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Title:

Adapting the Propensity for Angry Driving Scale for use in Australian research

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Abstract:

Road rage is a topic that receives consistent attention in both the road safety literature and media. Before Australian research can address the underlying factors associated with road rage, there is a need for a valid instrument appropriate for use in this context. The present program of research consisted of two studies. Study 1 used a university sample to adjust the scoring technique and response options of a 19-item American measure of the propensity for angry driving with acceptable reliability and validity. In Study 2, Factor Analysis confirmed a one-factor solution and resulted in a 15-item scale, the Australian Propensity for Angry Driving Scale (Aus-PADS), with a coefficient alpha of .82 ($N = 433$). The Aus-PADS may be used in future research to broaden the Australian road rage literature and to improve our understanding of the underlying processes associated with road rage in order to prevent the problem. Future research should also confirm the factor structure and generate normative data with a more representative sample.

Keywords:

road rage; angry driving; aggressive driving; survey; questionnaire; Australia.

1. Introduction

Road rage is the popular term used to describe impulsive acts of aggression on the road (Harding et al., 1998). The behaviours that constituted driving aggression (road rage) for the purposes of this program of research included yelling at other drivers, making obscene gestures toward other drivers, engaging in intimidating behaviours such as tailgating or following too closely, honking the horn, flashing headlights, intentionally making contact with other vehicles, and intentionally blocking or impeding another vehicle's progress.

Research conducted by the Royal Automobile Club of Queensland indicates that aggressive driving, such as the examples described above, is an increasing problem among Queensland drivers, as more people reported being a victim of road rage, and engaging in road rage themselves, than in the previous driver survey conducted in 1995 (Royal Automobile Club of Queensland, 2002). The driver behaviour literature reveals that this trend is also occurring internationally (DePasquale et al., 2001; Parker et al., 2002).

A major difficulty in assimilating the findings of road rage research is the variety of measures of road rage employed across studies. While many studies consider self-reported road rage (e.g., Hennessy & Wiesenthal, 1997; Hennessy & Wiesenthal, 1999; Perry & Baldwin, 2000; Stokols et al., 1978; Wilson & Jonah, 1988), others have used measures specifically developed for the study (e.g., Jonah et al., 2001; Knee et al., 2001; Yagil, 2001), or even horn honking frequency (e.g., Kenrick & MacFarlane, 1986; Shinar, 1998). Novaco (1991) argues that frequency of horn honking is a particularly problematic measure, as it is often intended as a helpful behaviour, such as when used to warn other drivers of impending danger or hazardous

conditions ahead.

When considering the road rage literature, it becomes apparent that there are few objective measures of road rage available. The Driving Behavior Inventory (DBI) is a reliable and valid tool designed to assess participants' general disposition (or trait susceptibility) to driver stress (Gulian et al., 1989); while the Driving Anger Scale (DAS) is a reliable and valid measure with 33 items that divide into six subscales (hostile gestures, illegal driving, police presence, slow driving, discourtesy, and traffic obstructions) (Deffenbacher et al., 1994). A limitation for the use of the DBI and DAS is that both scales assess stress or anger *experienced*, as opposed to what people would actually *do* in those situations. This is an important limitation, considering evidence that driving anger may not always be congruent with aggressive reactions (Lajunen & Parker, 2001). Thus a tool that assesses both anger and aggressive behavioural response is needed.

The Propensity for Angry Driving Scale (PADS) (DePasquale et al., 2001) assesses what respondents would do in a number of driving situations, as well as making inferences about the severity of anger experienced. The PADS contains 19 items, and reports an adequate internal consistency (Cronbach's alpha) of .88 ($N = 318$) (DePasquale et al., 2001). The scale presents driving situations and asks participants to indicate how they would respond to the given situation by circling one of the four reaction options. The scoring technique for the scale was developed in a pilot study, where the severity of responses to each item was rated on a Likert scale from 1 (*very mild*) to 7 (*very extreme*) by a sample of 51 drivers (DePasquale et al., 2001). These mean severity ratings formed the scoring technique for the questionnaire. Thus, the scale tells not only what a person would do in the given situation, but also gives an indication of the comparative degree of anger involved, as

the scores reflect severity.

The PADS has demonstrated convergent validity, as scores correlate with other measures of hostility (Buss-Durkee Hostility Index), anger (trait subscale of the State-Trait Anger Scale), and Eysenck's impulsivity subscale (DePasquale et al., 2001). The divergent validity of the PADS was demonstrated by a non-significant correlation with scores on Eysenck's venturesomeness subscale (DePasquale et al., 2001). The PADS has established criterion validity, as scores also predicted frequency of verbal confrontations and obscene gestures, over and above the anger and hostility measures (DePasquale et al., 2001). Since its publication, the validity of the scale has been established by other researchers with samples of American (Dahlen & Ragan, 2004) and British drivers (Maxwell et al., 2005).

However, the scale is not appropriate for research with an Australian sample without minor adjustments. "Americanisms" in the language should be amended to aid clarity, and differences in road rules and measurement systems need to be addressed. These types of adjustments were made when the validity of the PADS was established within a British sample (Maxwell et al., 2005). Further, as research with an American sample was conducted to develop the scoring technique of the PADS, it is not clear whether the resulting severity ratings and thus scoring technique are appropriate for use within an Australian driving context.

The purpose of the present program of research (consisting of two studies) was to fill this obvious gap in the literature and use the PADS study (DePasquale et al., 2001) as a basis from which to develop a tool appropriate for use in Australian road rage research, using a sample of Queensland drivers. The purpose of Study 1 was to adapt the PADS for use in Australia, resulting in the initial form of the Australian Propensity for Angry Driving Scale (Aus-PADS). The purpose of Study 2 was to

conduct a Factor Analysis and assess the scale reliability (Cronbach's alpha) of the final Aus-PADS. A further purpose of Study 2 was to provide normative data. It was expected that the present series of studies would result in a tool appropriate for use in Australian road rage research.

2. Study 1: Item Scoring and Response Selection

The general aims of Study 1 were to: adapt the PADS (DePasquale et al., 2001) for use within Australia; develop a new scoring technique; and select four response options from a pool of six. There are a number of reasons why the scale may not be appropriate for use in Australian road rage research without the above modifications. Firstly, there are subtle language differences between American and Australian English that should be addressed to aid clarity. In the present study, this involved substituting American terms or phrases that may not be widely understood by Australians for those terms that are in popular use in Australia.

Also, it is plausible that differences in the rates and experience of aggression and violence between America and Australia may influence the scoring technique of the PADS, which, as described above, was population-specific (DePasquale et al., 2001). That is, an Australian pilot study sample may rate the severity of the response options differently to the manner in which the American participants rated responses in the PADS study. As the purpose of the present program of research was to develop a tool appropriate for use in Australia, it was important that the scoring technique accurately reflect the Australian experience of road rage. Thus all response options were to be rated for severity by a pilot study using Australian drivers in Study 1. In line with the PADS study (DePasquale et al., 2001), mean severity ratings would form

the scoring technique for the Aus-PADS.

The PADS appears to have poor discriminant validity on some items. For example, item 17 asks “You are driving on the highway in the overtaking lane. You come up behind another car in the overtaking lane. You flash your headlights as an indicator for the other car to move over. Instead of moving over, you see the driver in the other car give you the finger and remain in the overtaking lane. How do you respond?”, with possible scores of 1.2 (“Start flashing your lights with greater frequency, hoping to influence the driver to move over”), 3.1 (“Get right on the rear bumper of the car, flash your lights, and honk your horn in order to intimidate the other driver into moving over”), 4.8 (“Roll your eyes in disbelief and wait for the car to move over or exit”) or 4.9 (“Get right on the rear bumper of the other car and lay on your horn”) (DePasquale et al., 2001, p. 15).

As questionnaires should differentiate between individuals (Cohen & Swerdlik, 1999), it is important that the distances between pairs of response options on the scale are maximised. Thus in order to maximise the ability of scale scores to discriminate between individuals, response options were also addressed in Study 1.

2.1. *Method*

2.1.1. *Participants*

There were 33 participants in Study 1 (9 male, 24 female), ranging in age from 17 to 56 years ($M = 23.97$, $SD = 8.00$). The driving experience of the sample ranged from 1 to 31 years ($M = 6.05$, $SD = 6.71$). Participants were first year students from the School of Psychology at the University of Queensland, Australia, who received course credit for their participation.

2.1.2. Materials

Participants indicated their age, gender, and number of years driving experience on a questionnaire, which was an adapted form of the PADS (for the original scale, see Appendix A, DePasquale et al., 2001, p. 12). Several terms throughout the scale were changed to suit the Australian sample used in the present program of research. For example, “interstate” was changed to “highway”, “parking lot” was changed to “car park”, all references to miles were converted into kilometres, and references to right or left sides of the road and lanes were adjusted as appropriate. Any reference to the other driver’s gender was replaced with “him / her” or “the other driver” so any gender biases could not influence responses. Two additional response options were added to each item, so that each multiple choice item now had six response possibilities. These items were developed after a previous discussion with two male traffic controllers (aged 43 and 37). No identifying information was collected, as participation was anonymous.

As an illustrative example, item 1 as rated by participants in Study 1 was as follows:

1. You are driving your car down a two-lane road. Without warning, another car pulls out in front of you from a car park. You had to brake suddenly to avoid hitting it. How do you respond?
 - ___ Let out a sigh of relief and drive on
 - ___ Lean out your window and yell at the other driver
 - ___ Honk your horn to let the other driver know they almost caused an accident
 - ___ Follow the car to its destination so you can give the driver a piece of your mind
 - ___ Overtake the car and pull in front of them so you can brake suddenly and *they* have to avoid hitting *you*
 - ___ Flash your headlights to get the driver’s attention and glare angrily at him/her

2.1.3. Procedure

Before the study commenced, the experimenter checked that all participants satisfied the selection criteria (i.e., participants were asked if they were licensed drivers with a minimum of one year unsupervised driving experience). Participants were given the adapted PADS questionnaire and were instructed to fill in the demographic information. Participants were then instructed to read each item carefully, and consider the severity of the six possible responses with reference to that item only. Participants rated each of the six responses to the 19 items using a 7-point Likert scale of severity, such that a rating of 1 indicated that the response was *very mild*, while a rating of 7 indicated that the reaction was *very severe*. Participants checked that they had rated each response and were thanked for their time and participation.

The questionnaires were entered into statistics package SPSS to generate descriptive statistics and frequency distributions. SPSS was also used to analyse any gender differences in mean ratings using an independent samples *t*-test. The mean severity ratings of the six responses for each item were plotted on a 7-point line graph. As the aim of Study 1 was to turn a six-response scale into a four-response scale with optimal distribution of scores, any two scores that fell closely on the line graph were compared. Responses were retained on the basis of their distributional qualities, such as skewness and central tendency, as well as the results of an independent samples *t*-test for gender, where appropriate.

2.2. Results

As there were no cases of missing data, all 33 cases were analysed. Table 1

shows the mean ratings and standard deviations for each of the response options for the 19 items on the adapted questionnaire, and the corresponding PADS means and standard deviations for responses (a) to (d) (DePasquale et al., 2001, p. 4). Responses presented in bold font were removed.

Table 1

Mean severity of response ratings (*SDs* in parentheses) of the adapted Study 1 questionnaire ($N = 33$) and the PADS ($N = 51$) (DePasquale et al., 2001)

Item	a		b		c		d		e	f
	Study 1	PADS	Study 1	PADS	Study 1	PADS	Study 1	PADS	Study 1	Study 1
1	1.52 (0.87)	1.1 (0.3)	5.09 (1.23)	4.4 (1.3)	3.42 (1.00)	3.2 (0.9)	6.67 (0.54)	6.4 (0.7)	6.39 (0.79)	4.06 (1.30)
2	4.21 (1.36)	4.4 (1.0)	1.33 (0.60)	1.1 (0.3)	5.58 (1.03)	5.6 (1.2)	4.36 (1.32)	3.7 (1.2)	5.79 (0.74)	6.18 (0.77)
3	4.58 (1.37)	3.1 (1.0)	4.12 (1.34)	4.1 (1.1)	1.58 (0.90)	1.3 (0.6)	5.48 (1.28)	6.2 (0.8)	5.12 (1.41)	2.21 (1.27)
4	2.21 (1.11)	2.0 (0.9)	1.21 (0.78)	1.0 (0.2)	5.42 (1.12)	5.0 (1.1)	4.94 (1.56)	5.6 (1.3)	5.12 (1.11)	6.45 (1.35)
5	1.36 (0.90)	1.0 (0.0)	5.09 (1.31)	4.8 (1.2)	3.45 (1.15)	3.1 (0.9)	4.48 (1.15)	4.4 (1.1)	2.91 (1.26)	4.33 (1.19)
6	5.09 (1.84)	4.7 (1.5)	1.73 (1.18)	1.0 (0.1)	5.45 (1.54)	5.3 (1.1)	3.52 (1.52)	3.0 (1.3)	1.94 (1.09)	3.64 (1.67)
7	4.52 (1.33)	3.8 (1.0)	5.42 (1.35)	5.2 (1.2)	2.03 (1.21)	1.1 (0.3)	4.88 (1.36)	4.4 (1.3)	2.64 (1.37)	6.03 (1.24)
8	1.64 (1.03)	1.1 (0.2)	2.27 (1.18)	1.7 (0.6)	3.55 (1.30)	3.1 (0.9)	4.64 (1.11)	4.4 (1.1)	5.48 (1.20)	2.24 (1.30)
9	5.12 (1.36)	5.5 (1.1)	1.55 (1.46)	1.1 (0.9)	4.27 (1.44)	3.7 (1.1)	3.00 (1.39)	2.6 (1.0)	3.06 (1.30)	5.70 (1.38)
10	4.91 (1.13)	4.4 (1.2)	5.70 (0.85)	5.5 (1.1)	1.48 (0.91)	1.1 (0.2)	3.55 (1.42)	2.7 (0.8)	1.97 (0.95)	5.82 (1.16)
11	1.48 (0.76)	1.0 (0.1)	5.39 (1.27)	5.6 (1.2)	4.39 (1.22)	3.9 (0.1)	5.18 (1.16)	5.0 (1.2)	2.33 (1.67)	3.27 (1.74)
12	3.33 (1.16)	2.7 (0.9)	2.48 (1.44)	1.6 (0.7)	5.52 (1.33)	5.4 (1.1)	4.94 (1.27)	4.6 (1.2)	2.61 (1.34)	4.21 (1.41)
13	4.76 (1.44)	4.2 (1.3)	4.88 (1.14)	4.3 (1.4)	2.39 (1.32)	1.9 (0.9)	6.33 (1.27)	6.2 (0.9)	4.61 (1.41)	4.24 (1.62)

14	3.55 (1.46)	3.0 (1.1)	4.52 (1.44)	4.4 (1.2)	1.94 (1.39)	1.2 (0.6)	6.09 (1.18)	6.2 (0.9)	2.00 (1.12)	2.70 (1.02)
15	5.79 (1.24)	5.0 (1.3)	1.82 (1.18)	1.0 (0.2)	6.00 (1.17)	5.6 (1.2)	3.94 (1.14)	3.0 (1.2)	2.64 (1.48)	4.24 (1.30)
16	2.45 (1.70)	1.2 (0.6)	6.76 (0.50)	6.5 (0.8)	4.00 (1.39)	3.3 (1.4)	4.85 (1.44)	4.7 (1.3)	4.79 (1.11)	3.09 (1.83)
17	3.88 (1.43)	3.1 (1.2)	5.52 (0.87)	4.9 (1.1)	1.91 (1.04)	1.2 (0.5)	5.33 (1.02)	4.8 (1.2)	3.42 (1.25)	4.88 (1.36)
18	3.21 (1.39)	2.2 (0.9)	1.76 (1.06)	1.1 (0.3)	4.42 (1.17)	3.7 (1.1)	5.03 (1.21)	4.8 (1.2)	1.76 (1.25)	2.64 (1.08)
19	1.73 (1.18)	1.2 (0.5)	4.24 (1.37)	3.7 (1.2)	4.09 (1.38)	3.4 (1.1)	6.12 (1.05)	5.8 (1.2)	4.70 (1.42)	4.94 (1.27)

From Table 1, it can be seen that the severity ratings of the first four options in the present study were of the same pattern as those of the PADS. For example, in item 1, the severity ratings of the response options in increasing order across both studies were (a), (c), (b), and then (d). However, the present severity ratings were sometimes higher than those reported in the PADS study, such as can be seen in item 1. These observed differences could not be analysed statistically, however, as the original PADS data was not available.

As was the case with the PADS, the mean severity ratings form the scoring technique for the adapted questionnaire, as the mean rating for each response is the score for circling that response. For example, participants who tick (a) for item 1 receive a score of 1.52, 5.09 for (b), 3.42 for (c), and 6.67 for (d), and so on. Continuing to use item 1 (presented in section 2.1.2) as an illustrative example, the mean severity ratings for response options (c) and (f), and (e) and (d), were quite close together, and were thus the pairs of item 1 responses compared on the basis of their distributions, with the intention of removing one response from each pair, and retaining four response options.

Fig. 1 shows the frequency distributions for item 1 responses (c) and (f). From

this figure it can be seen that the response (f) distribution is slightly more normal than that for response (c), while Table 1 shows that response (c) has a smaller standard deviation than (f). An independent groups *t*-test revealed that there were gender differences in severity ratings of response (f), $t(31) = 2.04, p = .05$, such that male participants ($M = 4.78, SD = 1.09$) rated the response as more severe than female participants ($M = 3.79, SD = 1.28$). As a result of these issues, response (f) was rejected and response (c) was retained.

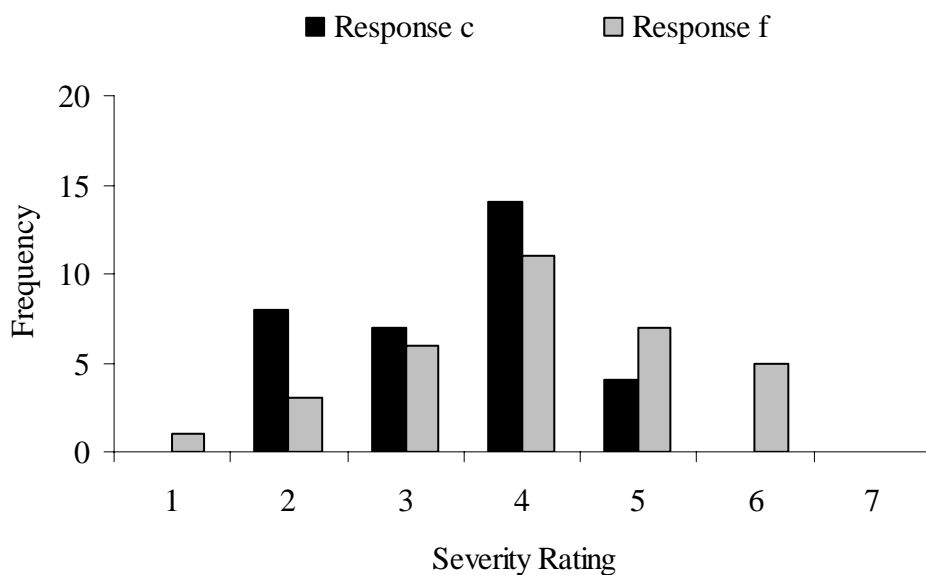


Fig. 1. Frequency distributions of severity ratings for item 1, responses (c) and (f).

Fig. 2 shows the frequency distributions for item 1 response options (d) and (e). From this figure it can be seen that both responses have negatively skewed distributions as a result of outliers. Table 1 indicates that response (d) has a smaller standard deviation than response (e), presumably because response (e) has a more extreme outlier. As a result, response (e) was rejected and response (d) was retained.

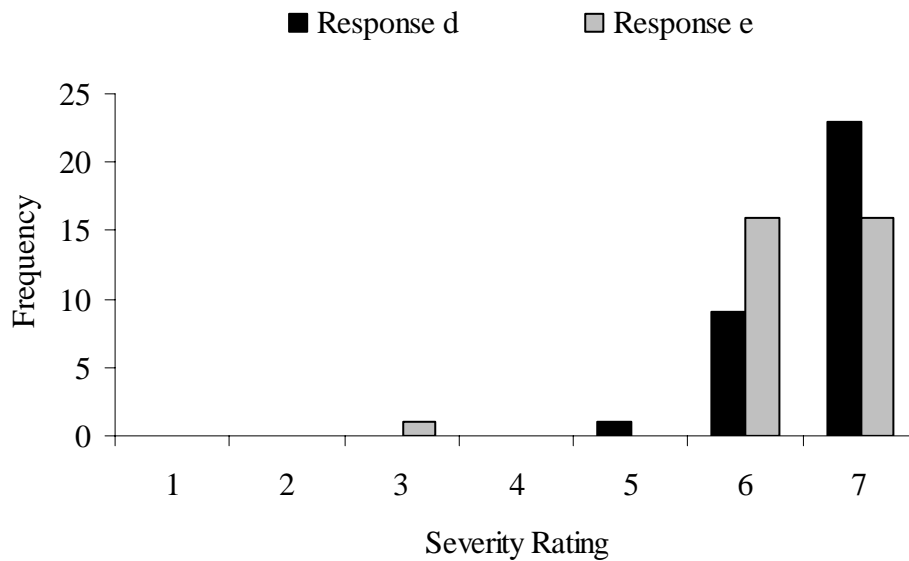


Fig. 2. Frequency distributions of severity ratings for item 1, responses (d) and (e).

This process was repeated for all items until two response options were discarded for each item (see bold formatted scores in Table 1). No further modifications to the adapted questionnaire were deemed necessary at this point.

2.3. Discussion

The results of Study 1, specifically the patterns of severity ratings for the response options, were comparable to those found by DePasquale et al. (2001). For each of the 19 items, the order of increasing severity of the response options was identical across studies. This suggests that there is some degree of similarity in driver behaviour, or at least perceptions of driver behaviour, between the two cultures. However, there was some support for the need for a population-specific scoring technique for the Aus-PADS, as Study 1 participants seemed to rate the responses more severely than the American pilot study participants on some items.

There was some evidence of the utility of presenting an additional two

response options for severity rating by participants in order to select the most discriminatory four, as the new responses (e) and (f) were often retained in place of the original response options. The use of six response options allowed maximum discrimination of the item scores (i.e., maximum distances between response options), however there was little improvement in overall distribution of scores (i.e., the range between the highest and lowest scoring option). Thus the between-response distances were maximised, but the range for each item was similar to that of the PADS (DePasquale et al., 2001).

A limitation of Study 1 was the over-representation of women in the sample. However, any effect of this was minimised by post hoc tests for gender differences in ratings, and using the results of these tests in the decision making process when rejecting or retaining response options. In all cases, responses with significant gender effects were discarded. This was a conservative course of action, as any differences were probably the result of the heterogeneity of variance between the genders, due to the differing sample sizes. However, this approach was deemed necessary due to the evidence in the literature supporting gender differences in aggression (Hyde, 1984) and road rage (Harding et al., 1998).

Furthermore, the sample also over-represented young people when a post hoc comparison with Queensland Licensing Statistics was conducted (Queensland Transport, 2005). Thus the severity ratings obtained in Study 1 should be interpreted with caution until future research offers similar ratings using a sample with gender and age distributions more comparable to the general driving population. However, the distribution of ages of participants and mean age in this sample suggest that this sample may be more representative than that used by DePasquale et al. (2001), where participants ranged in age from 18 to 42 ($M = 19$).

3. Study 2: Factor Analysis and Normative Data

The purpose of Study 2 was to conduct a Factor Analysis on the initial Aus-PADS developed in Study 1 in order to determine whether the one-factor solution offered by DePasquale et al. (2001) was appropriate in an Australian context, and to eliminate any items with poor factor loadings and / or item-total correlations. A further purpose of Study 2 was to generate normative data. As gender effects have been observed in previous anger (Hyde, 1984) and road rage research (Harding et al., 1998), gender effects were considered to assess whether it was necessary to calculate normative data separately for males and females. Any effects of participants' age, or driving experience, were also considered in Study 2 as exploratory variables.

3.1. Method

3.1.1. Participants

There were 439 participants in Study 2 (139 male, 289 female, 11 did not specify), ranging in age from 17 to 66 years ($M = 26.76$, $SD = 10.62$). The driving experience of the sample ranged from 1 to 49 years ($M = 8.78$, $SD = 9.99$).

Participants were affiliated with the University of Queensland and Queensland University of Technology, Australia. First year psychology students received course credit for their participation. Higher level students and staff members did not receive anything.

3.1.2. *Materials*

Participants completed the initial Aus-PADS developed in Study 1. In line with Study 1, the questionnaire also asked participants their age, gender, and number of years driving experience. No identifying information was collected, as participation was anonymous.

3.1.3. *Procedure*

Before the study commenced, the experimenter checked that all participants satisfied the selection criteria (i.e., they were licensed drivers with a minimum of one year unsupervised driving experience). Participants were given the initial Aus-PADS and instructed to fill in the demographic information and driving history questions, before choosing which of the four responses to the 19 initial Aus-PADS items was closest to their likely response should they be presented with that situation. Participants checked that they had answered every question and were thanked for their time and participation.

The questionnaires were entered into statistics package SPSS for analysis. Responses to the 19 driving situations (i.e., a, b, c, or d) were transformed into numeric values in the data file, where the score for a response was the mean severity rating found in Study 1.

3.2. *Results*

Factor Analysis using Principal Axis Factoring was performed using listwise deletion of missing data. While only one interpretable factor emerged in the American study (DePasquale et al., 2001), the possibility that more factors may be evident in the

data was explored, as SPSS was not instructed to limit extraction to a particular number of factors. However, as was the case in the American study, only one interpretable factor emerged in this data.

The full 19-item scale explained 21.66 percent of the variance in the data, and had a Cronbach's alpha of .816 ($N = 429$). Factor loadings ranged from .045 to .586. Four items with factor loadings less than .40 and item-total correlations less than .35 were dropped from the scale, resulting in a 15-item scale with a Cronbach's alpha of .824 ($N = 433$).

While total scores on the scale could range from 26.18 to 86.05, within this sample, scores ranged from 26.81 to 72.88 ($M = 39.46$, $SD = 8.90$). The Australian Propensity for Angry Driving Scale (Aus-PADS) is presented as Appendix A.

As normative data was to be offered in Study 2, any effects of age, gender, and driving experience on final Aus-PADS scores were also explored. However, as age and driving experience were nearly perfectly correlated, $r(421) = .97$, $p < .001$, only age was analysed. Results revealed a small but significant negative correlation between age and Aus-PADS scores, $r(418) = -.25$, $p < .001$, such that Aus-PADS scores decreased as participant age increased. An independent samples t -test revealed that males scored significantly higher on the Aus-PADS ($M = 41.69$, $SD = 9.25$) than female participants ($M = 38.48$, $SD = 8.54$), $t(420) = 3.51$, $p < .001$.

Compared to Study 1, the Study 2 sample gender ratio was improved, the age distribution was broader, and the mean age was higher. However, comparison with Queensland Licensing Statistics (Queensland Transport, 2005) revealed that the Study 2 sample still over-represented females and young people, and therefore did not adequately represent licensed drivers. As a result of this, and the significant gender and age effects, it was deemed inappropriate to offer normative data from this sample.

3.3. Discussion

The final form of the Aus-PADS has an acceptable Cronbach's alpha, comparable to that found by DePasquale et al. (2001), indicating that the 15 retained items measure the same construct.

Aus-PADS scores within the present sample covered a large range of the possible scores, even towards the higher end of the scale, suggesting that social desirability, at least in a research context, does not greatly influence Aus-PADS scores. This may be because the participants did not feel threatened by completing the scale, as they were informed that results would be used for research purposes only, and questionnaires were anonymous. However, should the Aus-PADS be used for other purposes, such as assessing change before and after anger management courses, or as part of a criminal proceeding, for example, any effects of social desirability on the scale should be considered.

It is unclear at this stage whether the age effect observed in Study 2 is a true effect, or simply a product of the heavily positively skewed sample. From the data gathered in this study, it would appear that drivers tend to show decreased road rage with age, as their tendency to react aggressively to frustrating or anger-provoking situations decreases over time. Future research should be conducted using a more representative sample of drivers in order to confirm this finding, and further consider the relationship between age and road rage observed in the present study. It is only then that reliable age normative data can be offered.

The effect of gender observed is also in line with expectations, based on previous anger (Hyde, 1984) and road rage research (Harding et al., 1998), as males

scored more aggressively than females in this study. Again, however, this relationship must be interpreted with caution, as there were twice as many women in the sample as men. It is thus possible that there is no effect of gender, other than the product of heterogeneous sampling in this study. However, as the findings were in line with the anger and road rage research described above, and the results of the PADS study (DePasquale et al., 2001), the relationship between gender and road rage was accepted, and any normative data offered in future should be calculated separately for each gender.

4. General Discussion

The general purpose of the present program of research was to use the PADS study (DePasquale et al., 2001) as a basis from which to develop a tool appropriate for use in Australian road rage research (the Aus-PADS). Specifically, this involved addressing identified problems with the scale, such as population-specific scoring, and apparently poor discrimination. These issues were addressed in Study 1, where an Australian scoring technique was developed by having Australian drivers rate the severity of each option, and additional response options were added so the optimum spread of response options could be selected. Although there are likely to be similarities in the behaviour of drivers between the two cultures, the results of this study indicate that a population-specific scoring technique was necessary, as Australians tended to rate the responses more severely than the American sample (DePasquale et al., 2001). In many cases, the additional response options were worthwhile additions and were retained above the original response options. As was the case in the PADS study (DePasquale et al., 2001), the mean severity ratings

obtained in Study 1 served as the score for selecting that option in Study 2.

The purpose of Study 2 was to conduct a Factor Analysis to determine the most appropriate factor solution for the Aus-PADS, and to provide normative data. Discarding four items with poor factor loadings and item-total correlations resulted in a single-factor, 15-item scale with an acceptable Cronbach's alpha of .82, comparable to that found by DePasquale et al. (2001). However, Study 2 could not offer normative data as the sample was not adequately representative of drivers generally due to an over-representation of females and young people. Further, gender and age effects suggested that to use this sample as a norm group would be problematic.

The present two studies, although promising, had some problems that should be considered when interpreting the results, and should also be addressed in future research. As discussed, the present studies used participants drawn from university staff and student populations, resulting in samples that over-represented both women and young people, and under-represented drivers over 40. Thus the samples used were not representative of Queensland, or Australian, drivers. In order to confirm the relationships observed in this study, the Aus-PADS should be administered to a larger, more representative sample of drivers. However, as a one-factor solution was also found in the original study (DePasquale et al., 2001) where 59 percent of participants were male, and the mean age was 42, it is unlikely that the factor structure would change significantly should a more representative sample be used.

The present program of research resulted in the development of the Aus-PADS, the first tool appropriate for use in Australian research into the causes of this serious road safety problem. It is hoped that researchers confirm the factor structure observed in the present research program, and address the limitations of using the scale discussed above. It is then that the Aus-PADS can be more confidently used as a

basis for broadening the Australian road rage literature, so that we may improve our understanding of the underlying processes associated with road rage in order to prevent the problem, and design appropriate countermeasures.

References

- Cohen, R. J., & Swerdlik, M. E. (1999). *Psychological testing and assessment: An introduction to tests and measurement* (4th ed.). Mountain View, CA: Mayfield Publishing Company.
- Dahlen, E. R., & Ragan, K. M. (2004). Validation of the Propensity for Angry Driving Scale. *Journal of Safety Research*, 35(5), 557-563.
- Deffenbacher, J. L., Oetting, E. R., & Lynch, R. S. (1994). Development of a driving anger scale. *Psychological Reports*, 74(1), 83-91.
- DePasquale, J. P., Geller, E. S., Clarke, S. W., & Littleton, L. C. (2001). Measuring road rage - Development of the propensity for angry driving scale. *Journal of Safety Research*, 32(1), 1-16.
- Gulian, E., Debney, L. M., Glendon, A. I., Davies, D. R., & Matthews, G. (1989). Coping with driver stress. In F. J. McGuigan, W. E. Sime & J. M. Wallace (Eds.), *Stress and tension control 3: Stress management*. (pp. 173-186). New York: Plenum Press.
- Harding, R. W., Morgan, F. H., Indermaur, D., Ferrante, A. M., & Blagg, H. (1998). Road rage and the epidemiology of violence: Something old, something new. *Studies on Crime & Crime Prevention*, 7(2), 221-238.

- Hennessy, D. A., & Wiesenthal, D. L. (1997). The relationship between traffic congestion, driver stress and direct versus indirect coping behaviours. *Ergonomics*, *40*(3), 348-361.
- Hennessy, D. A., & Wiesenthal, D. L. (1999). Traffic congestion, driver stress, and driver aggression. *Aggressive Behavior*, *25*(6), 409-423.
- Hyde, J. S. (1984). How large are gender differences in aggression? A developmental meta-analysis. *Developmental Psychology*, *20*(4), 722-736.
- Jonah, B. A., Thiessen, R., & Au-Yeung, E. (2001). Sensation seeking, risky driving and behavioral adaptation. *Accident Analysis & Prevention*, *33*(5), 679-684.
- Kenrick, D. T., & MacFarlane, S. W. (1986). Ambient temperature and horn honking: A field study of the heat/aggression relationship. *Environment and Behavior*, *18*(2), 179-191.
- Knee, C. R., Neighbors, C., & Vietor, N. A. (2001). Self-determination theory as a framework for understanding road rage. *Journal of Applied Social Psychology*, *31*(5), 889-904.
- Lajunen, T., & Parker, D. (2001). Are aggressive people aggressive drivers? A study of the relationship between self-reported general aggressiveness, driver anger and aggressive driving. *Accident Analysis & Prevention*, *33*(2), 243-255.
- Maxwell, J. P., Grant, S., & Lipkin, S. (2005). Further validation of the propensity for angry driving scale in British drivers. *Personality and Individual Differences*, *38*(1), 213-224.
- Novaco, R. W. (1991). Aggression on roadways. In R. Baenninger (Ed.), *Targets of Violence and Aggression* (pp. 253 – 326). Amsterdam: North Holland.
- Parker, D., Lajunen, T., & Summala, H. (2002). Anger and aggression among drivers in three European countries. *Accident Analysis & Prevention*, *34*(2), 229-235.

- Perry, A. R., & Baldwin, D. A. (2000). Further evidence of associations of type A personality scores and driving-related attitudes and behaviors. *Perceptual and Motor Skills, 91*(1), 147-154.
- Queensland Transport. (2005). *Queensland current drivers' licences on record as at February 2005*. [computer file; request RQ 4927]. Brisbane: Queensland Transport.
- Royal Automobile Club of Queensland. (2002). Tailgating is still Queensland motorists' number one gripe. Retrieved August 3, 2002, from http://www.racq.com.au/13_news/articles/20020607_Tailgating_is_s.htm
- Shinar, D. (1998). Aggressive driving: The contribution of the drivers and the situation. *Transportation Research Part F: Traffic Psychology and Behaviour, 1*(2), 137-159.
- Stokols, D., Novaco, R. W., Stokols, J., & Campbell, J. (1978). Traffic congestion, Type A behavior, and stress. *Journal of Applied Psychology, 63*(4), 467-480.
- Wilson, R. J., & Jonah, B. A. (1988). The application of Problem Behavior Theory to the understanding of risky driving. *Alcohol, Drugs & Driving, 4*(3), 173-191.
- Yagil, D. (2001). Interpersonal antecedents of drivers' aggression. *Transportation Research Part F: Traffic Psychology and Behaviour, 4*(2), 119-131.

Appendix A. The Australian Propensity for Angry Driving Scale (Aus-PADS)

ID Code _____

Age _____

Gender _____

The following questionnaire contains 15 scenarios one might encounter while driving. Please read each of the scenarios carefully and then decide which of the potential responses most closely matches how you would respond in that situation.

1. You are driving your car down a two-lane road. Without warning, another car pulls out in front of you from a car park. You had to brake suddenly to avoid hitting it.

How do you respond?

- a. Let out a sigh of relief and drive on
- b. Lean out your window and yell at the other driver
- c. Honk your horn to let the other driver know they almost caused an accident
- d. Follow the car to its destination so you can give the driver a piece of your mind

2. You are driving your car down the highway in the overtaking lane. You come up to a car driving much slower than you are in the overtaking lane. Even though you flash your high beams as a signal for the other car to move over, it does not. How do you respond?

- a. Make an obscene gesture to the driver as you pass on the left
- b. Shrug your shoulders and continue to wait for the other car to move to the side
- c. Alternate between honking your horn and yelling obscenities out the window
- d. Lay on your horn and don't budge until the driver moves

3. You are driving on a single lane road. For no apparent reason the car in front of you is constantly braking and accelerating, causing you to drive in the same manner.

How do you respond?

- a. Honk your horn and loudly curse at the driver
- b. Slow down a little and keep a safe distance
- c. Deliberately tailgate the car and occasionally lay on the horn
- d. Curse to yourself but continue at the pace set by the other driver

4. You are in a full car park. You see a driver leaving and you put on your blinker to indicate that you intend to take the parking spot. As the other driver pulls out, a second driver cuts in front of you from the other side and takes the parking spot. How do you respond?

- a. Glare angrily at the other driver as you move on to find another parking spot
- b. Shrug your shoulders and look for another spot
- c. Lay on your horn and inform the driver in no uncertain terms that they have taken your spot and should move at once

- d. “Accidentally” scrape the car with your keys after you have found another spot
5. You are driving your vehicle in a traffic jam in the far left-hand lane. Out of nowhere, a car comes up from behind on the shoulder and attempts to squeeze in front of you. How do you respond?
- a. Nothing, let the car squeeze in
 - b. Make obscene gestures, or yell “asshole” at the other driver as you close ranks on the car in front of you to prevent the driver from cutting in front of you
 - c. Let the car squeeze in but honk your horn to show your disapproval to the other driver
 - d. Honk your horn and close ranks on the vehicle in front of you to prevent the car from getting in front of you
6. You are driving on the highway when another vehicle pulls up alongside your car. You look over and see a total stranger making obscene gestures at you. How do you respond?
- a. Ignore the other driver by looking straight ahead and minding your own business
 - b. Look at the other driver and shake your head in disbelief, then slow down and wait for the other car to drive on
 - c. Make obscene gestures back to the driver in the other vehicle
 - d. Yell obscenities at the other driver
7. You are driving on the highway. One of the cars in front of you keeps changing lanes, preventing other cars from overtaking efficiently. Thus traffic is being slowed. How do you respond?
- a. Yell obscenities in your car and honk your horn numerous times to show your displeasure
 - b. Pull up next to the other car so that you can honk your horn and scream obscenities at the driver blocking traffic
 - c. Yell out obscenities in your car
 - d. Change lanes and move away so the driver doesn’t affect you anymore
8. You are driving on a city street. Without warning, a pedestrian suddenly runs in front of your car, nearly causing you to hit him/her. How do you respond?
- a. Do nothing except feel grateful no one was injured
 - b. Yell at the pedestrian out your window telling them to watch where they are going
 - c. Curse loudly at the pedestrian out your window telling them next time you’re not going to stop
 - d. Stop the car and make sure the pedestrian is okay, while kindly telling them to be more careful
9. You are trying to exit off the highway. However, a car coming on to the highway has failed to acknowledge a give-way sign and their behaviour has caused you to miss the exit. How do you respond?
- a. Honk your horn at the other driver to demonstrate your displeasure
 - b. Throw your hands in the air in disbelief and drive to the next exit

- c. Drive up next to the car that cut you off, honk your horn, and give the driver a mean look
 - d. Flash your lights at the other driver and give him/her the finger
10. Your exit is quickly approaching. The driver next to you is driving in a manner that is preventing you from changing lanes. You may miss your exit. How do you respond?
- a. Hit the accelerator to get in front of the other car, yelling obscenities as you pass the other car
 - b. Cursing under your breath, reduce your speed as necessary to make the lane change
 - c. Follow the car to its destination so you can yell obscenities at the other driver
 - d. Give the other driver the finger as you slow down to let them pass so you can exit
11. You are driving on the highway. The driver in the car in front of you throws a cup of coffee out his/her car window. The cup hits your windscreen. How do you respond?
- a. Honk your horn and yell at the other driver from within your car
 - b. Speed up next to the car and make obscene gestures at the other driver
 - c. Speed up so that you pass the car and then throw something out your window to hit the other car
 - d. Curse to yourself and clean the windscreen using your wipers
12. While making a left-hand turn you accidentally cut off another car. In response, the other driver follows you to the next intersection at which point he/she pulls up to your car and proceeds to yell obscenities at you until the light turns green. When the light turns green the other driver takes off in a hurry. How do you respond?
- a. Follow the car to the next intersection so that you can yell obscenities back
 - b. Sigh in relief that the whole ordeal is over
 - c. Yell back at the other driver telling him/her to relax because it was an accident
 - d. Lock your doors and keep heading to your destination
13. You are driving on the highway in the overtaking lane. You come up behind another car in the overtaking lane. You flash your headlights as an indicator for the other car to move over. Instead of moving over, you see the driver in the other car give you the finger and remain in the overtaking lane. How do you respond?
- a. Get right on the rear bumper of the car, flash your lights, and honk your horn in order to intimidate the other driver into moving over
 - b. Roll your eyes in disbelief and wait for the car to move over or exit
 - c. Get right on the rear bumper of the other car and lay on your horn
 - d. Overtake the driver on the left, giving them a mean look as you pass
14. You are driving in the right-hand lane behind another vehicle. When the right turn light is given, the vehicle does not move because the driver is not paying attention. You tap on your horn to get his/her attention and the driver gives you the middle finger in the rearview mirror. How do you respond?
- a. Fume inside a bit, but do nothing
 - b. Lay on your horn
 - c. Lay on the horn and return the finger gesture

- d. Gesture with your palms up and mouth “What are you waiting for?”

15. You are traveling in a single-lane road late at night and the vehicle coming at you in the other lane has on high beams. You flash your lights, but the bright lights of the other vehicle do not change. How do you respond?

- a. Grit your teeth in frustration and wait for the car to pass so you can see again
- b. Put on your high beams and honk your horn
- c. Turn around and follow the other vehicle with your high beams on
- d. Yell obscenities out your window when they pass

Scoring Technique

Item	Response Option			
	a	b	c	d
1	1.52	5.09	3.42	6.67
2	4.21	1.33	5.79	6.18
3	4.58	1.58	5.48	2.21
4	2.21	1.21	5.12	6.45
5	1.36	5.09	3.45	4.48
6	1.64	2.27	4.64	5.48
7	4.91	5.70	3.55	1.97
8	1.48	4.39	5.18	2.33
9	3.33	2.48	4.94	4.21
10	4.88	2.39	6.33	4.61
11	3.55	4.52	6.09	2.00
12	5.79	1.82	3.94	2.64
13	5.52	1.91	5.33	3.42
14	1.76	4.42	5.03	1.76
15	1.73	4.24	6.12	4.94