	-.012	-.104	-.424	-.230	-.157	<b>-.416*</b>	-.235	.067
<b>Oa</b>	<b>-.429*</b>	-.004	.221	-.066	.076	-.257	-.266	-.227	-.332	-.231	.088
<b>Pa</b>	<b>-.444*</b>	-.166	.158	-.025	.147	-.166	<b>-.379*</b>	-.162	-.276	-.169	.050
<b>Pc</b>	-.269	-.307	.232	-.000	-.281	-.258	-.209	-.114	<b>-.420*</b>	-.128	-.089
<b>S</b>	-.045	.310	-.005	.361	.056	-.015	-.205	-.090	-.130	-.136	-.083
<b>V</b>	-.019	.019	.083	.165	.410	.009	-.108	-.034	-.322	-.205	-.081

N.B. Bolded values are significant at  $< .01$ \* level.

Legend:

Ghqa-somatic symptoms	Orq-occupational stress	Neon-neuroticism	It-inspection time
Ghqb-anxiety and insomnia	Psq- psychological strain	Neoe-extraversion	Cfqt-cognitive failures
Ghqc-social dysfunction	Prq-coping resources	Neoo-openness	Ds-digit symbol
Ghqd-severe depression	Lsq-life stress total	Neoa-agreeableness	Oa-object assembly
		Neoc-conscientiousness	Pa-picture arrangement
			Pc-picture completion
			s-spatial
			v-vocabulary

A significant positive relationship was found between subscale A (somatic symptoms) of the GHQ and speeding convictions ( $r = .346, p < .01$ ) suggesting that individuals reporting higher somatic complaints also reported a higher number of speeding convictions. Significant negative relationships were found between the openness domain of the NEO PI-R and Accident 5 (Was the accident preventable?) ( $r = -.417, p < .01$ ), speeding convictions ( $r = -.416, p < .01$ ), and dangerous driving convictions, ( $r = -.355, p < .01$ ). These results indicate that less open individuals tend to report more speeding and dangerous driving convictions and report that their accident involvement was not preventable. The number of claims reported correlated negatively with the conscientiousness domain of the NEO PI-R ( $r = -.702, p < .01$ ) this correlation accounts for approximately half of the variance in the two variables, suggesting that less conscientious individuals report more workers compensation claims. Significant negative correlations were suggested between conviction variables and the subtests of the MAB. A significant negative correlation was found between the reporting of speeding convictions and picture arrangement ( $r = -.379, p < .01$ ). These results indicate that those individuals who are less able to organise visual material into a sequential order report more speeding convictions. A significant negative relationship was found between dangerous driving and the performance total of the MAB ( $r = -.399, p < .01$ ), digit symbol ( $r = -.416, p < .01$ ), and picture completion ( $r = -.420, p < .01$ ). These results suggest that those individuals who are less visually oriented, who are impulsive or retain a poor visual-motor co-ordination report more dangerous driving convictions. The number of accidents correlated with two subtests of the MAB, object assembly ( $r = -.429, p < .01$ ) and picture arrangement ( $r = -.444, p < .01$ ), suggesting that those individuals who are less perceptually organised or have less organisational ability report more accidents.

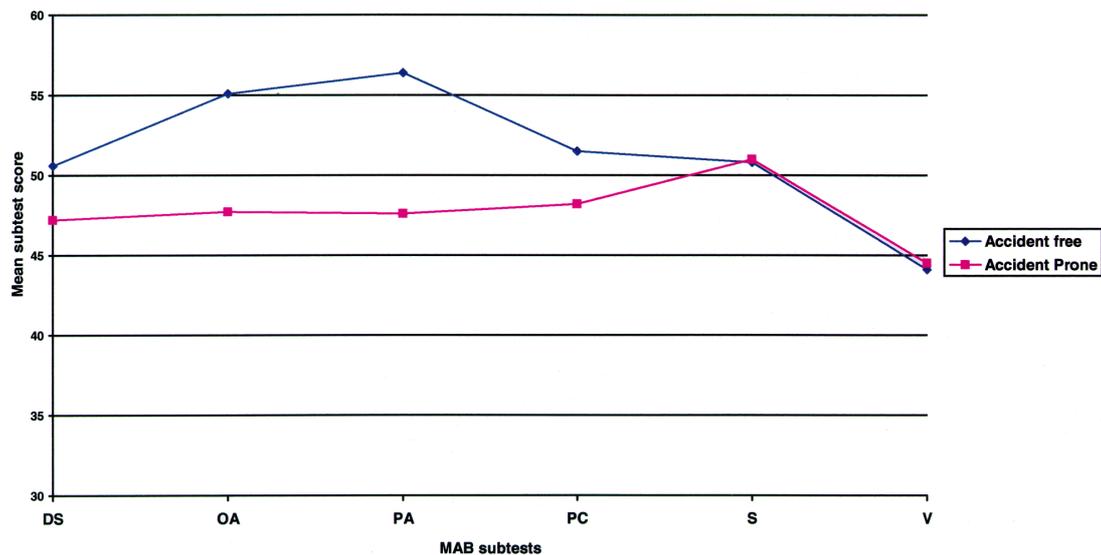


Figure 1 Mean MAB subtest scores for truck drivers with and without accident records

### The Relationship Between the NEO PI-R Facets and Accident and Conviction Variables

Correlations between the individual facets of the NEO PI-R and accident and conviction variables revealed a number of relationships. The mean domain scores for the groups “accident free” and “accident reported” illustrate the differences between these two groups (see Figure 2) Specifically, accident 4 (do you think you were responsible for the accident) was negatively correlated with excitement seeking ( $r = -.51, p < .01$ ) indicating that individuals who were high on excitement seeking tended to feel less responsible for the accident, Accident 6 (did you change your driving style after the accident) was negatively correlated with openness facet actions ( $r = -.45, p < .01$ ) indicating that individuals who score low on actions were more inclined to change their driving style after an accident. Of the conviction scores the number of speeding convictions was negatively correlated with the agreeableness facet modesty ( $r = -.45, p < .01$ ) indicating that those individuals who are less modest tend to report more speeding convictions. Significant negative correlations were observed between speeding convictions and the openness facets; aesthetics ( $r = -.42, p < .01$ ), feelings ( $r = -.44, p < .01$ ) and ideas ( $r = -.52, p < .01$ ) suggesting that individuals who are less interested in art and beauty, who are low in feeling, and who have a limited curiosity, report more speeding

convictions. Driving under the influence was negatively correlated with the neuroticism facet impulsiveness ( $r = -.41, p < .01$ ) suggesting that individuals who are less impulsive tend to report more drink driving offences. The number of compensation claims reported was negatively correlated with the conscientiousness facets order ( $r = -.59, p < .01$ ) and self discipline ( $r = -.62, p < .01$ ), suggesting that individuals who are less organised tend to present more workers compensation claims.

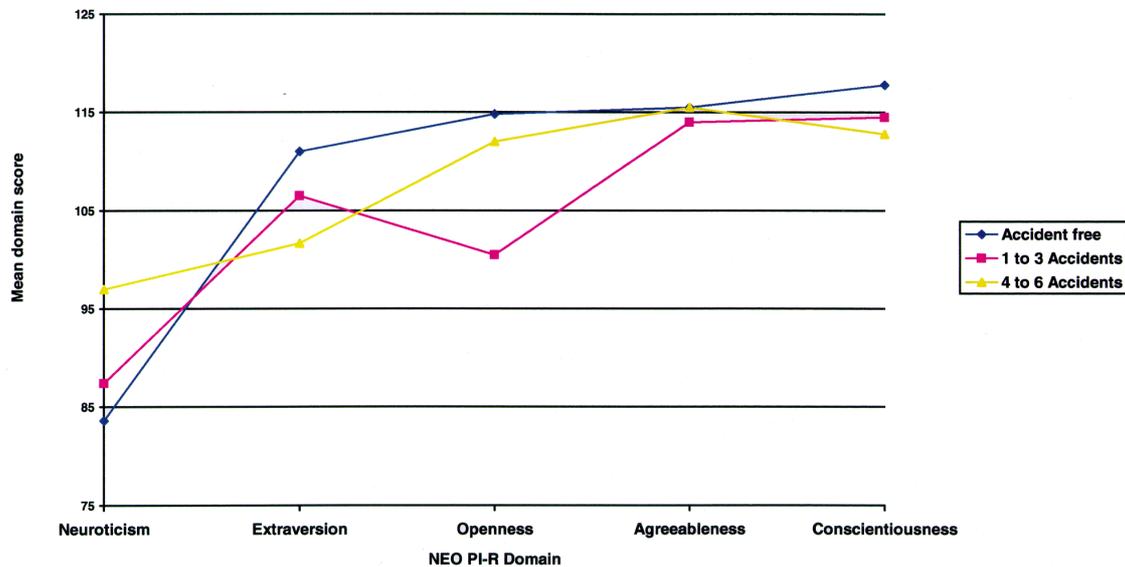


Figure 2 Mean NEO PI-R domain scores for truck drivers with no accident, average and high driving accident records

### The Relationship between the OSI Facets and Accident and Conviction Variables

The relationship between the individual subscales of the OSI and accident and conviction variables indicated that there were significant positive relationships between the level of interpersonal strain reported and the number of accidents reported ( $r = .41, p < .01$ ), and the level of responsibility reported and the number of accidents reported ( $r = .44, p < .01$ ). These results suggest that increased levels of interpersonal strain and increased levels of responsibility results in a higher rate of accident involvement. Positive relationships were found between the number of compensation claims presented and psychological ( $r = -.60, p < .01$ ) and physical strain ( $r = .54, p < .01$ ), suggesting that more claims are reported when there is an increased level of physical and psychological strain.

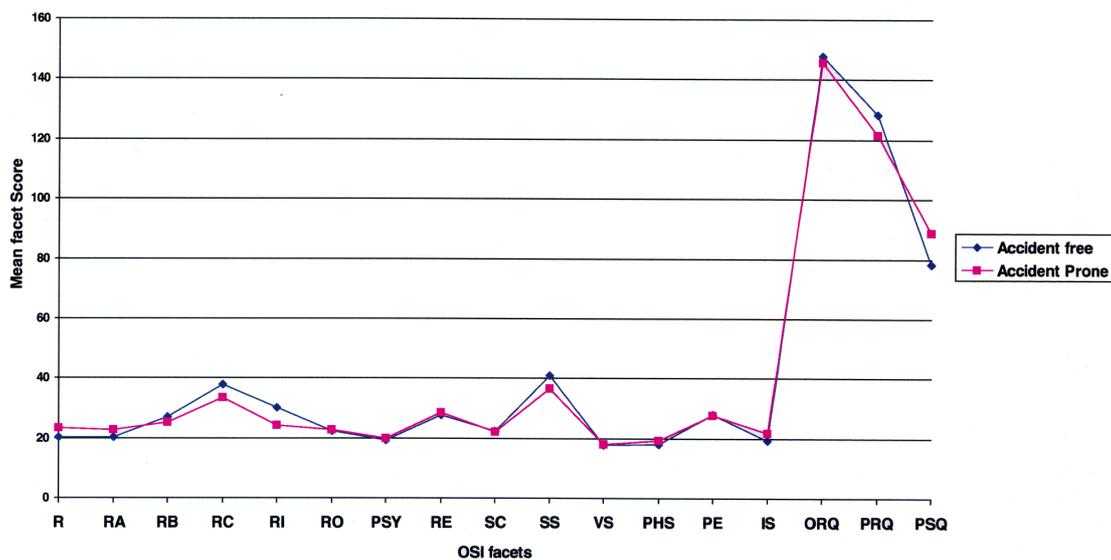


Figure 3 Mean OSI facets for truck drivers with and without accident records

## **The relationship between the CFQ variables and Accident and Conviction Variables**

There were several relationships between accident and conviction variables and the facets of the CFQ. The number of accidents and specific errors on the CFQ indicated that there were significant positive relationships between error 6 (do you find you forget whether you've locked a door or a fire or a locked door?) ( $r = .445, p < .01$ ), error 12 (do you find you forget which way to turn on a road you know well but rarely use?), ( $r = .353, p < .01$ ), and error 20 (do you find you forget peoples names?), ( $r = .327, p < .01$ ). These results suggest that those individuals reporting problems with short-term memory and or attention span report more work accidents. Both accident 2 (length of time before last accident), ( $r = .378, p < .01$ ) and accident 3 (seriousness of accident), ( $r = .378, p < .01$ ) and accident 5 (do you think the accident was preventable), ( $r = .378, p < .01$ ) showed significant positive relationships between error 25 (do you find you cant think of anything to say?), ( $r = .378, p < .01$ ). This indicates that poorer level of social skill and difficulty in retrieval from short term memory the more serious the accident, the greater the time length post accident and the greater the chance of preventability.

The conviction rates also indicated a number of relationships with cognitive errors. Driving under the influence significantly correlated with error 7 (when you are worried about something do you find you turn things over in your head?), ( $r = .356, p < .01$ ), and error 20 (when you are in a bad mood or angry would you say you drive aggressively?), ( $r = .355, p < .01$ ). This suggests that individuals who report more speeding convictions report higher emotional responses in traffic. The cost of driving accidents revealed significant positive relationships with error 6 (when you are worried would you say you drive cautiously?), ( $r = .398, p < .01$ ) and error 12 (in general how much would you say you enjoyed driving?), ( $r = .353, p < .01$ ). This indicates that those reporting higher costs of previous accidents report a more cautious and enjoyable driving attitude. In conclusion the reporting of speeding convictions correlated with one cognitive error, error 1 (do you usually listen to a radio or tape when driving?), ( $r = .430, p < .01$ ). This suggests that individuals who report more speeding convictions tend to report a higher level of various stimuli in addition to the driving task itself.

## **DISCUSSION**

### **Aims of Current Study**

The current research explored the relationship between psychological variables and differential accident involvement and incidence of driving convictions. Differential accident involvement included three aspects of work injury, incidence of accidents over a three year working period, number of workers' compensation claims reported, and accident cost in dollars. Driving convictions referred to speeding, dangerous driving, and driving under the influence convictions. Specifically, the current study aimed to explore the relationship between psychological antecedents (personality, stress, cognitive ability, information processing and general health) and differential accident involvement and driving convictions.

### **The Relationship between Occupational Stress and Accident and Conviction Involvement**

The current research supported the hypothesis that differential accident involvement will positively correlate with increased occupational stress. Results indicated that the incidence of accidents increased with high levels of reported interpersonal strain and increased job responsibility. These findings are consistent with Matthews et al (1991) who have indicated that a high incidence of daily 'hassles' during the working day predispose a driver to adverse emotional reactions in traffic possibly leading to an increased vulnerability toward accidents. Furthermore, Hartley and El Hassani (1994) suggest that stress due to driving demands and preoccupation about domestic and occupational worries lead to increased complaints of mental and physical well being and increased vulnerability toward an accident outcome.

### **The Relationship between General Health and Accident and Conviction Variables**

The current research did not support the hypothesis that differential accident involvement will positively correlate with decreased general health and well being. This concurs with previous findings by Hartley and El Hassani (1994) who concluded no relationship existed between accident involvement and general health within a group of truck drivers. Support was found for the hypothesis that the incidence of convictions will positively correlate with decreased general health and well being. Speeding convictions correlated positively

with somatic complaints this concurs with Hartley and El Hassani (1994) previous findings within a sample of car drivers, it is however the first study to identify the relationship within a sample of truck drivers.

### **The Relationship between Personality and Accident and Conviction Involvement**

The current findings did not support the hypothesis that differential accident involvement will positively correlate with increased neuroticism and/or extraversion. Results indicated that the incidence of compensation claims as a result of work injury negatively related to the conscientiousness domain of the NEO PI-R as hypothesised, and specifically to, order and self discipline facets of conscientiousness. This is consistent with Arthur and Grazziano (1996) who found an inverse relationship between at-fault driving accidents, moving violation tickets and the conscientiousness domain of the NEOPI-R. They further expanded their conclusion by suggesting that the more conscientious driver is sensitive to social responsibility norms, and may engage in less risk taking and/or avoid dangerous situations. These findings are also consistent with conclusions by Cattell et al (1970) whose generic profile of the accident prone individual is composed of a primary factor of the 16PF, rule consciousness. Rule consciousness (Factor G) is positively correlated with all facets of the conscientiousness domain of the NEO PI-R, suggesting that individuals who are unmethodical and lack motivation tend to report more compensation claims from work injury than individuals who are well organised and able to motivate themselves to get the job done properly.

The current research did not support the hypothesis that the incidence of convictions will positively correlate with increased neuroticism and/or extraversion. These results are not consistent with previous findings by Furnham and Saipé (1993) who suggested that convicted drivers took more risks resulting in convictions as a result of high levels of neuroticism.

### **The relationship between Cognitive Ability, Information Processing and Accident and Conviction Variables**

The current findings did not support a relationship between IT (measure of early information processing) and increased accident and conviction scores, this may be a reflection on the small sample size, with only half the current sample completing this particular task. The current findings did however reflect a multitude of relationships between cognitive ability and accident and conviction rates. Specifically, differential accident involvement correlated negatively with MAB subtests object assembly and picture arrangement. It is suggested by Sprandel (1995) that this is indicative of poor social skills and understanding of social custom. This is consistent with Shinar (1990) whom suggests that certain types of information processing behaviours lead directly to accidents in the context of the state of the driver and his/her capabilities. The current study also reported relationships between driving violations and cognitive ability, specifically dangerous driving and the subtests vocabulary, object assembly, digit symbol, and picture completion. This covers a wide range of performance tasks or non-verbal subtests excluding vocabulary. Sprandel (1995) suggests that this infers poor visual perception, low levels of verbal expression, low levels of perceptual organisation and may indicate a carelessness or impulsiveness. The scores of these subtests may be affected by a number of other variables such as visual acuity, perceptual difficulties and attention span. An inverse relationship between speeding convictions and picture arrangement corresponds with the results in so far it indicates a lack of perceptual organisation. These results are supported by a number of previous authors that conclude (Shinar, 1990; Herschel & Leibowitz, 1993; Hartley & El Hassani, 1994) exceeding cognitive resources reduces driving performance and the majority of sensory information used by drivers is visual therefore reduced visual perception or acuity problems result in multiple accidents. In conclusion driver inattention and deficiencies in information processing have previously been shown to be major factors in accident causation (Shinar, 1990).

## **CONCLUSIONS**

In conclusion, the current study suggests that relationships exist between psychological antecedents (personality, stress, cognitive ability, information processing and general health) differential accident involvement and the incidence of driving convictions. Although the current study indicates that the prediction of differential accident involvement can be drawn from standard psychological tests, further investigation expanding the sample could provide more definite results in this area. In terms of the possibility for future use the current findings suggest that by utilising standard psychological inventories identification of those individuals who are more likely to have a work accident or receive a driving

conviction is possible. The possibility of this identification is obvious in its rewards in an industry such as the transport industry who are amongst the five highest in terms of cost per employee for workers compensation, and who are involved in over one thousand heavy vehicle accidents, costing one hundred million dollars per year.

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