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Development of an Implicit Association Test to measure attitudes toward speeding

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Development of an Implicit Association Test to measure attitudes toward speeding

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Abstract

Speeding is a major contributor to road trauma and attitudes toward speeding are hypothesised to be a key determinant of the behaviour. Attitudinal research is limited by reliance on self-report measures and the attendant possibility of reporting biases. The Implicit Association Test (IAT; Greenwald, McGhee & Schwartz, 1998) aims to measure attitudes without reliance on self-report, by assessing the association between a target-concept and an evaluation, in terms of reaction time for compatible versus non-compatible pairings. The present research aimed to develop and evaluate an IAT to measure attitudes to speeding.

In Study 1, 45 licensed drivers completed a questionnaire that assessed self-reported attitudes to speeding, and several variables theoretically related to attitudes, including speeding behaviour. Participants also drove a driving simulator, and completed the speed-related IAT. Observed IAT results suggested that attitudes toward speeding are negative, and were generally consistent with results derived from the self-report and speeding on the driving simulator.

In Study 2, a further 45 licensed drivers underwent the Study 1 procedures, before being exposed to an intervention that was designed to increase negative attitudes to speeding (treatment group) or not (control group). Participants returned after 1-2 weeks for a second session, during which the Study 1 procedures were repeated. The intervention appeared to have a significant effect only on perceived crash risk for speeding. Thus, we could not adequately test the responsivity of the speed-related IAT to changed attitudes to speeding. In the control group, the IAT effect at Session 1 demonstrated a significant correlation with IAT effect at Session 2. Thus, the speed-related IAT appeared to be a valid and stable measure of attitudes to speeding, which might be used to measure attitudes in road safety research, without reliance on self-report.

Keywords

Implicit Association Test, driver attitudes, speeding

CONTENTS

EXECUTIVE SUMMARY

Background

Road trauma is recognised as a serious problem both in Australia and internationally. Risky driving has been identified as an important contributor to road crashes. In particular, speeding increases both the frequency and severity of crashes. Despite efforts to reduce speeding, it remains prevalent. Psychologically-based approaches to reducing speeding require a sound understanding of factors which contribute to it.

According to the Theory of Planned Behaviour (TPB), the immediate cause of speeding is an intention to speed, and one of the determinants of this intention is a positive attitude to speeding. In simple terms, the TPB proposes that drivers speed because they believe that speeding is good", or don't speed because they believe that speeding is "bad". Several recent studies have reported evidence that attitudes towards speeding and other traffic violations are predictive of both the intention to speed and of subsequent speeding behaviour.

Nonetheless, our understanding of the role of attitude in the causation of speeding is limited by the use of self-report methods to measure attitudes. Self-reporting may be distorted by several response biases, including socially desirable responding, acquiescence, extreme and moderacy responding, and generally negative responding.

The Implicit Association Test (IAT; Greenwald, McGhee & Schwartz, 1998) is a task that measures attitudes without reliance on self-report, by assessing the association between a target-concept and an evaluation. Participants are shown words that are either speeding-related or speeding-unrelated, and words that are either synonymous with "good" or with "bad", and must make one of two responses for each of these 4 types of words. For the "hypothetically compatible" stage speeding-related words share a response key with bad/negative words and speeding-unrelated words share a response key with good/positive words. For the "hypothetically non-compatible" stage this pairing is reversed and speeding-related words share a response key with good/positive words and speeding-unrelated words share a response key with bad/negative words. Participants should find the compatible stage easier than the non-compatible stage, and so performance should be faster. The IAT effect is defined as the difference in mean response time for the non-compatible minus compatible stage. Thus, a positive IAT effect in the present study would indicate a negative attitude toward speeding or a positive attitude toward not-speeding.

The IAT has been successfully employed to assess a range of attitudes and to predict behaviour, but is yet to be employed to measure attitudes in the field of road safety. The present research aims to develop an IAT to measure attitudes to speeding, and to test its convergent validity (against self-reported attitudes), predictive validity (against self-reported measures of variables theoretically related to attitudes, and simulated driving behaviour), sensitivity to changes in attitudes (produced by an audiovisual intervention), and test-retest reliability.

Study 1: Validity

Forty-five licensed drivers (42.2% female, mean age of 20-25 years) responded to an advertisement that was posted around the University of New South Wales, Kensington campus, and were tested individually. Participants completed a questionnaire that assessed self-reported attitudes to speeding, social norms regarding speeding, perceived appropriateness of speed limits, perceived crash risk of speeding, speeding-related illusory invulnerability, speeding behaviour, number of

speeding infringements, and number of speed-related crashes. On the driving simulator, participants then completed two drives designed to assess speeding in several speed limit zones. Finally, participants completed the speed-related IAT. Half of the participants were randomly selected to receive a compatible-before-incompatible combinations version of the IAT, and the remainder received an incompatible-before-compatible combinations version.

Consistent with previous research, the IAT effect was significantly greater when hypothetically compatible response combinations preceded non-compatible combinations, than when non-compatible combinations were presented first. The IAT effect was significantly greater than zero for both compatibility-order groups. Thus, the IAT appears to be operating as expected in measuring implicit attitudes to speeding, and that attitudes toward speeding are negative.

Observed IAT results were generally consistent with results derived from the self-report and driving measures. Means for all of the eight explicit measures of attitudes toward speeding included in the Driver Questionnaire also indicated negative attitudes toward speeding. Further, several explicit negative attitude measures correlated significantly and positively with the IAT effect. Self-report measures of variables that are theoretically related to attitudes (from the Driver Questionnaire) generally produced mean values that are consistent with negative attitudes toward speeding. Specifically, mean values indicated generally negative social norms regarding speeding (or low tolerance of speeding), high perceived risk of crashing due to speeding, and low high-range speeding behaviour. Further, a higher IAT effect (indicating a negative attitude to speeding) was associated with the belief that speed limits are too high (i.e. should be lower), a higher perceived risk of being caught when speeding, and lower self-reported frequency of speeding (averaged across sixteen situations). Although participants engaged in speeding, particularly in lower speed limit zones, those with IAT scores suggesting a stronger negative attitude to speeding were less likely to do so in the 80 km/h speed zone.

Study 2: Reliability and responsivity to change in attitudes

Forty-five licensed drivers (60.0% female, mean age of 18-19 years) responded to an advertisement that was posted around the University of New South Wales, Kensington campus, and were tested individually. Procedures were identical to Study 1 except that after completing the IAT, participants (randomly assigned to treatment versus control group) were shown either advertisements chosen for their potential to increase negative attitudes to speeding (treatment group) or advertisements outlining the dangers of smoking (control group). After viewing the advertisements, participants were questioned about them (in order to increase their effects). Participants returned after 1-2 weeks to repeat the Study 1 procedures.

The intervention appeared to have a significant effect only on perceived crash risk for speeding. Thus, we could not adequately test the responsivity of the speed-related IAT to changed attitudes to speeding.

Attitudes, beliefs, and of course behaviours, are notoriously difficult to change, and our decision to assess the impact of the advertisements between 1 and 2 weeks after showing them (in order to avoid the effect of demand characteristics on self-report measures) may have diluted their effects.

In the control group, the IAT effect at Session 1 demonstrated a significant correlation with IAT effect at Session 2. Thus, the IAT appears to provide a stable measure of negative attitudes to speeding.

Conclusion

The speed-related IAT developed for the present research appeared to be a valid and reliable measure of attitudes to speeding. Because it does not rely on self-report it may be a useful tool for measuring attitudes to speeding in road safety research.

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1 INTRODUCTION

1.1 The road safety problem and contributing factors

Road trauma is recognised as a serious problem both in Australia and internationally. In 2005, 1,636 people were killed in 1,481 crashes on Australian roads, representing a 3.3% increase in road crash fatalities from the previous year (Australian Transport Safety Bureau, 2006). In NSW alone, over the twelve-month period up to June 2006, there were 547 persons killed, and over 26,000 injured, from road crashes (Roads and Traffic Authority, 2006).

A range of factors may contribute to road crashes; including the road system, vehicles and road-user behaviour. Risky driving has been identified as an important contributor to road crashes, although its role is not comprehensively understood. In his review of the literature, Jonah (1986) illustrated a link between various risky driving behaviours and road trauma. More recently, Iversen (2004) found that people who had been involved in at least one car crash over the last one-year period engaged in more speeding, drink-driving and reckless driving, as well as lower use of seat belts, over the same period.

1.2 The role of speeding

Speeding is an important contributor to road crashes. For example, speeding was identified as a contributing factor in at least 37% of all fatal crashes that occurred in NSW in 2004 (Roads and Traffic Authority of NSW, 2005). Speeding increases both the frequency (Vernon, Cook, Peterson & Dean, 2004; Wagenaar, Streff & Schultz, 1990) and severity (Fildes & Lee, 1993; Moore, Dolinis & Woodward, 1995) of road crashes. A mean increase in speed of 1 km/h is associated with a 4–5% increase in the risk of a crash involving a fatality and a 3% increase in the risk of a crash involving an injury (Fildes & Lee, 1993). Blows, Ameratunga, Ivers, Lo & Norton (2005) found that participants who reported more frequent speeding over the last one-year period were up to four times more likely to have been injured in a car crash while driving over the same period.

Despite efforts to reduce speeding, it remains the norm, with extremely high detection rates, crash involvement attribution rates, and self-reported rates. For example, in a survey conducted in 2004, approximately 63% of respondents reported exceeding the speed limit by at least 20 km/h “once or twice” or “several times” (Blows et al., 2005), which is consistent with findings from previous years (e.g. Mitchell-Taverner, Zipparo, & Goldsworthy, 2003; Lee, Prabhakar, & Job, 1993).

Psychologically-based approaches to reducing speeding require a sound understanding of factors which contribute to it.

1.3 The influence of attitudes on speeding

Theories of health-relevant behaviour suggest a range of factors that might influence speeding (for a review see Hatfield & Job, 2004). These theories include very similar factors, although they use slightly different labels. According to the Theory of Planned Behaviour (Ajzen & Madden, 1986) the immediate cause of speeding is an intention to speed, one of the determinants of which is a positive attitude to speeding. This positive attitude is essentially born of high perceived benefits of the behaviour, and low perceived costs of the behaviour, both of which are influenced by the perceived number, likelihood and value of expected outcomes of the behaviour. Several of these factors are manifest in the Health Beliefs Model (Becker and Rosenstock, 1984), although

"attitudes" are not explicitly mentioned. Drawing on the broader psychological literature, attitudes are taken here to mean "evaluative judgements" (e.g. Atkinson et al., 2000; Gray, 2002). In simple terms, a negative attitude to speeding means that speed is believed to be "bad", whereas a positive attitude to speeding means that speed is believed to be "good" (where these evaluative judgements may be based on the kinds of factors that are included in models of health-relevant behaviour; e.g. perceived risk, social norms, personality traits like risk propensity).

Several recent studies have reported evidence that attitudes towards speeding and other traffic violations are predictive of both the intention to speed and subsequent speeding behaviour. In a cross-sectional study, Warner & Aberg (in press) found that specific attitude to speeding ("how acceptable is it for you personally to exceed different speed limits" in both urban and rural environments), subjective norm and perceived behavioural control significantly predicted self-reported speeding. Hatfield & Job (2004) also observed significant negative correlations between the attitude that "people who are caught exceeding the speed limit by more than 45 km/h should have speed governors fitted to their cars" and self-reported speeding. Furthermore, in a cross-sectional university student sample, Flieter & Watson (2006) found that approximately 67% of participants reported that speeding is both not OK and not worth the risk, and that these attitudes were also significant predictors of self-reported speeding behaviour.

Nonetheless, our understanding of the role of attitude in the causation of speeding and other risky driving behaviours is limited by shortcomings in the methodology of available research.

1.4 Self-report: issues

Self-report is often employed in studies of driving behaviour, and indeed until fairly recently it has been regarded as the only way of measuring attitudes.

Self-report may suffer from inaccuracies of recall (in the case of behaviour) or reporting (in the case of behaviour, attitudes and beliefs). In particular, reporting may be distorted by several response biases, including socially desirable responding, acquiescence, extreme and moderacy responding, and negative affectivity bias. Further, if these response biases influence self-reports of both attitudes and behaviours, they may produce spurious correlations between these variables.

1.4.1 Socially desirable responding

It has been suggested that self-report data may be biased, at least to some extent, because some participants engage in socially desirable responding (Barrick & Mount, 1996; Lajunen, Corry, Summala & Hartley, 1997; Paulhus, 1984; 1989). Most simply, socially desirable responding can be described as a tendency to give "right" answers. Participants' responses may be influenced by their beliefs and perceptions of the researchers' expectations, and further by the desire to protect their own image (Anastasi & Urbina, 1997).

The possibility that participants may engage in socially desirable responding is particularly pronounced when there are clear social norms attached to the factor that is being measured, and this appears relevant to road safety behaviours, attitudes and beliefs. For example, socially desirable responding may bias self-reports of driving behaviour. This would generally manifest in under-reporting of risky driving behaviour for fear of legal and social consequences. Negative images of fast drivers who are inconsiderate of other road users may cause some drivers to under-report their speeding behaviour in order to avoid being similarly categorised (Corbett, 2001). However, fast driving may also be viewed as "good", "valued" and "highly skilled" (Corbett, 2001, p.146), and some drivers may not want to report travelling too slowly, to avoid being viewed as unconfident, old, unskilled or unsafe drivers. In either case, self-reports would not be accurate. Of course, social

norms may also have a genuine influence on attitudes and behaviours, so that the socially desirable response is in fact valid.

1.4.2 Negative affectivity bias

Negative affectivity has been referred to as the tendency to experience negative emotions across situations and time (Watson & Clark, 1984). It is argued that, because individuals high in negative affectivity tend to report distress and negative emotions in general, this might bias self-report measures, particularly evaluative judgements (Watson, Pennebaker & Folger, 1986). Indeed, it has been illustrated that negative affectivity accounts for some of the variance in self-report measures (e.g. Parkes, 1990; Watson & Pennebaker, 1989). However, there has been a lack of strong empirical support for this argument (for a review see Razavi 2001). Furthermore, other research suggests that negative affectivity, rather than being a potential source of bias, has a substantive effect on dependent measures (for a review see Spector, Fox & Van Katwyk, 1999).

Negative affectivity would result in self-reports of negative attitudes toward speeding, but probably also risky driving. Effects on self-reported behaviours and beliefs are not as simple to predict because they are not evaluative concepts.

1.4.3 Acquiescence

Acquiescence response style refers to the tendency to respond in a positive manner (“true” or “yes”) regardless of the content of the question (Razavi, 2001). Paulhus (1991) makes the distinction between agreement acquiescence, which refers to the tendency to agree with all types of items (e.g. ‘‘yes’’ to both happy and not happy), and acceptance acquiescence, which refers to the tendency to endorse all statements as true of oneself (e.g. ‘‘yes’’ to happy, and ‘‘no’’ to not happy).

The impact of acquiescent responding on self-reports regarding road safety behaviours, attitudes and beliefs is unlikely to be systematic. That is, acquiescence mediates an effect of question phrasing and format, rather than of question content.

1.4.4 Extreme and moderacy responding

Extreme and moderacy response styles refer to the tendency for subjects to respond consistently using particular sections of the scale (Razavi, 2001). The tendency to use the extreme choices on a rating scale (e.g. 1 or 7 on a seven-point scale) has been consistently identified as a possible response bias (e.g. Anastasi & Urbina, 1997; Paulhus, 1991), while moderacy bias refers to a tendency to avoid extreme choices and to respond neutrally (Razavi, 2001).

Again, extreme and moderacy responding styles are unlikely to produce consistent effects on self-reports regarding road safety behaviours, attitudes and beliefs, because these response biases mediate an effect of question format, rather than of question content.

1.5 Approaches to minimising reporting bias in self-report

While bias in self-report is difficult to eliminate entirely, various features may be built into self-report instruments to minimise or control for response bias. For example, instructions may be written to encourage participants to respond frankly (Anastasi & Urbina, 1997). Furthermore, participants are more likely to respond accurately if they are convinced that it is advantageous to do so (Anastasi & Urbina, 1997). In the present study, instructions encouraged participants to respond

as accurately and honestly as possible, and emphasised increased public scrutiny on road trauma, particularly involving young drivers.

Reporting bias in self-report may be reduced by employing the "bogus pipeline" technique, which involves telling participants that their responses will be verified (Jones & Sigall, 1971). For example, in the present research examining speeding behaviour, participants were told that their responses would be checked against official records. When archival records are in fact checked (although they were not in the present research) this technique also becomes a validation exercise. The bogus pipeline technique has been shown to be effective in a range of areas (for a review see Roese & Jamieson, 1993). However, it is not relevant to measurement of psychological attributes, such as attitudes.

Inclusion of a measure of the tendency to respond in a socially desirable manner allows for control of the influence of socially desirable responding in statistical analyses. For example, participants who demonstrate an extremely high score on such a measure may be excluded from analyses. Alternatively, scores on the measure may be employed as covariates in statistical analyses of dependent variables with which they correlate significantly.

1.6 The Implicit Association Test

The Implicit Association Test (IAT; Greenwald, McGhee & Schwartz, 1998) provides a method for measuring attitudes without reliance on self-report, and thus also for testing the validity of self-reported attitudes.

The IAT is a task, normally administered by computer that assesses the association between a target-concept and an evaluation. The procedure (illustrated in Table 1) starts with introduction of the target-concept discrimination. For speeding behaviour, this discrimination involves participants distinguishing words that are recognisable as speeding- or risky-driving-related (left hand response) from words that are recognisable as not-speeding- or safe-driving-related (right hand response). Secondly, participants learn the evaluation discrimination by distinguishing words as bad/negative (left hand response) versus good/positive (right hand response). Thirdly, the two discrimination tasks are superimposed, so that (for example) participants respond with a left hand response if a word is speeding-related or negative, and with a right hand response if the word is not-speeding-related or positive. Fourthly, participants learn the reversal of response assignments for the initial target-concept discrimination (so now not-speeding/left versus speeding/right). Fifthly the evaluation discrimination is superimposed with the reversed target-concept discrimination (so that participants respond with a left hand response if the word is not-speeding-related or negative, and with a right hand response if the word is speeding-related or positive) (Greenwald et al., 1998). Typically, a between-subjects counterbalance ensures that half of the participants are given the compatible response combinations before non-compatible response combinations (as described above assuming that attitudes to speeding are negative), and that remaining participants are given the non-compatible combinations first (Stages 1 and 3, swapped for Stages 4 and 5, respectively).

Table 1: Schematic illustration of the "compatible before non-compatible combinations" in a speeding-related IAT (template employed from Greenwald et al., 1998).

Stage	**1**	**2**	**3**	**4**	**5**
Task Description	*First Concept Discrimination Task*	*Evaluation Discrimination Task*	*First Combined Task*	*Second (Reversed) Concept Discrimination Task*	*Second (Reversed) Combined Task*
Task Instructions	● SPEED SAFE ●	● bad good ●	● SPEED ● bad SAFE ● good ●	SPEED ● ● SAFE	SPEED ● ● bad ● SAFE good ●
Sample Stimuli	o FAST SLOW o o SPEED o RACE BRAKE o SAFE o	peace o love o o hatred o agony happy o o nasty	o hatred SLOW o o FAST love o peace o o SPEED	SPEED o FAST o o SLOW RACE o o BRAKE o SAFE	love o peace o o SLOW FAST o SPEED o o hatred

For the "non-compatible combinations before compatible" speeding-related IAT, Stages 1 & 3 will be swapped with Stages 4 & 5, respectively.

Categories for all discriminations are assigned a left or right response key, indicated by the black circles in the third row. The 4th row figure shows selected stimuli with correct responses indicated as open circles. Target-concept words are in upper case, while evaluation words are in lower case.

If the target-concept categories are differentially associated with the evaluation categories, participants should find the compatible combined stage considerably easier than the non-compatible combined stage, and so performance should be faster (Burgess & Faunce, 2006; Faunce & Golding, 2002). For example, if people have negative attitudes toward speeding, responding should be faster when speeding-related words share a response key with negative words, and not-speeding-related words share a response key with positive words (Table 1, Stage 3), than when speeding-related words share a response key with positive words, and not-speeding-related words share a response key with negative words (Table 1, Stage 5). The IAT effect is defined as the difference in mean latency for the non-compatible minus compatible stage (Greenwald et al., 1998). Thus, a positive IAT effect in the present study would indicate a negative attitude toward speeding or a positive attitude toward not-speeding.

The IAT measures attitudes in terms of the relative strength of associations of concepts with negative and positive evaluations, by measuring response times when different combinations of words share a response key. As a hidden measure of attitudes the IAT is likely to circumvent all of the response biases outlined earlier.

Several studies have investigated whether participants are able to fake desired patterns of responding on the IAT (for review see Fiedler and Bluemke, 2005). Generally, these studies suggest that participants can fake responses only when they are explicitly asked, and given strategies, to do

so. For example, Kim (2003) found that participants could fake responses only when told to respond slowly for the compatible condition and quickly for the non-compatible condition. Fiedler and Bluemke (2005) found successful faking when they created conditions to encourage and allow it. Participants were asked their attitudes toward Turks and Germans at the start of the experiment, so they were primed with the knowledge that attitudes were being assessed. They were then told the purpose of the IAT. After a baseline IAT participants received feedback on their relative speeds in the compatible and incompatible stages and information about how these results were interpreted in terms of attitudes. Before completing the "faking" IAT participants were given instructions which varied in the detail of strategies for faking. All participants were instructed to "reflect ahead of each block on how to influence your reaction times to avoid the inference that you are prejudiced against Turks. One third was given no further information. One third was additionally instructed that "the shorter reactions times are in the compatible block and the longer reaction times are in the incompatible block". One third was additionally instructed "it is most important to be slower in the compatible block. It doesn't pay off trying to be faster in the incompatible block." All participants were equally successful at faking. In a second experiment, participants given the first instruction, but no baseline IAT and feedback, were not able to fake.

Amongst remaining concerns that have been raised regarding the IAT, only one is relevant here[1]. Specifically, several researchers have investigated the possibility that any observed implicit association may result from associations between the particular word stimuli chosen to represent the target-concept and/or evaluation categories, rather than from an association between the categories themselves (for a review see Bluemke and Friese, 2006). For example, the target category *female* may appear to be associated with the attribute category *pleasant* if exemplars for *female/male* are MARILYN MONROE and ADOLF HITLER, but not if they are MARGARET THATCHER and ALBERT EINSTEIN. Similarly, the exemplars for *pleasant/unpleasant* may produce apparent associations with the gender categories. The target category *female* may appear to be associated with the attribute category *pleasant* if exemplars for *pleasant/unpleasant* are BEAUTIFUL and BRUTAL, but not if they are HYSTERICAL and BRAVE. In the most systematic investigation to date, Bluemke and Friese (2006) demonstrate that the chosen stimuli can indeed influence the IAT, but also that "a neutral IAT with non-valenced target stimuli and target-unrelated attribute stimuli produced a strong effect, which is hard to explain by other properties of the stimuli alone" (p.170). In the present research we were careful to choose target-concept and attribute word stimuli that demonstrated no cross-category associations. This was facilitated by choosing target-concept stimuli that were essentially synonymous with "speed" rather than particular examples of it.

If it is not made explicit to participants that their attitudes are being assessed, then they are fairly unlikely to realise this, and so fairly unlikely to be motivated to demonstrate socially desirable attitudes. Further, participants require substantial knowledge about how the task works in order to fake socially desirable responses. Finally, participants are instructed to respond as quickly as possible to all combinations, and this would thus be a socially desirable response competing with any desire to demonstrate socially desirable attitudes.

The IAT has been successfully employed to assess attitudes associated with obesity (Burgess & Faunce, 2006; Faunce & Golding, 2002), homosexuality (Banse, Seise, & Zerbes, 2001; Steffens & Buchner, 2003), smoking (Swanson, Rudman, & Greenwald, 2001), presidential candidates (Nosek, Banaji, & Greenwald, 2001), consumer products (Brunel, Collins, Greenwald, & Tietje, 1999;

1 Another line of research has investigated whether the IAT can be produced artefactually in a procedure where the concept classification is of the form Teeth versus no-Teeth (e.g. Mitchell, 2004), which is not the case here. De Houwer (2006) investigated the effect of replacing actual pairings of concept stimuli with good or bad outcomes, with propositional knowledge about these pairings, on associations as tested by the IAT. This application of the IAT is of limited relevance to the procedures employed here

Maison, Greenwald, & Bruin, 2001), and social anxiety (Tanner, Stopa & Houwer, 2006). Further, several studies have shown that IAT measures correlate as expected with group membership classifications (see Greenwald & Nosek, 2001 for a review). For example, Greenwald et al. (1998) employed the IAT to demonstrate expected differences between Japanese Americans and Korean Americans in attitudes towards their respective racial groups. Finally, Teachman, Gregg and Woody (2001) used the IAT to measure attitudes to snakes and spiders among participants who reported snake and spider fears, and found that the IAT successfully discriminated between fear groups.

Further, the IAT has been found to predict behaviour. For example, Marsh, Johnson, and Scott-Sheldon (2001) found that an IAT designed to measure attitudes towards condom use successfully predicted condom use with casual partners. Moreover, the IAT has been found to predict behaviours that self-report measures have failed to predict. For example, Rudman and Glick (2001) found that, when participants were instructed to assess applicants for a hypothetical job (presented via videotape), prejudice against female job applicants was associated with gender stereotypes as assessed by the IAT, but not as assessed by a self-report measure (which may have been distorted by socially desirable responding).

The IAT is yet to be employed to measure attitudes in the field of road safety. However, the IAT may be of substantial benefit to road safety research, which has hitherto relied on potentially biased self-reported measures of attitudes (which are likely to be key predictors of risky driving behaviour). The present research aims to develop an IAT to measure attitudes to speeding, and to test the validity and reliability of this instrument. Validity will be assessed both against self-reported measures of attitudes (convergent validity), self-report measures of theoretically related constructs (predictive validity), and objective measures of simulated driving behaviour (predictive validity).

1.7 Project aims

The present program aimed to:

Objective 1: Develop an IAT to assess attitudes to speeding.

Objective 2: Develop a Driver Questionnaire, to assess attitudes, beliefs, and behavioural intentions in relation to speeding.

Objective 3: Test the association of IAT-measured attitudes to speeding, with self-reported attitudes to speeding, and with relevant self-reported beliefs and behaviours[2].

Objective 4: Test the association of IAT-measured attitudes to speeding, with speeding behaviour on a driving simulator.

Objective 5: Test the effect of audiovisual materials designed to promote negative attitudes to speeding (compared to control audiovisual materials) on IAT-measured attitudes to speeding, as well as on self-reported attitudes to speeding, relevant self-reported beliefs and behaviours, and simulated driving behaviour.

2 Although driving behaviour can be measured directly, this is time consuming and costly. Thus, self-reported measures of driving behaviour are employed frequently (e.g. Ulleberg & Rundmo, 2002; Prabhakar, Lee & Job, 1996). Further, many studies have supported the validity of self-report risky driving measures (e.g. Ulleberg & Rundmo, 2002; Prabhakar et al., 1996; Aberg, Larsen, Glad & Beilinsson, 1997). For example, self-reported intention to engage in risky driving behaviours correlates strongly with observed driving speed (Aberg et al., 1997; West, French, Kemp & Elander, 1993) and with archival measures (Arthur, Tubre, Day, Sheehan, Sanchez-Ku, Paul, Paulus & Archuleta, 2001). In the present study, simulated driving behaviour was observed to supplement self-reported measures of speeding.

2 STUDY 1

2.1 Methods

2.1.1 Participants

Participants were forty-five licensed drivers (42.2% female), who responded to an advertisement for a "driving simulator study" that was posted around the University of New South Wales, Kensington campus. The age range of the sample was 17-45 years, and the mean age was 20-25 years. Participants were randomly allocated to two different versions of the IAT. The counterbalance group that received compatible combinations before incompatible combinations had a significantly greater proportion of females than the counterbalance group that received the combined stages in the reversed order (χ^2 [1] = 3.94, p=0.047), but the groups did not differ in terms of age (F [1, 43] = 0.087, p=0.769).

2.1.2 Materials and apparatus

Recruitment Advertisement

The Recruitment Advertisement [Appendix A] identified that licensed drivers were required to participate in "a study on attitudes and behaviours involved in driving" that would be conducted in the Department of Psychology at the University of New South Wales. It offered potential participants the opportunity to drive in a driving simulator, earn up to twenty dollars (depending on how they drive), complete a short questionnaire, and complete a short computer task, in a session that would last no more than one hour. The Recruitment Advertisement informed potential participants that they would be free to withdraw at any time, and that all collected information would remain confidential. It provided the contact details of the researcher so that interested people could volunteer.

Participant Information Sheet

The Participant Information Sheet [Appendix B] described the research as "a study of driver attitudes and behaviours" that aimed to "better understand both driver attitudes toward risky driving, as well as the ways in which motorists can be best informed of the dangers associated with risky driving". It informed participants that researchers might check their driving records (if they provided specific consent and their Driver's Licence Number). The Participant Information Sheet reminded participants that any information collected in the study would remain confidential (except as required by law), and would be reported only as grouped results, so that individual participants cannot be identified. It also reminded participants of the voluntary nature of participation, and of their right to withdraw at any time. It provided details about the procedure for lodging complaints or asking any further questions. The Participant Information Sheet identified affiliation with the NSW Injury Risk Management Research Centre, the University of New South Wales, and the Australian Transport Safety Bureau.

Consent Form

The Consent Form [Appendix C] instructed participants to read and sign if they were willing to participate. Participants were also asked to consent to providing access to their driving records, and

provide a Driver's Licence Number. The Consent Form identified affiliation with the NSW Injury Risk Management Research Centre, the University of New South Wales, and the Australian Transport Safety Bureau.

Revocation of Consent Form

The Revocation of Consent Form [Appendix D] instructed participants to read, sign and return, if at any stage during the study, they wanted to withdraw their consent. The Revocation of Consent Form identified affiliation with the NSW Injury Risk Management Research Centre, the University of New South Wales, and the Australian Transport Safety Bureau

Driver Questionnaire

The complete version of the Driver Questionnaire is reproduced in Appendix E. All participants were instructed to read all questions carefully and to answer each question as honestly as possible.

Question 1: Perceived crash risk

Participants listed the three most important causes of serious car crashes, beginning with the most important. Three spaces (categorised, in order, as "Most serious", "Second", and "Third") were provided for participants to make their responses. A score of 3 was computed if speeding was mentioned as "Most serious", 2 for "Second", 1 for "Third", and 0 if speeding was not mentioned at all.

Questions 2-4: Infringement and crash history

Participants indicated how many crashes (of any type) they had been involved in while driving (in the last two years). Participants who indicated they had been involved in a crash also indicated how many of those crashes were caused by speeding. Participants also indicated how many times (in the last two years) they had been fined for speeding.

Question 5: Perceived relative risk (illusory invulnerability)

Participants rated the chances that each of six events [see Table 2] would happen to them, compared with the average driver of the same age and gender. Responses were made on a 5-point scale (1="Much lower than average"; 2="Lower than average"; 3="Same as average"; 4="Higher than average"; 5= "Much higher than average"). Responses were averaged across the three events that related specifically to speeding (Questions b, c and d, below).

Table 2: Events for which participants rated perceived relative risk (in order of presentation)

a) Your chances of having a car crash?
b) Your chances of having a crash if exceeding the speed limit by less than 15 km/h?
c) Your chances of having a crash if exceeding the speed limit by more than 15 km/h?
d) Your chances of being fined for speeding?
e) Your driving safety?
f) Your driving skill?

Questions 6-9: Self-reported frequency of speeding

For each of 4 speed limit zones (40 km/h, 60 km/h, 80 km/h, and 100 km/h), participants reported how often they drive between 1-15 km/h over the limit, and how often they drive more than 15 km/h over the limit. Responses were made on a 6-point scale (5="Always"; 4="Most of the time"; 3="Often"; 2="Sometimes"; 1="Rarely"; 0="Never"). Responses were averaged across speed limit zones for low-range and high-range speeding separately.

Question 10: Perceived risk of being caught for speeding

Participants rated their chances of being detected (when exceeding the speed limit) by (a) police on the side of the road with a radar; (b) an automatic fixed speed camera; and (c) police in a moving patrol vehicle with a radar. Responses were made on a 5-point scale (1="Very unlikely"; 2="Unlikely"; 3="Even chance"; 4="Likely"; 5= "Very likely") and averaged.

Question 11: Perceived appropriateness of speed limits

Participants rated the appropriateness of the 40 km/h, 50 km/h, 60 km/h, 80 km/h, and 100 km/h speed limit zones they know (for each zone separately). Responses were made on a 5-point scale (1="Much too low"; 2="Too low"; 3="Just right"; 4="Too high"; 5="Much too high"). Responses were averaged across speed limit zones, such that a higher score reflects a lower tolerance for high speed limits.

Question 12: Self-reported likelihood of speeding across a range of situations

Participants rated how likely they would be to exceed the speed limit in the driving situations that are presented in Table 3. Responses were made on a 5-point scale (1="Very unlikely"; 2="Unlikely"; 3="Even chance"; 4="Likely"; 5="Very likely"). Responses were averaged across situations.

Table 3: Driving situations for which participants rated likelihood of speeding (in order of presentation)

a) On a clear, dry day
b) In wet conditions
c) At night
d) You are in a hurry to get to an appointment
e) You feel like a thrill
f) To keep up with traffic
g) You need to "blow off steam"
h) You know the road very well
i) There are no other cars on the road
j) You want to impress others
k) To compete with other drivers and vehicles
l) To get through an amber traffic light
m) To avoid an accident
n) You are near a school
o) You are in a hurry to get home
p) You have friends in the car

Question 13: Social norms

Participants rated how many km/h over the speed limit a driver would have to travel, in a 40 km/h, 60 km/h, 80 km/h and 100 km/h speed limit zone, for him/her to be considered stupid, irresponsible, criminal, and a potential murderer (separately; see Table 4). Responses were averaged across all cells of the grid, such that a higher score indicates a higher tolerance for speeding.

Table 4: Format of the social norms items

		40 km/h zone	60 km/h zone	80 km/h zone	100 km/h zone
a)	Stupid?				
b)	Irresponsible?				
c)	Criminal?				
d)	Potential Murderer?				

Question 14: Beliefs and attitudes regarding speeding and road safety

Participants rated their agreement with the statements regarding speeding and road safety that are presented in Table 5. Responses were made on a 5-point scale (1="Strongly Disagree"; 2="Disagree"; 3="Neutral"; 4="Agree"; 5="Strongly Agree"). The items that are highlighted in Table 5 were considered as items reflecting a positive or negative attitude to speeding. Items reflecting a positive attitude (a, i, j, and l) were recoded so that a higher score reflected a higher negative attitude. Scores for items a and l were averaged due to their similarity (speeding is safe). Similarly, scores for items k and p were averaged (those who speed should be brought to justice). Other scores were treated separately.

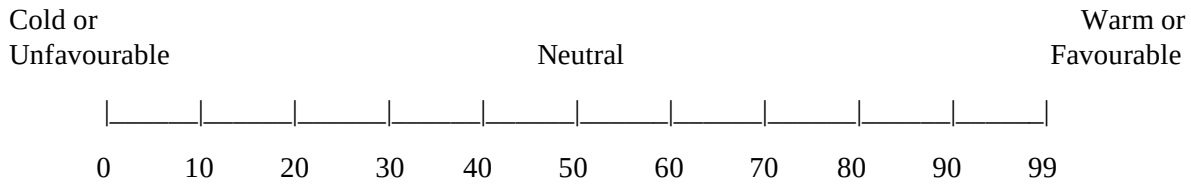
Table 5: Statements of beliefs and attitudes with which participants rated agreement in order of presentation)

a) Speeding can be safe for a skilful driver
b) My safety is an important factor in my decision about whether to exceed the speed limit or not
c) The possibility of losing points from my licence is an important factor in my decision about whether to speed or not
d) The possibility of getting a fine is an important factor in my decision about whether to speed or not
e) Speeding presents a means of rebelling against authority
f) Speeding presents a means of being noticed and attracting admiration from friends/others on the road
g) Speeding allows people to have a sense of control over something
h) Speeding allows people to experience an 'adrenalin rush'
i) Speeding is fun, thrilling, and exciting
j) Speeding is OK if you are running late and you need to save driving time
k) People who are caught exceeding the speed limit by more than 30 km/h should have to appear in court
l) Speeding can be safe in some circumstances
m) It is irresponsible to speed
n) Penalties for speeding are just revenue raising
o) Demerit points for speeding should be doubled during holiday periods
p) People who are caught exceeding the speed limit by more than 30 km/h should be made to have speed governors fitted to their cars

Question 15: "Feeling thermometer" measures of speeding-related attitudes

Participants identified their "general level of warmth or coolness" toward speeding by marking a dimension at an "appropriate position". The dimension was labelled at 10-point intervals from 0 to 99, and anchored at the 0, 50, and 99 points with the words "cold or unfavourable", "neutral", and "warm or favourable", respectively [see Figure 1]. Participants rated "sticking to the speed limit / safe driving" on the same dimension. A difference score was computed ("sticking to the speed limit / safe driving" – "speeding"), such that higher scores reflected higher negative attitude to speeding.

Figure 1: Feeling thermometer



Question 16: Semantic differential item measures of speeding-related attitudes

Participants completed a set of five semantic differential item scales for speeding. These 7-point scales were anchored at either end by polar-opposite adjective pairs: "beautiful-ugly", "good-bad", "pleasant-unpleasant", "honest-dishonest", and "nice-awful" (with corresponding scores ranging from 3/positive to -3/negative). On each scale, participants circled one of the seven points to best describe speeding, circling the middle point if they considered both anchoring adjectives to be irrelevant to speeding. Participants also completed the five scales for "sticking to the speed limit/safe driving". The semantic differential was scored by averaging the 5 scales for "speeding" and "sticking to the speed limit/safe driving" separately, and then computing a difference score ("sticking to the speed limit / safe driving" – "speeding"), such that higher scores reflected higher negative attitude to speeding.

Questions 17-25: Personal characteristics

Participants also responded to questions regarding (in order): amount of driving time (hours per week), driver's licence status (Learners permit, Red P-plates, Green P-plates, Full licence, and Licence disqualified), driving experience (years/months), postcode, gender, age category (16-17 years old, 18-19 years old, 20-25 years old, 26-45 years old, and 45+ years old), main language spoken at home, marital status (Single, Widowed, Separated/Divorced, Married/De facto), and level of education (School Certificate or equivalent, Higher School Certificate or equivalent, TAFE/College or equivalent, and Tertiary or higher).

Driving simulator

Hardware

The driving simulator was situated in a room in the University of New South Wales. It consisted of a real car body with a steering wheel, automatic transmission, and accelerator and brake pedals. Speed was displayed on the speedometer. The visual scene was projected onto three screens (each 1.42m x 1.14m), providing a 135-degree field of view [see Figure 2]. The simulator provided engine noise, tyre screeches, and collision sounds.

Figure 2: Simulator car body, screens, and example graphics

Software

The simulator drives, programmed on Systems Technology Inc software, comprised 6.5 km of two-lane road in rural and urban settings, and included traffic lights, crossing pedestrians, and curves.

The practice drive consisted of a straight road, followed by a left bend in the road, followed by a "STOP" sign. Throughout the practice drive, the speed limit was shown to be 80 km/h, some houses were visible, and there were no oncoming vehicles present.

Two test drives were designed to assess speeding in a range of speed limit zones. The task was divided in two to minimise simulator sickness.

Drive 1 consisted of a straight road in an 80 km/h speed zone (with no housing visible), followed by a 40 km/h school zone (with a school and many school children visible, as well as oncoming vehicles present), followed by a 60 km/h speed zone, leading into a right bend in the road (with oncoming vehicles present), followed by a straight road in a 50 km/h speed zone (with people

visible, and oncoming vehicles present, in a built-up residential area), followed by a straight road in a 70 km/h speed zone (with an oncoming vehicle present).

Drive 2 consisted of a straight road in an 80 km/h speed zone (with some houses visible, and some oncoming cars present), followed by a central business district approaching a hill and a set of traffic lights over the hill (with not signs to indicate a change of speed limit), followed by a straight road in a 60 km/h speed zone (with people visible, and oncoming vehicles present, in a built-up residential area).

The simulator was programmed to record time, distance, speed, lateral position, and crashes, every foot for approximately 400 feet either side of each speed limit sign, because speed was assumed to be changing in accordance with the change to the posted speed limit.

Implicit Association Task

Hardware

The IAT was administered on a Hewlett-Packard Pavilion ze4300 laptop computer. Participants made left-hand responses using the "E" key, and right-hand responses using the "I" key, of a standard keyboard.

Software

Computer programs were designed to present the IAT as described in the "Background" section [see Table 6]. Two forms of the IAT were developed: one with hypothetically compatible combinations tested before hypothetically non-compatible combinations, and the other with this order reversed.

Table 6: Schematic illustration of the "compatible before non-compatible combinations" in a speeding-related IAT (template employed from Greenwald et al., 1998).

Stage	**1**	**2**	**3**	**4**	**5**
Task Description	*First Concept Discrimination Task*	*Evaluation Discrimination Task*	*First Combined Task*	*Second (Reversed) Concept Discrimination Task*	*Second (Reversed) Combined Task*
Task Instructions	● SPEED SAFE ●	● bad good ●	● SPEED ● bad SAFE ● good ●	SPEED ● ● SAFE	SPEED ● ● bad ● SAFE good ●
Sample Stimuli	o FAST SLOW o o SPEED o RACE BRAKE o SAFE o	peace o love o o hatred o agony happy o o nasty	o hatred SLOW o o FAST love o peace o o SPEED	SPEED o FAST o o SLOW RACE o o BRAKE o SAFE	love o peace o o SLOW FAST o SPEED o o hatred

For the "non-compatible combinations before compatible" speeding-related IAT, Stages 1 & 3 will be swapped with Stages 4 & 5, respectively.

Categories for all discriminations are assigned a left or right response key, indicated by the black circles in the 3rd row. The 4th row figure shows selected stimuli with correct responses indicated as open circles. Target-concept words are in upper case, while evaluation words are in lower case.

Table 7 presents the stimulus word lists employed for the present research. 14 target-concept discrimination words (7 "speeding/risky driving" words and 7 "not speeding/safe driving" words) and 14 evaluation words (7 "bad/unpleasant-meaning" words and 7 "good/pleasant-meaning" words) were selected by the researchers to be both familiar to, and unambiguously classifiable, by potential participants. In their selections the researchers were also careful to avoid cross-category associations (see Bluemke and Friese, 2006). All words were presented in blue letters against the white screen background, vertically and horizontally centred in the display.

Table 7: Stimulus word lists for each word category employed for the IAT throughout the present research program.

CATEGORY	WORD LIST
TARGET-CONCEPT DISCRIMINATION WORDS	
"Speeding / Risky Driving"	Fast, speed, race, rush, zoom, accelerate, blast
"Keeping to Speed Limits / Safe Driving"	Slow, careful, cautious, safe, decelerate, brake, sensible
EVALUATION WORDS	
"Good"	Paradise, peace, love, wonderful, glorious, laughter, happy
"Bad"	Grief, poison, disaster, hatred, agony, nasty, evil

On-screen instructions told participants that the task consisted of five separate classification blocks, each comprising 14 practice trials, and 28 "active" trials. The five separate blocks would involve classifying words from 4 categories, in different combinations. The 4 category-labels and corresponding word lists (see Table 7) were displayed on the computer screen. Instructions told participants that the category-labels applicable in each classification block would be present at the top of the screen, one on the top left (e.g. "Speeding / Risky Driving") and one on the top right (e.g. "Keeping to Speed Limits / Safe Driving"), indicating whether they should press a left-hand ("E") or right-hand key ("I") when a corresponding word appeared in the centre of the screen. Participants were instructed to make responses as fast as possible, and that mistakes were of no consequence, but would result in a red "X" appearing in the centre of the screen.

Each classification block started with instructions that described the discrimination(s) for the block. Participants were instructed to classify each word that appeared into one of the two categories, by pressing the "E" key (a left forefinger response) if the word belonged in the top-left category, and by pressing the "I" key (a right forefinger response) if the word belonged in the top-right category. For each participant, words were selected randomly and without replacement until the available stimuli for a block were exhausted, at which point the stimulus pool was replaced if more word trials were needed. Words remained on screen until the participant responded. The participant's key press response initiated a 250 ms delay before the next word trial. After any incorrect response, an "X" immediately replaced the stimulus for 300 ms, lengthening the inter-trial interval by 300 ms.

Reaction time was recorded for each practice and "active" trial.

2.1.3 Procedure

Ethics approval was granted by the University of Sydney Ethics Committee, and ratified by the University of New South Wales Ethics Committee. Potential participants who responded to the Recruitment Advertisement were informed that the maximum $20 reimbursement depended on their driving, and that they would lose $4 for each traffic violation committed on the driving simulator (to a minimum of $10). This methodology was adopted to introduce a real cost to driving errors on the simulator, and so to maximise its ecological validity. Each person that agreed to participate arranged a time to meet the researcher at the driving simulator room at the University of New South Wales. Each participant was tested individually.

At the beginning of each session, the participant read the Participant Information Sheet and signed the Consent Form (possibly providing their Driver's Licence Number).

The participant then completed the questionnaire. The researcher checked returned questionnaires immediately to ensure that all sections had been completed. The participant was encouraged to complete any remaining sections.

The participant then completed the driving simulator drives. The participant completed a practice drive, in order to become accustomed to driving the simulator, and was given the opportunity of completing a second practice drive, if they were still uncomfortable with driving the simulator. The participant then completed the two test drives.

Finally, the participant completed one version of the IAT.

No time restrictions were enforced, and the session took approximately 35-45 minutes. Upon completion, the participant was debriefed, thanked for their participation, and reimbursed for their time (a minimum of $10, depending on simulator performance).

2.1.4 Statistical analyses

Data were analysed employing SPSS and Microsoft Excel. A Type 1 error rate of 0.05 and 2-tailed tests were employed throughout.

Data transformations

For the IAT, practice trials and uncombined classification blocks were disregarded. For both combined classification blocks, the distribution of reaction times was examined for each participant, revealing a small proportion of extremely fast and extremely slow responses. These outlying values typically indicate, respectively, anticipated responses and momentary inattention. These values are problematic, not only because they lack theoretical interest, but also because they distort means and inflate variances. As such, in accordance with original IAT methodology (Greenwald et al., 1998), all latency values below 300ms were recoded to 300s, and all latency values above 3000ms were recoded to 3000s. Log-transformations were then conducted for all latencies, in order to stabilise variance and achieve a closer to normal distribution. Average latencies for each of the two combined IAT classification blocks were then computed for each participant. IAT effects were then calculated by computing the difference between average latencies for the two combined stages (hypothetically non-compatible – hypothetically compatible). Thus, a higher score is consistent with assumptions (of a negative attitude toward speeding, and/or a positive attitude toward sticking to the limit).

Scores for Driver Questionnaire variables were computed as described in the Materials Section. Table 8 summarises the transformations and possible ranges of final scores.

Table 8: Transformations and possible range for all self-report measures employed from the Driver Questionnaire, in Study 1.

Self-Report Measure	Scale	Transformation	Range	Score consistent with more negative attitude to speeding
Feeling Thermometer	0= cold 99= warm	Not speed minus speed	-99 to 99	Higher
Semantic Differential scale	-3 = negative description 3 = positive description	Average of 5 scales Not speed minus speed	-6 to 6	Higher
Explicit Attitude: Speeding is safe	1 = Strongly agree 5= Strongly disagree	Average of beliefs/attitudes items a and l	1 to 5	Higher
Explicit Attitude: Those who speed should be brought to justice	1 = Strongly disagree 5= Strongly agree	Average of beliefs/attitudes items k and p	1 to 5	Higher
Explicit Attitude: “Speeding is fun, thrilling, and exciting”	1 = Strongly agree 5= Strongly disagree		1 to 5	Higher
Explicit Attitude: “Speeding is OK if you are running late and you need to save driving time”	1 = Strongly agree 5= Strongly disagree		1 to 5	Higher
Explicit Attitude: “It is irresponsible to speed”	1 = Strongly disagree 5= Strongly agree		1 to 5	Higher
Explicit Attitude: “Demerit points for speeding should be doubled during holiday periods”	1 = Strongly disagree 5= Strongly agree		1 to 5	Higher
Social Norm (regarding speeding)	0+	Average across descriptors across limit zones	0+	Lower
Perceived Appropriateness of Speed Limits	1= Much too low 5= Much too high	Average across limit zones	1 to 5	Higher
Perceived Risk of being caught for speeding	1= Very unlikely 5= Very likely	Average across mode of detection	1 to 5	Higher
Perceived Crash Risk for speeding	3= Rated most serious 0= Not mentioned		0 to 3	Higher
Speeding-related illusory invulnerability	1= Much lower 5= Much higher	Average across illusory invulnerability items b-d	1 to 5	Higher
Self-reported general likelihood of speeding	1= Very unlikely 5= Very likely	Average across all situations	1 to 5	Lower

Self-Report Measure	Scale	Transformation	Range	Score consistent with more negative attitude to speeding
Self-reported speeding (low-range)	0= Never 5= Always	Average across speed limit zones	0 to 5	Lower
Self-reported speeding (high-range)	0= Never 5= Always	Average across speed limit zones	0 to 5	Lower
Self-reported fined for speeding	0+		0+	Lower
Self-reported crash due to speeding	0+		0+	Lower

Treating both drives together, average speed and percentage of speed exceedances (number of speed exceedances divided by number of speed recordings), were computed for the 40 km/h, 50 km/h, 60 km/h, and 80 km/h speed zones of the simulated drives (the 70 km/h zone was not considered because it was the last zone in Drive 1 and suffered some data recording anomalies).

Descriptive statistics

Means and standard deviations were computed for the IAT effect, key self-report variables, and driving simulator variables.

Inferential statistics

A one-way ANOVA was employed to compare the counterbalance groups (compatibility order) in terms of IAT effect. IAT effects were compared to zero by conducting a one-sample t-test.

The relationship of age with all key measures (implicit attitude, self-report, and simulated driving measures) was assessed employing Pearson's correlation coefficients. The relationship of gender with all key measures was assessed employing a one-way ANOVA with gender as the grouping variable. In order to reduce unnecessary variance (and possible confounding) age and gender were employed as covariates in any analysis involving variables with which they demonstrated significant relationships.

The convergent validity of the IAT developed here can be assessed only against self-reported attitudes (i.e. evaluative beliefs) because the IAT measures the association between target concept (speed versus sticking to the speed limit) and an evaluation. Thus the association of the IAT effect with self-report measures of attitudes from the Speeding Questionnaire (the feeling thermometer, the semantic differential scale, selected attitude items from Question 14) were assessed employing linear regressions.

The predictive validity of the IAT effect was assessed against Speeding Questionnaire measures of social norms, appropriateness of speed limits, risk of being booked, crash risk, relative risk, self-reported speeding, experience of being booked, and crash experience, all of which are theoretically related to attitudes toward speeding. The relationship between the IAT effect and simulated driving speed in each of the speed zones was also assessed. Again, linear regressions were employed to assess relationships.

2.2 Results

2.2.1 The IAT effect

The IAT effect (incompatible combined block – compatible combined block) was significantly greater when hypothetically compatible response combinations preceded non-compatible combinations, than when non-compatible combinations were presented first (F [1, 43] = 4.839, p=0.033).

Figure 3 displays the mean latencies for hypothetically compatible and non-compatible response blocks, for participants who were given hypothetically compatible response combinations before non-compatible combinations. The mean latency for the hypothetically compatible block (527.76; SD=164.41) was significantly lower than the mean latency for the hypothetically non-compatible block (1114.56; SD=726.87), with the IAT effect being significantly greater than zero (t=4.286, p<.001, CI: 302.88 – 870.73).

Figure 3: Mean latencies for compatible and non-compatible combined IAT classification blocks for participants who were given hypothetically compatible response combinations before non-compatible combinations in Study 1 (n = 23).

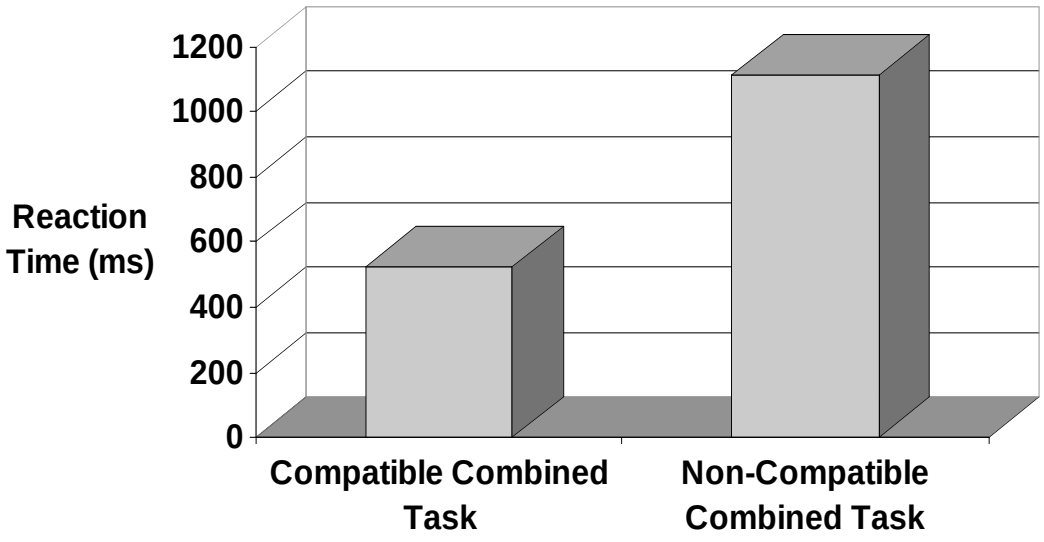
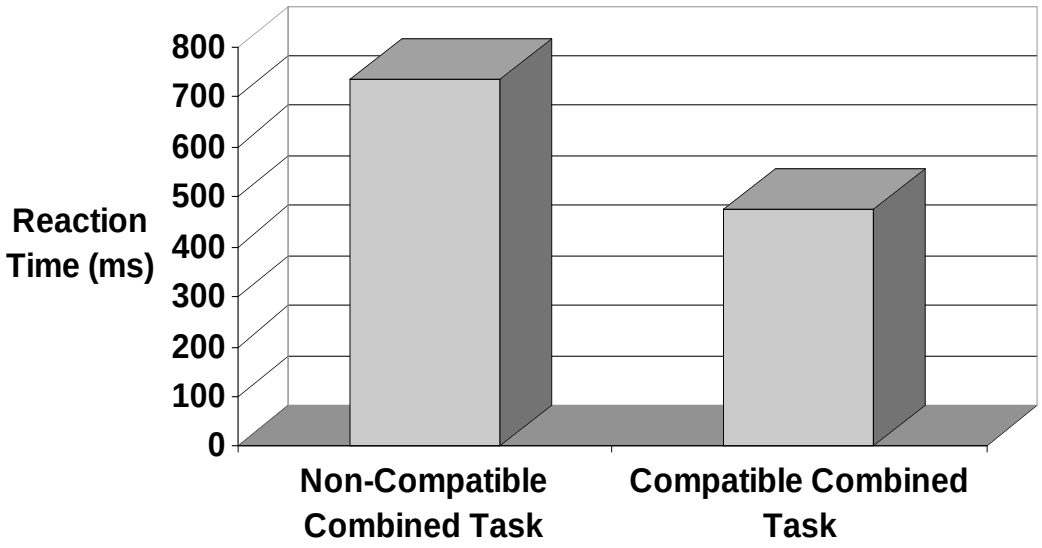


Figure 4 displays the mean latencies for hypothetically non-compatible and compatible response blocks, for participants who were given hypothetically non-compatible response combinations before compatible combinations. The mean latency for the hypothetically non-compatible block (734.87; SD=362.97) was significantly higher than the mean latency for the hypothetically compatible block (475.65; SD=150.86), with the IAT effect being significantly greater than zero (t=5.009, p<.001, CI: 151.60 – 366.85).

Figure 4: Mean latencies for non-compatible and compatible combined IAT classification blocks for participants who were given hypothetically non-compatible response combinations before compatible combinations in Study 1 (n = 22).



2.2.2 Driver Questionnaire: descriptive analysis

Table 9 provides the means and standard deviations for all self-report measures employed from the Driver Questionnaire. Referring to the last 2 columns of Table 8, responses generally indicate a negative explicit attitude to speeding, high perceived crash risk of speeding, and low self-reported high-range speeding. However, self-reported low-range speeding was moderate.

Table 9: Means and standard deviations for all self-report measures employed from the Driver Questionnaire, in Study 1.

Self-Report Measure	Mean	Standard Deviation
Feeling Thermometer	49.00	23.18
Semantic Differential scale	2.57	1.39
Explicit Attitude: Speeding is safe[a]	3.00	0.92
Explicit Attitude: Those who speed should be brought to justice	3.71	0.76
Explicit Attitude: "Speeding is fun, thrilling, and exciting" [a]	3.40	0.96
Explicit Attitude: "Speeding is OK if you are running late and you need to save driving time" [a]	3.42	1.14
Explicit Attitude: "It is irresponsible to speed"	3.58	1.22
Explicit Attitude: "Demerit points for speeding should be doubled during holiday periods"	3.91	1.18
Social Norm (regarding speeding)	34.18	25.01
Perceived appropriateness of Speed Limits	2.77	0.23
Perceived Risk of being caught for speeding	3.01	0.74

Self-Report Measure	Mean	Standard Deviation
Perceived Crash Risk for speeding	2.67	0.74
Speeding-related illusory invulnerability	3.06	0.50
Self-reported general likelihood of speeding	2.76	0.42
Self-reported speeding (low-range)	2.81	0.85
Self-reported speeding (high-range)	0.97	0.69
Self-reported fined for speeding	0.58	0.69
Self-reported crash due to speeding	0.35	0.42

a Scoring reversed so that higher score reflects more negative attitude to speeding.

2.2.3 Driving Simulator: descriptive analysis

Table 10 displays the average simulated driving speed and percentage of exceedances for each speed zone. Average speed in the 40 km/h, 50 km/h and 60 km/h speed zones was substantially higher than the posted speed limit, while average speed in the 80 km/h speed zone was marginally higher than the posted speed limit. The observed percentage of speed exceedances was high in the 40 km/h and 50 km/h speed zones, but moderate in the 60 km/h and 80 km/h speed zones.

Table 10: Average simulated driving speed and percentage of exceedances for each speed zone, in Study 1.

Speed Zone	Mean	Standard deviation
Average Speed		
40 km/h	56.61	10.23
50 km/h	60.61	9.41
60 km/h	67.62	11.17
80 km/h	81.03	7.47
Percentage of Exceedances		
40 km/h	97.28%	6.17
50 km/h	91.04%	23.72
60 km/h	44.37%	41.01
80 km/h	54.40%	39.87

2.2.4 Relationships with age and gender

The IAT effect was significantly associated with both age ($r=.313$, $p=.037$) and gender ($F [1, 43] = 12.236$, $p=0.001$). Thus, these variables were employed as covariates in all subsequent analyses (all involving the IAT effect), and there was no need to assess relationships of age and gender with other measures.

Relationship of the IAT with self-report and simulated driving measures

A separate linear regression on the IAT effect (as dependent variable) was conducted for each self-reported and simulated driving measure, entered at the second step, after age, gender, and counterbalance group had been entered at the first step (to control for their effects on the IAT). Table 11 presents relevant statistics for the self-report measures and Table 12 presents relevant statistics for simulated driving measures.

Table 11: Standardised B, t, and p for each self-report measure added to the second step, after age, gender and counterbalance group were added at the first step, in linear regressions on the IAT effect (with Model r2 and p), in Study 1.

Self-Report Measure	Standardised B	t	p	Model Adj. r^2	Model p
Feeling Thermometer	0.039	2.084	.044*	.346	<.001**
Semantic Differential scale	0.278	1.903	.064	.324	.001*
Explicit Attitude: Speeding is safe [a]	0.092	0.690	.494	.338	.002*
Explicit Attitude: Those who speed should be brought to justice	-0.155	-1.205	.235	.289	.001*
Explicit Attitude: "Speeding is fun, thrilling, and exciting" [a]	0.416	3.470	.001*	.434	.001*
Explicit Attitude: "Speeding is OK if you are running late and you need to save driving time" [a]	0.309	2.481	.017*	.361	<.001**
Explicit Attitude: "It is irresponsible to speed"	-0.247	-1.899	.065	.324	.001*
Explicit Attitude: "Demerit points for speeding should be doubled during holiday periods"	0.112	0.837	.407	.276	.002*
Social Norm (regarding speeding)	-0.064	-0.460	.648	.249	.005*
Perceived Appropriateness of Speed Limits	0.268	2.073	.045*	.335	<.001**
Perceived Risk of being caught for speeding	0.311	2.405	.021*	.356	<.001**
Perceived Crash Risk for speeding	0.020	0.138	.891	.264	.002*
Speeding-related illusory invulnerability	0.215	1.627	.112	.309	.001*
Self-reported general likelihood of speeding	-0.317	-2.327	.025*	.361	<.001**
Self-reported speeding (low-range)	-0.313	-1.388	.173	.297	.001*
Self-reported speeding (high-range)	-0.237	-1.711	.095	.324	.001*
Self-reported fined for speeding	0.238	1.769	.085	.317	.001*
Self-reported crash due to speeding	-0.273	-0.763	.460	.1105	.272

a Scoring reversed so that higher score reflects more negative attitude to speeding.

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.001 level (2-tailed).

Table 12: Standardised B, t, and p for each simulated driving measure added to the second step, after age, gender and counterbalance group were added at the first step, in linear regressions on the IAT effect (with Model r2 and p), in Study 1.

Speed Zone	Standardised B	t	p	Model r^2	Model p
Average Speed					
40 km/h	-0.140	-1.057	.297	.283	.002*
50 km/h	-0.165	-1.243	.221	.291	.001*
60 km/h	-0.122	-0.887	.380	.277	.002*
80 km/h	-0.303	-2.394	.021*	.356	<.001**
Percentage of Exceedances					
40 km/h	0.145	1.018	.315	.282	.002
50 km/h	-0.090	-0.655	.516	.271	.002
60 km/h	-0.187	-1.327	.192	.294	.001
80 km/h	-0.394	-3.392	.002*	.428	<.001**

* Significant at the 0.05 level (2-tailed).

** Significant at the 0.001 level (2-tailed).

2.3 Discussion

Study 1 introduced a speeding-related IAT to the field of road safety. Consistently faster discriminations were observed when the hypothetically negative category ("speeding") shared a response key with negative evaluative words (compared to when this category shared a response with positive-meaning words) and the hypothetically positive category ("keeping to the speed limit") shared a response key with positive evaluative words, compared with when hypothetically incompatible categories shared a response key (speeding with positive, and sticking to the speed limit with negative). These results suggest that the IAT may be used to measure implicit attitudes to speeding, and so possibly also implicit attitudes to other risky driving behaviours. Further, the present results are consistent with our assumption that attitudes toward speeding are generally negative.

Two versions of the speeding-related IAT were introduced in the present study: one with hypothetically compatible combinations (i.e. speeding + negative; not speeding + positive) tested before non-compatible ones (i.e. speeding + positive; not speeding + negative), and the other with non-compatible combinations tested before compatible combinations. The IAT effect was significantly larger when compatible combinations preceded non-compatible combinations, consistent with the findings of Greenwald et al. (1998). This result further supports the notion that the IAT was operating as expected in measuring implicit attitudes to speeding, and that attitudes toward speeding are negative.

The IAT developed for the present research was modelled on the procedure employed by earlier researchers (e.g. Greenwald et al., 1998), and did not seek to examine methodological issues relating to this procedure. Because the IAT assesses the association of each of the two poles of a target-concept dimension (here: speeding/risky driving versus not speeding/safe driving) with negative and positive evaluations, observed IAT effects may reflect a valenced attitude to only one

pole of the target-concept dimension. For example, the IAT effect observed in the present research may reflect a positive attitude to not speeding, rather than a negative attitude toward speeding. Nonetheless, it is generally assumed that a positive attitude toward not speeding would coexist with a negative attitude toward speeding, and this assumption is reflected in explicit measures of speeding-related attitudes also.

Several procedural details may contribute to the larger IAT effect when compatible combinations precede non-compatible combinations, however because of the counterbalance employed in the present study, such procedural effects are unlikely to have produced the observed overall IAT artefactually. For example, it may be that the response assignments for the attribute dimension (learnt in Stage 2, and then not changed) is better remembered immediately after (Stage 3) than in Stage 5. The consequently decreased response times in Stage 3 would contribute to the apparent IAT effect when compatible combinations are presented in Stage 3, but detract from it when non-compatible combinations are presented in Stage 3. Future research might examine this possibility by reversing the response assignments for the attribute dimension (rather than the target-concept dimension) in Stage 4 (and introducing a further counterbalance of left- versus right- key assignment for the concept categories). Alternatively Stage 2 might be trailed as Stage 1.

It might be argued that several of the concept words employed in the IAT task are associated with some evaluation words outside of the driving context, such that the IAT reflects this association rather than a driving-specific attitude. For example, “safe” may have a positive connotation which is independent of driving. We included concept words such as “safe”, “sensible”, “dangerous” and “reckless” because it is difficult to identify sufficient clearly driving-related words for the IAT procedure. We hoped that because these words were identified in instructions as driving-related, and because they were included in lists of more clearly driving-related words (e.g. “speed” and “race”), it was the driving-related meaning that participants thought of when they performed the task. Nonetheless, if the more general meanings were considered, then we think it is not unreasonable to assume that a positive connotation of “safe” would extend to a positive connotation of “safe driving”.

Further, observed results are generally consistent with results derived from the self-report and driving measures.

Means for all of the eight explicit measures of attitudes toward speeding that were included the Driver Questionnaire indicate negative attitudes toward speeding. Further, several explicit negative attitude measures demonstrated significant positive correlations with the IAT effect. Thus, a higher IAT effect (indicating a negative attitude to speeding) was associated with a higher score on the feeling thermometer index (also indicating a negative attitude to speeding), and lower agreement with the statement “Speeding is fun, thrilling an exciting” and “Speeding is OK if you are running late and you need to save driving time”. The observed association of the IAT with the semantic differential scale index was also positive but not significant, although the observed p-value was low ($p=.065$). Non-significant positive associations were observed with a further two explicit attitude measures. Thus, the IAT and explicit attitude measures appear to have strong convergent validity. This is particularly notable, because IAT responding should be immune from response biases.

Evidence was also found for the predictive validity of the IAT. First, self-report measures of variables that are theoretically related to attitudes (from the Driver Questionnaire) generally produced mean values that are consistent with negative attitudes toward speeding. Specifically, mean values indicated generally negative social norms regarding speeding (or low tolerance of speeding), high perceived risk of crashing due to speeding, and low high-range speeding behaviour. Nonetheless, low-range speeding behaviour was reasonably frequent, according to participants’ self-report. Second, a higher IAT effect (indicating a negative attitude to speeding) was associated with the belief that speed limits are too high (i.e. should be lower), a higher perceived risk of being caught when speeding, and lower self-reported frequency of speeding (averaged across sixteen

situations). The p-value for the observed negative association between the IAT effect self-reported frequency of high range speeding was low (p=.095).

Driving simulator results were also consistent with IAT results. Although, participants engaged in speeding, particularly in lower speed limit zones, those with IAT scores suggesting a stronger negative attitude to speeding were less likely to do so. The IAT effect correlated significantly and negatively with mean driving speed and percentage of recordings in excess of the speed limit, in the 80 km/h speed zone, suggesting that higher negative implicit attitude to speeding (indicated by a higher IAT effect) is associated with lower simulated speeding behaviour in the 80 km/h speed zone.

The number of observed significant correlations with the IAT may have been restricted by several factors. For example, the observation of several marginally non-significant correlations suggests that statistical power may have been an issue, and more significant effects may have been observed in a larger sample. More substantively, the IAT may not be sufficiently sensitive to degrees of negative attitude to demonstrate clear relationships. That is, while an association between a particular concept (e.g. speeding) and negative-meaning words results in faster performance on the IAT, it is not clear whether more negative attitudes reflect yet stronger associations, or result in yet faster response times. Nonetheless, the observation of several predictable relationships belies this possibility. Finally, explicit measures may be influenced by response biases that are avoided by the IAT, and the consequent variance in the explicit measures may wash-out the relationship with the IAT. A weaker relationship between implicit and explicit attitude measures is likely when motivation to distort responses to explicit attitude measures is strong (Fazio & Olsen, 2003), as may well be the case in relation to speeding- an illegal behaviour.

In summary, Study 1 provides evidence for the construct, convergent and predictive validity of an IAT designed to assess attitudes toward speeding. Thus, the IAT may be a useful tool in research regarding speeding (and possibly other risky driving behaviours), and perhaps especially in program evaluation- in order to avoid the demand characteristics introduced by participation in the program itself. Study 2 was designed to assess the sensitivity of the IAT to changes in negative attitudes to speeding resulting from an anti-speeding intervention, and also provided an opportunity to measure the test-retest reliability of the IAT.

3 STUDY 2

3.1 Methods

3.1.1 Participants

Participants were forty-five licensed Psychology I students, who responded to an advertisement for "a study on attitudes and behaviours involved in driving" that was posted on the School of Psychology "Experimetrix" sign-up webpage at the University of New South Wales. Course credit was awarded for participation. The IAT is not discussed as part of the Psychology I syllabus. The age range of the sample was 18-45 years, and the mean age was 18-19 years. Participants were randomly allocated to control (n=22) and intervention (n=23) groups, which did not differ in terms of age (F [1, 43] = 0.053, p=0.819) or gender (χ^2 [1] = 0.626, p=0.763).

3.1.2 Materials and apparatus

Participant Information Sheet

The Participant Information Sheet was the same as in Study 1, but with mention of video advertisements (intervention task) to be watched at the end of the initial testing session, and mention of a second testing session to be conducted approximately 1-2 weeks after the initial session.

Consent Form

The Consent Form was the same as in Study 1.

Revocation of Consent Form

The Revocation of Consent Form was the same as in Study 1.

Driver Questionnaire

The Driver Questionnaire was the same as in Study 1.

Implicit Association Task

The two forms of the Implicit Association Task were the same as in Study 1.

Intervention advertisements

Two advertisements were selected for their potential to increase negative attitudes toward speeding. These advertisements not only emphasised the dangers of speeding, but also appeared to compare a more normative message of speeding as a "bad thing to do". In one, a young driver is shown picking up his brother from school, speeding, and crashing into a telegraph pole. In the other, a young man is depicted speeding (uses images akin to those commonly employed in car advertisements promoting speed capabilities) and then colliding with another car, killing its

occupants. In this advertisement the young man sees an emergency services officer looking at him with utter disdain, and looks stunned and remorseful.

Two advertisements outlining the dangers of smoking were employed as a control video. All advertisements had been shown on television over the preceding three-month period. The two speeding advertisements had a duration of two minutes and 30 seconds, while the two smoking advertisements had a duration of three minutes.

Questions regarding the intervention advertisements

Participants were prompted to discuss the content of the advertisements. For each of the advertisements, participants were initially asked: "Have you seen any of these advertisements on television? If so, which ones?". Participants were then asked each of the following questions in relation to each of the advertisements, with slight changes to phrasing depending on whether they had previously seen the advertisements:

- "When you first saw the advertisement, what did it make you think of?"

- "What do you think the advertisement is trying to say?"

- "Do you think the advertisement gets its message across?"

- "What aspect(s) of the advertisement, in particular, really gets the message across?"

- "Has this advertisement affected the way you drive/smoke, or think about driving/smoking?"

Driving simulator

The STISIM driving simulator and drives were employed as in Study 1.

Laptop computer

All IAT testing was administered on a Hewlett-Packard Pavilion ze4300 laptop computer as in Study 1. Study 2 intervention videos were also presented on this computer.

3.1.3 Procedure

Ethics approval was granted by the University of Sydney Ethics Committee, and ratified by the University of New South Wales Ethics Committee. Participants were recruited as described in the "Participants" section. Each participant was tested individually.

At the beginning of each data collection session, in accordance with the 'Bogus Pipeline' technique, the participant was told that researchers wished to check driving records as part of the study, and were asked to provide their Driver's Licence Number. The participant was also informed that they were required to arrange a meeting time (approximately 1-2 weeks later) to complete all tasks a second time. The participant was told that course credit would be given only after completion of the second testing session.

For the first testing session, the participant read the Participant Information Sheet, and then completed the questionnaire, the driving simulator drives, and the Implicit Association Task on laptop computer (in that order). Finally, the participant was told that they would be shown a series of advertisements on laptop computer, and then would be asked some questions relating to each advertisement. Half of the participants were shown the speeding-related advertisements, while the other half were shown control advertisements (and intervention group was crossed with the IAT compatibility order counterbalance). After the advertisements, the researcher led a discussion

regarding the advertisements. At the end of this session the researcher arranged an appointment for the second testing session, and recorded the participant's telephone number.

The participant received a reminder telephone call one day prior to their second testing session.

For the second testing session, the participant again completed the driving simulator drives, the Implicit Association Task, and the questionnaire (in that order).

No time restrictions were enforced, and each session lasted approximately 45 minutes. Upon completion, all participants were debriefed, thanked for their participation, and given course credit for the involvement.

3.1.4 Statistical analyses

Data were analysed employing SPSS and Microsoft Excel. A Type 1 error rate of 0.05 and 2-tailed tests were employed throughout.

Data transformations

Data transformations were completed as in Study 1.

Descriptive statistics

Means and standard deviations were computed for the IAT effect, key self-report variables, and driving simulator variables, separately for treatment and control groups, separately for Session 1 and Session 2.

Inferential statistics

IAT effects were compared to zero by computing a one-sample t-test.

In order to assess the effect of the intervention task, the interaction of group and test session was tested for all measures (IAT-measured implicit attitudes, self-reported explicit attitudes, other self-report measures, and simulated driving measures), employing 2x2 repeated measures ANOVAs.

The test-retest reliability of the IAT was assessed by computing the correlation between IAT effect scores at Session 1 and Session 2, in the control group only.

3.2 Results

3.2.1 Implicit Association Task

Figure 5 displays the mean IAT effect for participants in the control group at Session 1 and Session 2. At Session 1, the mean latency for the hypothetically compatible block (691.40; SD=218.23) was significantly lower than the mean latency for the hypothetically non-compatible block (835.81; SD=201.90), with the IAT effect being significantly greater than zero (t[21]=3.882, p=.001, CI: 67.05 – 221.77). At Session 2, the mean latency for the hypothetically compatible block (678.97; SD=231.84) was lower than the mean latency for the hypothetically non-compatible block (738.75; SD=223.83) although the IAT effect was not significantly greater than zero (t[21]=1.943, p=.065, CI: -4.19 – 123.73).

Figure 6 displays the mean latencies for hypothetically compatible and non-compatible response blocks, for participants in the treatment group at Session 1 and Session 2. At Session 1, the mean latency for the hypothetically compatible block (628.07; SD=177.08) was significantly lower than the mean latency for the hypothetically non-compatible block (1005.16; SD=283.31), with the IAT

effect being significantly greater than zero (t[22]=7.826, p<.001, CI: 277.16 – 477.01). At Session 2, the mean latency for the hypothetically compatible block (589.288; SD=138.22) was significantly lower than the mean latency for the hypothetically non-compatible block (881.44; SD=247.07), with the IAT effect being significantly greater than zero (t[22]=7.728, p<.001, CI: 213.76 – 370.56).

Figure 5: Mean latencies for compatible and non-compatible combined IAT classification block, for control participants at Session 1 (n=22) and Session 2 (n=22), in Study 2

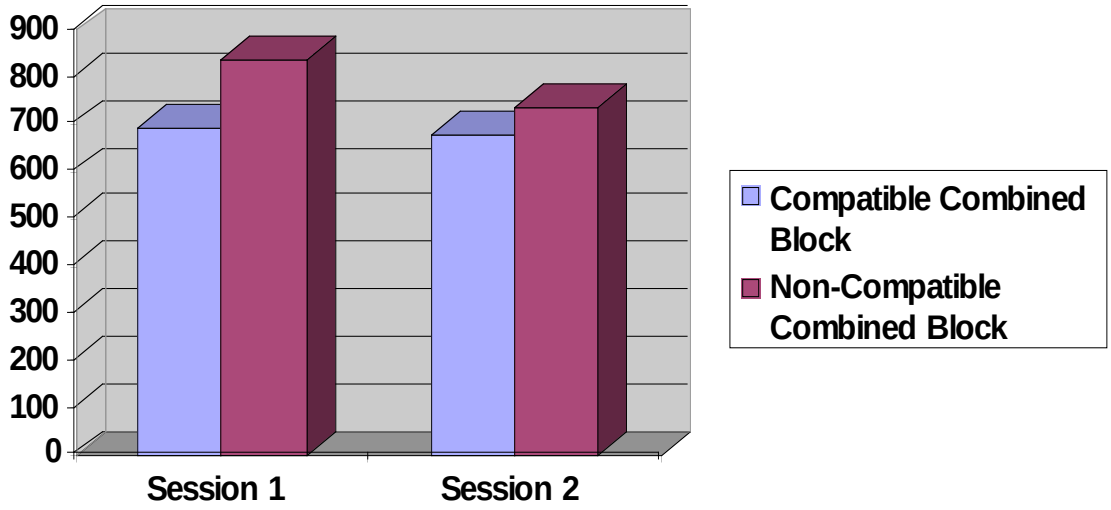
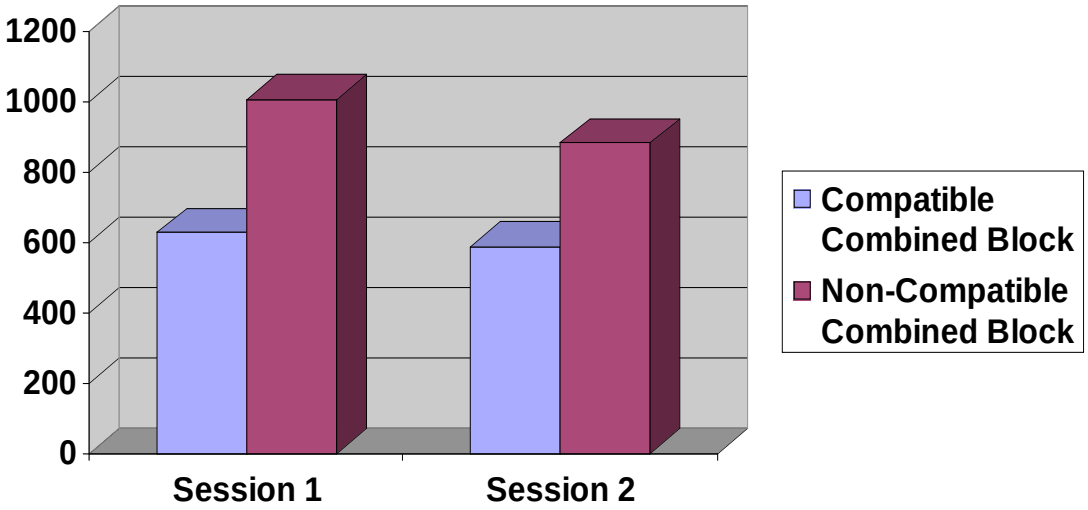


Figure 6: Mean latencies for compatible and non-compatible combined IAT classification block, for treatment participants at Session 1 (n=23) and Session 2 (n=23), in Study 2



The interaction group x session interaction was not significant (*F* [1,43] = .000, p=.996).

Driver Questionnaire

Table 13 illustrates the means and standard deviations for all self-report measures employed from the Driver Questionnaire, for control and treatment participants at Session 1 and Session 2, showing Groups x Session interaction effects from the 2x2 Repeated Measures ANOVAs.

Table 13: Means and standard deviations for all self-report measures employed from the Driver Questionnaire for control and treatment participants at Session 1 and Session 2, in Study 2, showing Group x Session interaction statistics.

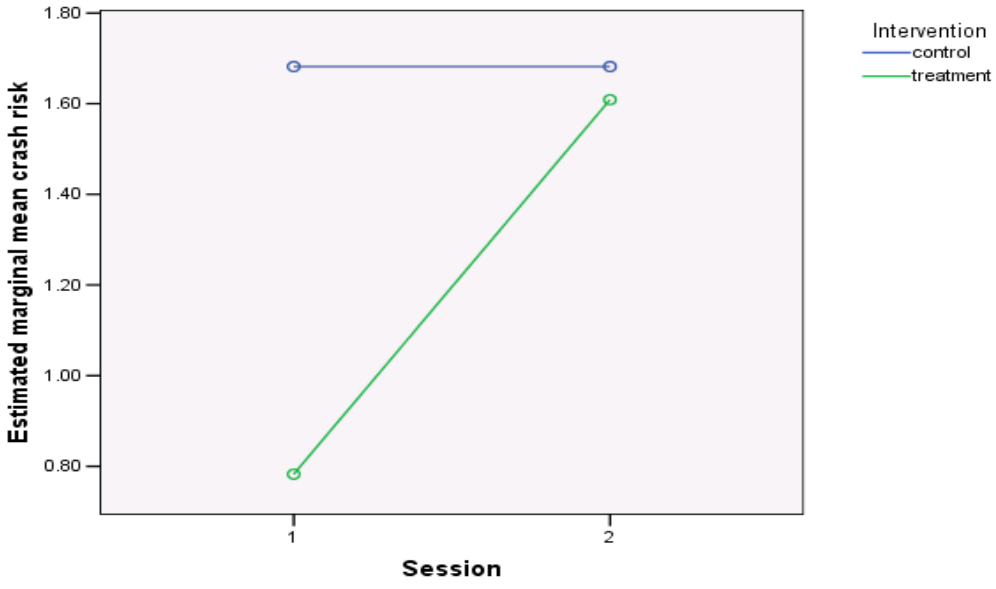
	Control		**Treatment**		
	Session 1	**Session 2**	**Session 1**	**Session 2**	
Self-Report Measure	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Interaction (p)**
Feeling Thermometer	18.09 (30.05)	13.86 (32.51)	19.78 (35.46)	22.35 (36.54)	*F* [1,43] = 1.370, (.248)
Semantic Differential scale	1.66 (1.23)	1.86 (1.13)	1.62 (1.79)	1.89 (2.04)	*F* [1,43] = 0.150, (.701)
Explicit Attitude: Speeding is safe	2.89 (1.02)	2.76 (1.00)	3.37 (.94)	3.37 (1.04)	*F* [1,42] = 0.904, (.347)
Explicit Attitude: Those who speed should be brought to justice	3.00 (.86)	2.88 (.89)	3.33 (.94)	3.26 (.98)	*F* [1,42] = 0.001, (.973)
Explicit Attitude: “Speeding is fun, thrilling, and exciting”	3.00 (1.31)	3.19 (1.12)	3.26 (1.14)	3.13 (1.32)	*F* [1,42] = 1.192, (.281)
Explicit Attitude: “Speeding is OK if you are running late and you need to save driving time”	3.18 (1.14)	3.38 (.97)	3.35 (1.03)	3.43 (1.04)	*F* [1,42] = 0.259, (.613)
Explicit Attitude: “It is irresponsible to speed”	3.45 (1.06)	3.43 (1.03)	3.65 (.88)	3.57 (.90)	*F* [1,42] = 0.125, (.725)
Explicit Attitude: “Demerit points for speeding should be doubled during holiday periods”	3.67 (.86)	3.48 (.98)	3.65 (1.11)	3.43 (1.31)	*F* [1,41] = 0.160, (.691)
Social Norm (regarding speeding)	68.34 (40.12)	65.72 (38.05)	53.72 (33.97)	45.96 (38.17)	*F* [1,39] = 2.085, (.157)
Perceived Appropriateness of Speed Limits	2.64 (.31)	2.70 (.35)	2.72 (.31)	2.68 (.31)	*F* [1,43] = 2.144, (.150)
Perceived Risk of being caught for speeding	3.09 (.57)	3.09 (.46)	2.91 (.84)	2.88 (.57)	*F* [1,43] = 0.031, (.862)
Perceived Crash Risk for speeding	1.68 (1.25)	1.68 (1.17)	.78 (1.13)	1.61 (1.20)	*F* [1,43] = 4.761, (.035*)

Self-Report Measure	Control		Treatment		
	Session 1	Session 2	Session 1	Session 2	
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Interaction (p)
Speeding-related illusory invulnerability	3.29 (.53)	3.09 (.47)	3.36 (.74)	3.36 (.55)	*F* [1,41] = 2.144, (.271)
Self-reported general likelihood of speeding	3.18 (.63)	3.10 (.60)	3.07 (.54)	2.93 (.59)	*F* [1,42] = 0.566, (.456)
Self-reported speeding (low-range)	2.95 (1.24)	3.00 (1.06)	2.66 (.92)	2.77 (1.06)	*F* [1,43] = 0.076, (.784)
Self-reported speeding (high-range)	.85 (.71)	.86 (.74)	.92 (.78)	.88 (.89)	*F* [1,42] = 0.206, (.652)

* Significant at the 0.05 level (2-tailed).

The group by session interaction effect was significant only for perceived crash risk of speeding. Examination of the cell means [see also Figure 7] indicated that although there was a large increase in perceived crash risk for speeding for the treatment group from Session 1 (M = 0.78) to Session 2 (M = 1.61), there was no change in perceived crash risk scores for the control group from Session 1 (M = 1.68) to Session 2 (M = 1.68). Although this significant difference is consistent with the contents of the speeding intervention, given the number of tests conducted it may reflect a Type I error. Further, the mean perceived crash risk was substantially lower in the treatment than in the control group at Session 1.

Figure 7: Means and standard deviations for all self-reported perceived crash risk for control and treatment participants at Session 1 and Session 2, in Study



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Driving Simulator

Table 14 displays the average simulated driving speed and percentage of exceedances for each speed zone, for control and treatment groups at Session 1 and Session 2, showing the Group x Session interaction effects from the 2x2 Repeated Measures ANOVAs.

Table 14: Average simulated driving speed and percentage of exceedances for each speed zone, for control and treatment participants at Session 1 and Session 2, in Study 2, showing Group x Session interaction statistics.

	Control		**Treatment**		
	Session 1	**Session 2**	**Session 1**	**Session 2**	
	Mean (SD)	**Mean (SD)**	**Mean (SD)**	**Mean (SD)**	**Interaction (p)**
Average Speed					
40 km/h	60.57 (7.65)	60.91 (8.34)	57.17 (6.37)	56.39 (6.20)	*F* [1,43] = 0.423, (.519)
50 km/h	60.51 (5.60)	62.41 (5.16)	58.98 (4.99)	58.89 (6.50)	*F* [1,43] = 1.710, (.198)
60 km/h	64.57 (5.71)	67.06 (6.44)	62.84 (4.25)	64.53 (7.71)	*F* [1,43] = 0.224, (.638)
80 km/h	81.69 (6.69)	82.88 (7.16)	80.24 (6.55)	80.54 (5.52)	*F* [1,43] = 0.212, (.647)
Percentage of Exceedances					
40 km/h	99.93 (.31)	99.53 (1.39)	96.91 (6.88)	98.73 (4.35)	*F* [1,43] = 3.946, (.053)
50 km/h	98.76 (5.81)	100.00 (.00)	96.88 (7.80)	98.68 (6.32)	*F* [1,43] = 0.113, (.738)
60 km/h	19.03 (28.11)	26.21 (37.64)	5.80 (14.80)	22.64 (35.45)	*F* [1,43] = 1.002, (.322)
80 km/h	68.40 (33.29)	78.37 (28.76)	54.69 (38.50)	54.31 (37.54)	*F* [1,43] = 0.972, (.330)

No significant group by session interaction effect was observed.

Test-retest reliability of IAT

The correlation between Session 1 and Session 2 measures of the IAT effect in the control group was significant (r= .462, n= 22, p= .030).

3.3 Discussion

Results of Study 2 suggest minimal efficacy of the intervention, so that sensitivity of the IAT to change in attitudes could not be tested adequately.

A significant Intervention Group by Session interaction effect was observed only for perceived crash risk for speeding. There was no change in perceived crash risk scores for the control group from Session 1 to Session 2, and perceived crash risk of speeding increased significantly for the treatment group. Thus, the speeding advertisements utilised in Study 2 may have succeeded in heightening drivers' perception of the risk of a crash due to speeding. Arguably, crash risk was most directly targeted by the advertisements, which appear not to have had a direct effect on attitudes and behaviours.

Attitudes, beliefs, and of course behaviours, are notoriously difficult to change. We selected anti-speeding messages that we felt were among the strongest available. Further, the particular advertisements selected appeared to identify speeding as a normatively "bad thing to do" as well as emphasising the dangers of speeding.

We assessed the impact of the advertisements between 1 and 2 weeks after showing them to participants. This may have diluted their effects. However, we were concerned that testing immediately after showing the advertisements would place a demand on subjects to produce the responses that they thought we expected. This may have produced an effect in the self-reported measures, and possibly even the simulated driving measures, but still no effect to be detected by the IAT measure.

Without a true change in attitudes we could not test the ability of the IAT to detect such a change. Thus the primary aim of the study[3] could not be achieved.

We were, however, able to achieve the secondary aim of Study 2, to assess the test-retest reliability of the IAT. In the control group, the IAT effect at Session 1 demonstrated a significant correlation with the IAT effect at Session 2. Thus, the IAT appears to provide a stable measure of negative attitudes to speeding.

3.4 Summary and conclusions

The development and use of the Implicit Association Task

The dependence on self-report measures to provide information about attitudes is a limitation of current road safety research. Self-report is subject to errors of recall and report, and in areas demonstrating clear social norms, socially desirable responding is particularly likely to distort self-reports. Thus, self-reports of beliefs, attitudes and behaviours in relation to speeding may not be valid. The present research aimed to address this issue by introducing a speeding-related IAT to the field of road safety. The IAT is an implicit measure of attitudes, which is not subject to self-report errors and biases.

To reiterate, the IAT assesses the association between a *target-concept* and an *attribute* (evaluation) by comparing the response time when theoretically compatible concepts and evaluations (e.g. *speeding* and *negative*) share a response key to the response time when theoretically incompatible concepts and evaluations (e.g. *speeding* and *positive*) share a response key. Performance should be faster for compatible key-sharing than for non-compatible key-sharing. Thus, the IAT offers a hidden measure of attitudes that is not subject to response bias.

3 It was not the primary aim of the study to develop an effective intervention.

The IAT effects observed in the present research indicate the presence of genuinely negative implicit attitudes toward speeding. Confirming expectation, consistently faster IAT performance was observed when the hypothetically negative category of speeding shared a response key with negative-meaning words and when the hypothetically positive category of safe-driving shared a response key with positive-meaning words (compared to when the concept/evaluation key pairings were reversed). These positive IAT effects illustrate that the IAT is sensitive to evaluative discriminations in speeding-related attitudes. Results support previous findings illustrating the sensitivity of the IAT in evaluative discriminations (Greenwald et al., 1998; Burgess & Faunce, 2002; Steffens & Buchner, 2003; Swanson et al., 2001), and suggest that the IAT method may be effectively employed to measure attitudes in road safety research.

Two versions of the speeding-related IAT were employed in the present study: one with compatible combinations tested before non-compatible combinations, and the other with non-compatible combinations tested before compatible combinations. The effect of compatibility order was statistically significant in Study 1, such that IAT effect sizes were significantly larger when compatible combinations preceded non-compatible combinations. This supports the findings of Greenwald et al. (1998), who suggest that this may compromise results for participants with no implicit attitude difference between two categories. For example, a person with no implicit attitude difference between speeding and safe driving may appear to be slightly pro-speeding if performing an IAT in which "speeding + good" combinations preceded "speeding + bad" combinations (Greenwald et al., 1998).

The observed IAT results were generally consistent with results derived from the self-report and driving measures.

Driver Questionnaire results in both Study 1 and Study 2 demonstrated generally negative attitudes to speeding. Further, in Study 1 several significant correlations between the explicit (Driver Questionnaire) and implicit (IAT) attitude measures were observed. Thus, the present results indicate the convergent validity of both the speeding-related IAT and the Driver Questionnaire.

The present research also supports the predictive validity of the speeding-related IAT. In Studies 1 and 2 mean values of variables which are theoretically related to attitudes (e.g. perceived appropriateness of speed limit, perceived crash risk) demonstrated mean values consistent with attitudes to speeding being negative. Several significant correlations observed in Study 1 also supported this notion. For example, a higher IAT effect (indicating a negative attitude to speeding) was associated with the belief that speed limits are too high (i.e. should be lower), a higher perceived risk of being caught when speeding, and lower self-reported frequency of speeding (averaged across sixteen situations). The p-value for the observed negative association between the IAT effect and self-reported frequency of high range speeding was low ($p=.095$).

The IAT effect also correlated significantly with mean observed driving speed, and mean percentage of recordings in excess of the speed limit, in the 80 km/h speed limit zone on the driving simulator in Study 1. A higher IAT effect (reflecting negative attitude to speeding) was associated with lower speed and less speeding. No significant correlation was observed for the other speed limit zones.

Study 2 aimed to assess the ability of the IAT to detect an effect of an anti-speeding audiovisual intervention (compared to control audiovisual materials). Two advertisements designed to reinforce the dangers of speeding were employed as part of an intervention video, while two advertisements outlining the dangers of smoking were employed as a control video, and participants were prompted to discuss the content of the speeding advertisements.

Treatment and control participants did not differ in terms of the change in IAT effect from pre-intervention to post-intervention. Given that a treatment x session interaction was observed for only one out of all the self-report and driving simulator variables (for perceived crash risk for speeding),

it is likely that the intervention was not effective. Thus, the IAT has been accurate in failing to detect an effect. Nonetheless, it would be illuminating to assess the ability of the IAT to detect the benefits of an intervention which *is* effective.

The IAT demonstrated acceptable test-retest reliability.

The present research indicates that the IAT may be a useful tool for measuring attitudes in road safety research without reliance on self-report.

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APPENDIXES

APPENDIX A: RECRUITMENT ADVERTISEMENT

If you are a licensed driver….

We are offering you the opportunity to participate in a study in which you will:

1. Drive in a driving simulator
2. Be able to earn up to **$20** (depending on how well you drive)
3. Complete a short questionnaire
4. Complete a short computer task

We are conducting a study on attitudes and behaviours involved in driving, and we would appreciate your help.

The study will be conducted in the Department of Psychology at UNSW, and should take no more than 1 hour of your time. All of our results are confidential, and you would be free to withdraw at any time.

If you are interested, please contact Ralston Fernandes to make an appointment on

ph: 9385 5354 or 0413 899 530

email: r.fernandes@unsw.edu.au (please provide a contact phone number)

APPENDIX B: PARTICIPANT INFORMATION SHEET

Participant Information Sheet

THE UNIVERSITY OF NEW SOUTH WALES

Approval No: HREC 04093

NSW INJURY RISK MANAGEMENT RESEARCH CENTRE, THE UNIVERSITY OF NEW SOUTH WALES *(AND THE AUSTRALIAN TRANSPORT SAFETY BUREAU)*

PARTICIPANT INFORMATION STATEMENT

Project Title: Implicit Attitudes and Simulated Driving Behaviour

[Participant selection and purpose of study]

You are invited to participate in a study of 'driver attitudes and behaviours'. We hope to learn about the different ways that drivers think about, and behave in response to, risky driving. We aim to better understand both driver attitudes to risky driving, as well as the ways in which motorists can be best informed of the dangers associated with risky driving. You were selected as a possible participant in this study because you are a motorist living in the Sydney metropolitan area. This research is designed to help in the development of campaigns to improve road safety.

[Description of study and risks]

If you decide to participate, you will be asked to complete a short questionnaire about your attitudes toward risky driving, as well as questions about various personal characteristics (e.g. driving experience). In addition, you will be asked to complete a computer task, as well as a range of short drives on a driving simulator. In total, these tasks should take you no more than 45 minutes to complete. Aside from this time, there should be no other inconvenience to you. If you consent, we would also like to check participants' driving records, which will further help our understanding of road safety issues for young drivers.

[Confidentiality and disclosure of information]

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission, except as required by law. If you give us your permission by signing this document, we plan to discuss the results with The University of New South Wales, the NSW Injury Risk Management Research Centre, and the Australian Transport Safety Bureau. Results from this project will only be presented to the scientific community. In any publication, information will be provided in such a way that you cannot be identified.

[Your consent]

Your participation in this study is entirely voluntary. Your decision whether or not to participate will not prejudice your future relations with The University of New South Wales, the NSW Injury Risk Management Research Centre, or the Australian Transport Safety Bureau. If you decide to participate, you are free to withdraw your consent and to discontinue participation at any time without prejudice.

Complaints may be directed to the Ethics Secretariat, The University of New South Wales, Sydney 2052, AUSTRALIA (phone 9385 4234, fax 9385 6648, email ethics.sec@unsw.edu.au). Any complaint you make will be treated in confidence and investigated, and you will be informed of the outcome. If you have any questions, please feel free to ask us. If you have any additional questions later, the Senior Research Officer, Mr. Ralston Fernandes (phone 9385 5354, email r.fernandes@unsw.edu.au) will be happy to answer them. You may keep this form.

APPENDIX C: CONSENT FORM

THE UNIVERSITY OF NEW SOUTH WALES

Approval No: HREC 04093

NSW INJURY RISK MANAGEMENT RESEARCH CENTRE, THE UNIVERSITY OF NEW SOUTH WALES *(AND THE AUSTRALIAN TRANSPORT SAFETY BUREAU)*

CONSENT FORM

Project Title: Implicit Attitudes and Simulated Driving Behaviour

You are making a decision whether or not to participate. Your signature indicates that, having read the Participant Information Statement, you have decided to take part in the study.

I consent to completing the tasks in the following study.

YES / NO

I consent to providing my driver's licence for the present researchers to access my driving records.

If YES, please provide Driver's Licence No. _____ / NO

…… . ……..…….

Signature of Research Participant Signature of Witness

…… ….…….

(Please PRINT name) (Please PRINT name)

…… …….

Date Nature of Witness

……

Signature(s) of Investigator(s)

……

Please PRINT Name

APPENDIX D: REVOCATION OF CONSENT FORM

THE UNIVERSITY OF NEW SOUTH WALES

Approval No: HREC 04093

NSW INJURY RISK MANAGEMENT RESEARCH CENTRE, THE UNIVERSITY OF NEW SOUTH WALES *(AND THE AUSTRALIAN TRANSPORT SAFETY BUREAU)*

REVOCATION OF CONSENT

Project Title: Implicit Attitudes and Simulated Driving Behaviour

I hereby wish to **WITHDRAW** my consent to participate in the research proposal described above and understand that such withdrawal **WILL NOT** jeopardise any treatment or my relationship with The University of New South Wales, the NSW Injury Risk Management Research Centre, or the Australian Transport Safety Bureau.

....

Signature Date

.....

Please PRINT Name

The section for Revocation of Consent should be forwarded to the Chief Investigator, Mr. Ralston Fernandes, at the NSW Injury Risk Management Research Centre, Level 8 Applied Science Building, The University of New South Wales, NSW, 2052.

APPENDIX E: QUESTIONNAIRE

THE UNIVERSITY OF NEW SOUTH WALES

NSW Injury Risk Management Research Centre

The University of New South Wales

Thank you for consenting to participate in this survey. This questionnaire will take approximately 15 minutes to complete. The survey is anonymous. Please do not write your name on the questionnaire. For all questions, please answer as accurately and honestly as possible. If you have any concerns or queries you may call **Ralston Fernandes at the NSW Injury Risk Management Research Centre, University of New South Wales, on 9385 5354** or the **UNSW Ethics Secretariat on 9385 4234**.

1. People often have different opinions on what causes serious road crashes. What would you say would be the three most important causes of serious car crashes, beginning with the most serious?

   Most serious _____

   Second _____

   Third _____

2. In the past 2 years, how many times have you been involved in a crash of any type (including collisions with pedestrians and stationary objects, etc.) while driving?

   (Please circle 'Never' or indicate the number of crashes)

   NEVER / ___times *(If 'NEVER', go to Question 4)*

3. Of these crashes, how many would be a result of speeding? _____

4. In the past 2 years, how many times have you been fined for speeding?

   (Please circle 'Never' or indicate the number of fines)

   NEVER / ___times

5. Compared to the average driver of your age and gender, how would you rate the following? *(Please circle your response)*

		Much lower than average	Lower than average	Same as average	Higher than average	Much higher than average
a)	Your chances of having a car crash?	1	2	3	4	5
b)	Your chances of having a crash if exceeding the speed limit by less than 15km/hr?	1	2	3	4	5
c)	Your chances of having a crash if exceeding the speed limit by more than 15km/hr?	1	2	3	4	5
d)	Your chances of being fined for speeding?	1	2	3	4	5
e)	Your driving safety?	1	2	3	4	5
f)	Your driving skill?	1	2	3	4	5

6. When you are driving in a **40km/hr speed zone**, how often do you engage in the following behaviours? *(Please circle your response)*

		Always	Most of the time	Often	Sometimes	Rarely	Never
a)	Drive at 41-55km/hr?	1	2	3	4	5	6
b)	Drive at more than 55km/hr?	1	2	3	4	5	6

7. When you are driving in a **60km/hr speed zone**, how often do you engage in the following behaviours? *(Please circle your response)*

		Always	Most of the time	Often	Sometimes	Rarely	Never
a)	Drive at 61-75km/hr?	1	2	3	4	5	6
b)	Drive at more than 75km/hr?	1	2	3	4	5	6

8. When you are driving in a **80km/hr speed zone**, how often do you engage in the following behaviours? *(Please circle your response)*

	Always	Most of the time	Often	Sometimes	Rarely	Never
a) Drive at 81-95km/hr?	1	2	3	4	5	6
b) Drive at more than 95km/hr?	1	2	3	4	5	6

9. When you are driving in a **100km/hr speed zone**, how often do you engage in the following behaviours? *(Please circle your response)*

	Always	Most of the time	Often	Sometimes	Rarely	Never
a) Drive at 101-115km/hr?	1	2	3	4	5	6
b) Drive at more than 115km/hr?	1	2	3	4	5	6

10. When you are exceeding the speed limit, how likely are you to be detected by…

(Please circle your response)

	Very unlikely	Unlikely	Even chance	Likely	Very likely
a) Police on the side of the road with a radar	1	2	3	4	5
b) An automatic fixed speed camera	1	2	3	4	5
c) Police in a moving patrol vehicle with a radar	1	2	3	4	5

11. For each of the speed limit zones identified below, please think about the roads you know with this speed limit, and rate how appropriate the speed limit is. For example, in the 40km/hr zones you know, how appropriate is the 40km/hr? *(Please circle your response)*

	Much too low	Too low	Just right	Too high	Much too high
a) 40km/hr zones you know	1	2	3	4	5
b) 50km/hr zones you know	1	2	3	4	5
c) 60km/hr zones you know	1	2	3	4	5
d) 80km/hr zones you know	1	2	3	4	5
e) 100km/hr zones you know	1	2	3	4	5

12. How likely would you be to exceed the speed limit in the following situations?

(Please circle your response)

	Very unlikely	Unlikely	Even chance	Likely	Very likely
a) On a clear, dry day	1	2	3	4	5
b) In wet conditions	1	2	3	4	5

c)	At night	1	2	3	4	5
d)	You are in a hurry to get to an appointment	1	2	3	4	5
e)	You feel like a thrill	1	2	3	4	5
f)	To keep up with traffic	1	2	3	4	5
g)	You need to "blow off steam"	1	2	3	4	5
h)	You know the road very well	1	2	3	4	5
i)	There are no other cars on the road	1	2	3	4	5
j)	You want to impress others	1	2	3	4	5
k)	To compete with other drivers and vehicles	1	2	3	4	5
l)	To get through an amber traffic light	1	2	3	4	5
m)	To avoid an accident	1	2	3	4	5
n)	You are near a school	1	2	3	4	5
o)	You are in a hurry to get home	1	2	3	4	5
p)	You have friends in the car	1	2	3	4	5

13. How many kilometres **over the speed limit** would a driver have to be going in a 40, 60, 80 and 100km/hr zones, for you to consider him/her to be……

		In a 40km/hr zone	**In a 60km/hr zone**	**In a 80km/hr zone**	**In a 100km/hr zone**
a)	Stupid?				
b)	Irresponsible?				
c)	Criminal?				
d)	Potential Murderer?				

14. Please rate your agreement with the following statements by circling a number, where the numbers mean:

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	|_____|	|_____|	|_____|	|_____|	|_____|
	1	2	3	4	5

a) Speeding can be safe for a skilful driver.

b)	My safety is an important factor in my decision about whether to exceed the speed limit or not.	1	2	3	4	5
c)	The possibility of losing points from my licence is an important factor in my decision about whether to speed or not.	1	2	3	4	5
d)	The possibility of getting a fine is an important factor in my decision about whether to speed or not.	1	2	3	4	5
e)	Speeding presents a means of rebelling against authority.	1	2	3	4	5
f)	Speeding presents a means of being noticed and attracting admiration from friends/others on the road.	1	2	3	4	5
g)	Speeding allows people to have a sense of control over something.	1	2	3	4	5
h)	Speeding allows people to experience an 'adrenalin rush'.	1	2	3	4	5
i)	Speeding is fun, thrilling, and exciting.	1	2	3	4	5
j)	Speeding is OK if you are running late and you need to save driving time.	1	2	3	4	5
k)	People who are caught exceeding the speed limit by more than 30km/hr should have to appear in court.	1	2	3	4	5
l)	Speeding can be safe in some circumstances.	1	2	3	4	5
m)	It is irresponsible to speed.	1	2	3	4	5
n)	Penalties for speeding are just revenue raising.	1	2	3	4	5
o)	Demerit points for speeding should be doubled during holiday periods.	1	2	3	4	5
p)	People who are caught exceeding the speed limit by more than 30km/hr should be made to have speed governors fitted to their cars.	1	2	3	4	5

(a speed governor is a device which makes it impossible for a car to exceed a certain speed)

15. Please describe your general level of warmth or coolness towards the following categories, by placing a mark anywhere along the scale to indicate the appropriate level.

a) SPEEDING…

Cold or Unfavourable — Neutral — Warm or Favourable

|_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|

0 10 20 30 40 50 60 70 80 90 99

b) STICKING TO THE SPEED LIMIT / SAFE DRIVING…

Cold or Unfavourable — Neutral — Warm or Favourable

|_____|_____|_____|_____|_____|_____|_____|_____|_____|_____|

0 10 20 30 40 50 60 70 80 90 99

16. Please describe each of the following categories in terms of each of the five scales presented below, by circling one of the seven points corresponding to that scale. If you feel as though both scale end-points are irrelevant to that category, please mark the middle of the range where appropriate.

a) SPEEDING…

Beautiful |_____|_____|_____|_____|_____|_____| Ugly

Good |_____|_____|_____|_____|_____|_____| Bad

Pleasant |_____|_____|_____|_____|_____|_____| Unpleasant

Honest |_____|_____|_____|_____|_____|_____| Dishonest

Nice |_____|_____|_____|_____|_____|_____| Awful

b) STICKING TO THE SPEED LIMIT / SAFE DRIVING…

Beautiful |_____|_____|_____|_____|_____|_____| Ugly

Good |_____|_____|_____|_____|_____|_____| Bad

Pleasant |_____|_____|_____|_____|_____|_____| Unpleasant

Honest |_____|_____|_____|_____|_____|_____| Dishonest

17. Approximately how many hours do you spend driving each week? _____hrs/p week

18. What class of driving license do you hold? *(Please circle)*

Learners permit	1
Red P-plates	2
Green P-plates	3
Full license	4
License disqualified	5

19. How long have you held a driving license (including L-plates and P-plates)?
_____ years, _____ months

20. What is your postcode? _____

21. Are you male or female? *(Please circle)* MALE FEMALE

22. Which of the following age categories do you belong to? *(Please circle)*

16-17 years old

18-19 years old

20-25 years old

26-45 years old

46 + years old

23. What is the main language spoken at your home? _____

24. What is your current marital status? *(Please circle)*

Single

Widowed

Separated/Divorced

Married/De facto

25. Which is the highest level of education you have reached? *(Please circle)*

School certificate or equivalent

Higher School Certificate or equivalent

TAFE/College or equivalent

Tertiary or higher