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Texting while Driving: Psychosocial influences on young people's texting intentions
and behaviour

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Abstract

Despite the dangers and illegality, there is a continued prevalence of texting while driving amongst young Australian drivers. The present study tested an extended theory of planned behaviour (TPB) to predict young drivers' (17 to 24 years) intentions to [1] send and [2] read text messages while driving. Participants (N = 169 university students) completed measures of attitudes, subjective norm, perceived behavioural control, intentions, and the additional social influence measures of group norm and moral norm. One week later, participants reported on the number of texts sent and read while driving in the previous week. Attitude predicted intentions to both send and read texts while driving, and subjective norm and perceived behavioural control determined sending, but not reading, intentions. Further, intention, but not perceptions of control, predicted both texting behaviours 1 week later. In addition, both group norm and moral norm added predictive ability to the model. These findings provide support for the TPB in understanding students' decisions to text while driving as well as the inclusion of additional normative influences within this context, suggesting that a multi-strategy approach is likely to be useful in attempts to reduce the incidence of these risky driving behaviours.

Texting while Driving: Psychosocial influences on young people's texting intentions and behaviour

1. Introduction

Driver distraction has been identified as one of the main causes of road traffic incidents (e.g., Patten, Kircher, Östlund, & Nilsson, 2004), estimated to account for approximately one quarter of all vehicle crashes (Stutts, Reinfurt, Staplin, & Rodgman, 2001). Mobile phones can often be a major distraction to drivers, with research pointing to the substantial safety risks of using a mobile phone while driving (e.g., McCartt, Hellinga, & Bratiman, 2006; Svenson & Patten, 2005). In two states of Australia, McEvoy, Stevenson, and Woodward (2006) found that, among drivers aged 18 to 65 years, an estimated 45 800 drivers have had a car accident while using a mobile phone and 146 762 have had to take action to avoid an accident. Further, the risk of being involved in an accident increases by between two and nine times if using a mobile phone (Redelmeier & Tibshirani, 1997; Violanti & Marshall, 1996).

Given that texting requires drivers to redirect their vision away from the road and towards the mobile phone screen or keypad and to remove their hands from the steering wheel to write or read a message (Hosking, Young, & Regan, 2006), texting while driving is especially dangerous. In their simulator study, Hosking et al. (2006) found that young novice drivers spent up to 400% more time looking away from the road when texting than when not texting. Despite the risks, there continues to be a prevalence of mobile phone use while driving in Australia (McEvoy et al., 2006; Pennay, 2006; Taylor, Bennett, Carter, & Garewell, 2003). The Australian Transport Safety Bureau (2005) survey found that 47% of drivers reported having used their mobile phone while driving, 16 % of drivers reading, and 8% sending, text messages while driving (Pennay, 2006). Younger drivers are more likely to engage in this behaviour than older drivers (AAMI, 2007). In Australia, young adults have the highest level of general mobile phone use, with the age groups of 18 to 24 years and 25 to 39

years reporting the highest percentages of 94% and 91%, respectively (Department of

Broadband Communications and Digital Economy, 2008). These age groups are also more

likely to use a mobile phone while driving than older drivers (Pennay, 2006), with 75% of

Australian drivers aged between 18 and 24 years reporting that they sent or received a text

while driving compared with 36% of drivers aged over 25 years (AAMI, 2007). Thus, mobile

phone use, and particularly texting while driving, represents an increased safety risk for this

age group. In some studies, differences between the genders have also been identified. For

example, males have been found to report using a mobile phone while driving more than

females (e.g., Sullman & Baas, 2004; Zhou, Wu, Rau, & Zhang, 2009) and, in relation to

mobile phone use in general, females have been found to send more texts than males (e.g.,

Billieux, Van der Linden, & Rochat, 2008). Other studies, however, have found no difference

between males and females in relation to texting while driving specifically (e.g., Zhou et al.,

2009).

Although previous research provides evidence for the increasing prevalence of using a

mobile phone while driving (Eby, Vivoda, & St. Louis, 2006), our understanding of the

psychosocial factors influencing mobile phone use, and more specifically texting, while

driving remains negligible. Although previous studies have explored mobile phone use while

driving in general, some studies have failed to differentiate results according to whether the

phone use was illegal or legal (i.e., using a hand-held or hands free car kit, respectively).

Further, previous studies have not differentiated between sending and reading text messages

as separate behaviours. Thus, in the present study, texting while driving was examined in

isolation (without examining calling behaviours which can be performed legally in Australia

by the use of hands-free devices) so that there can be no confusion as to the illegality of the

behaviour under examination and as separate behaviours (sending and reading text messages

while driving) to identify if any differences exist between sending and reading texts. In

addition, the present study focused on drivers aged between 17 and 24 years. Notably, this age

group is of particular interest as they are more likely to use mobile phones in general

(Department of Broadband Communications and Digital Economy, 2008), including for

texting (AAMI, 2007), and are more at risk of having an accident given their driving

inexperience. The present study applied a well-validated decision making and behavioural

prediction model, the Theory of Planned Behaviour (TPB), to investigate texting while

driving among young Australian drivers so that strategies to counteract this prevalent and

dangerous driving practice can be designed in an informed manner.

1.1   The Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB; Ajzen, 1991) has been employed in much

research examining people's driving behaviour (e.g., Parker, Manstead, Stradling, Reason, &

Baxter, 1992; Walsh et al., 2008; Zhou et al., 2009). According to this model, behaviour is

determined by the individual's intentions to perform the behaviour (Ajzen, 1991). Intentions,

in turn, are influenced by an individual's attitude, subjective norm, and perceived behavioural

control. Attitude reflects a person's favourable or unfavourable evaluation of performing the

behaviour; subjective norm is how much the person feels social pressure to perform or not

perform the behaviour; and perceived behavioural control describes how easy or difficult a

person perceives performing the behaviour to be. In addition, the TPB suggests that perceived

behavioural control can substitute for actual behavioural control and, as such, can influence

behaviour directly.

Much research supports the usefulness of the TPB model in predicting people's

intentions and behaviour across a wide range of behaviours. For example, in their meta-

analysis of 185 studies that incorporated the TPB, Armitage and Conner (2001) identified

that, together, the TPB variables of attitude, subjective norm, and perceived behavioural

control explained 39% of the variance in intention to perform behaviour and 27% of the

variance in explaining behaviour. Specific to mobile phone use while driving, Walsh, White,

Hyde, and Watson (2008) found that the TPB accounted for 32% of the variability in people's

intentions and Zhou et al. (2009) found that that the TPB explained 43% and 48% variance in intention to use a hands-free and handheld mobile phone, respectively. Importantly, past behaviour has been shown to be one of the strongest predictors of people's intention and behaviour, often explaining more variance than that accounted for by the TPB variables alone (Ajzen, 1991; Conner & Armitage, 1998). Although past behaviour does not necessarily cause subsequent behaviour, frequent performance of a behaviour may lead to habitual processes, making subsequent performance more likely (Conner & Armitage, 1998) and is, therefore, often included in TPB studies (Conner, Lawton, Parker, Chorlton, Manstead, & Stradling, 2007).

Previous TPB studies examining mobile phone use while driving have focussed primarily on predicting people's intentions to engage in certain driving behaviours, and have not measured their (prospective) behaviour. Although the expectation is that intentions and behaviour are correlated (see Armitage & Conner, 2001), the size of the relationship in terms of mobile phone use while driving is yet to be determined. Further, Walsh et al. (2008) found that, after examining the correlations amongst mobile phone use, calling and texting while driving could be considered as separate behaviours. Calling was highly correlated with mobile phone use in general ($r = .84$) whereas text messaging was only moderately correlated with mobile phone use in general ($r = .63$). Additionally, calling and text messaging were only moderately correlated with each other ($r = .61$). Further, they found that the TPB accounted for a relatively small percentage of the variance in people's intention to engage in texting while driving (between 11% and 14% across a number of scenarios), suggesting that there are other factors influencing people's intentions to perform this driving-related behaviour.

1.2   Other Sources of Social Influence

Within the TPB, subjective norms have been found to be the weakest predictors of intentions compared with attitudes and perceived behavioural control (Armitage & Conner, 2001). In relation to mobile phone use while driving, Walsh, White, Watson, and Hyde (2007)

found that subjective norm significantly predicted people's intentions to use a mobile phone while driving across a broad age range of participants. However, after further analyses were conducted by Walsh et al. to examine the sub-sample of younger drivers (aged between 17 and 25 years), subjective norm did not emerge as a significant predictor of intention for this sub-set of drivers

This weaker association between subjective norm and intentions could mean that people's intentions are influenced primarily by personal factors such as attitude and perceived behavioural control (Ajzen, 1991). However, others have suggested that the conceptualization of social influences within the TPB may be inadequate (Armitage & Conner, 2001; Terry & Hogg, 1996; Terry, Hogg, & White, 1999; White, Terry, & Hogg, 1994). As young people's mobile phone use is strongly related to social influences (Walsh & White, 2007), research utilising samples of younger adults may benefit from considering more closely the role of norms in the use of mobile phones in driving contexts (Nelson, Atchley, & Little, 2009; Walsh & White, 2007; Walsh et al., 2008). Thus, with mixed findings for the role of subjective norm in the TPB studies related to mobile phone use while driving, the present study explores the impact of additional social influence factors on behavioural intentions, namely group norms and moral norms.

Some researchers have suggested that the construct of group norms described by social identity (Turner, Brown, & Tajfel, 1979) and self-categorization (Turner, Hogg, Oakes, Reicher, & Wetherell, 1987) theories may provide a more thorough explanation of the role of social influences on decision-making than subjective norm (Johnston & White, 2003; Terry & Hogg, 1996; Terry et al., 1999; White et al., 1994). In the TPB, subjective norm relates to perceived social pressure and approval or disapproval from significant others (Ajzen, 1991) whereas group norm reflects the expectations (explicit or implicit) regarding one's attitudes and behaviours as a member of a specific reference group within a specific context (White, Hogg, & Terry, 2002) and has been shown to impact on people's behavioural intentions

within tests of the TPB (e.g., Terry & Hogg, 1996; Terry et al., 1999). In their qualitative

exploration of psychosocial factors relating to young people's (16 to 24 years) mobile phone

use (in general, not related specifically to driving behaviours), Walsh, White, and Young

(2009) found that group norms emerged as influential for people's mobile phone behaviour.

The present study, therefore, examined the perceived actions and attitudes of an important

referent group for young adults (i.e. friends and peers) to determine their influence on young

people's intentions to text while driving. It was expected that people's behavioural intentions

to text while driving would be stronger for participants who perceived that their reference

group would engage in and approve of texting while driving.

Another social influence variable that has been shown to impact on people's

behavioural intentions is moral norms. Moral norms refer to an individual's perception of the

socially-derived moral correctness or incorrectness of performing particular behaviours

(Ajzen, 1991). Researchers examining the TPB model with the inclusion of moral norms have

reported that moral norms added (on average) a significant 4% (Conner & Armitage, 1998) to

10% (Manstead, Terry, & Hogg, 2000) to the prediction of intention, after taking account of

other TPB variables.

Being a dangerous behaviour with the potential for causing harm to oneself and others,

texting while driving is likely to constitute a behaviour with moral dimensions (Conner et al.,

2007). For example, in their study examining drivers' intentions and behaviour in regards to

exceeding the speed limit, Conner et al. (2007) measured TPB variables and included moral

norms, anticipated regret, and past behaviour. Their combination of predictors accounted for

17% of variance in behaviour, with moral norms emerging as a significant predictor of not

only intentions to speed, but also speeding behaviour. Therefore, in the present study it was

expected that those young people who regard texting while driving as the wrong thing to do

would be less likely to intend to do so.

1.3   The Current Study

The aim of the present study was to examine the utility of the TPB in predicting intentions to engage in, and subsequent behaviour of, sending and reading texts while driving in a sample of young adults aged between 17 and 24 years. The role of the additional normative variables of group norm and moral norm within the TPB framework in predicting young people's behavioural intentions to send and read texts while driving was examined also (See Figure 1).

Hypotheses

It was hypothesised that intention to text while driving would be directly influenced by participants' attitudes, subjective norm, and perceived behavioural control (Hypothesis 1), after controlling for the demographic variables of gender and past behaviour. Age was not controlled for in the analyses given the restricted age group examined in the present study (i.e., young drivers aged between 17 to 24 years). It was hypothesised also that participants' subsequent behaviour in the 1 week follow–up period would be directly influenced by their intentions and perceived behavioural control to text while driving, after controlling for gender and past behaviour (Hypothesis 2). Given that the conceptualisation of subjective norm has been deemed inadequate and responsible for previously reported weak subjective norm-intention relations, it was hypothesised that the addition of group and moral norm would improve the prediction of intention to text while driving over the TPB alone (Hypothesis 3)

2. *Method*

2.1   Participants and Procedure

Prior to conducting the study, ethical clearance was applied for and granted from the University's Human Research Ethics Committee. The study was prospective in design (with behaviour reported at follow-up being retrospective in nature) comprising two phases of data collection, 1 week apart. Participants were recruited during psychology lectures at a major Australian university. The research took place in classrooms, with data collected over a period

of 3 weeks in May, 2009. At the commencement of the testing sessions, participants were provided with an information sheet outlining the details of the study, confidentiality, potential risks of participation, participant rights, and the voluntary nature of participation. One week after completing the main questionnaire, consenting participants (78.7%) completed the follow-up questionnaire. Participant responses on the main and follow-up questionnaires were matched using a unique code identifier provided by the participant so data matching could occur whilst ensuring the anonymity and confidentiality of the information obtained from the questionnaires. Some participants received partial course credit for their participation.

As part of a larger survey of 115 questions, 38 questions related to standard TPB items specified by Ajzen (1991), and group and moral norm, and 10 questions related to demographic items. Questions assessing each construct were distributed in a random order with only a few exceptions (e.g. the 4 attitude items were presented in a single block). The second questionnaire, 1 week later, asked participants to state the number of texts they sent and read while driving during the previous week.

At Time 1, participants were 169 university students enrolled in a psychology unit (113 female, 66.9%; 56 male, 33.1%). Of the 169 participants that completed the main questionnaire, most (78.7 %) participants ($n = 133$) completed the follow-up questionnaire 1 week later. Participants were aged between 17 and 24 years ($M = 19.26$ years, $SD = 2.05$ years) and were required to have a current driver's license and own a mobile phone. Participants drove an average of 5.84 hours per week ($SD = 6.15$ hours; range 0-60 hours) with most (54.4%) participants ($n = 92$) holding a provisional driver's licence, 23.7% ($n = 40$) holding an open licence, and 21.9% ($n = 37$) holding a learner's licence. The time having held a driver's licence ranged between 1 month and 8.25 years ($M = 2.10$ years, $SD = 1.67$ years)[1]. Forty-two percent of participants ($n = 71$) drove an automatic transmission car, 55% a manual transmission car ($n = 93$), and 3% ($n = 5$) drove both. Participants reported having owned a

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[1] Please note that hierarchical regression analyses which included driving experience as a predictor variable as part of the demographic factors showed a similar pattern of results to those reported.

mobile phone between 3 months and 12 years (M = 5.96 years) (SD = 1.94 years). At Time 1,

more participants reported that they had read (65.7%, n = 75) rather than sent (47.3%, n = 44)

texts while driving in the past week.

2.2   Measures

The two target texting while driving behaviours were defined as (1) using a mobile

phone to send Short Message Service (SMS) messages while driving [Send] and (2) using a

mobile phone to read SMS messages while driving [Read]. The first (main) questionnaire

assessed background information of participants and standard TPB model variables as

specified by Ajzen (1991) of attitude, subjective norm, perceived behavioural control, and

intention to (1) send and (2) read texts while driving. Additional items measuring group

norms and moral norm were also included. The majority of items was worded positively, with

some items negatively worded (and subsequently recoded) to reduce response bias. All items

not related to background information were measured on 7-point Likert scales, except for

attitude, measured on a 7-point semantic differential scale. Higher scores on a scale

represented a more positive response on the construct.

2.2.1   Intention.

Participants' intentions to text while driving was assessed using 3 items as specified

by Ajzen (1991) for each behaviour (sending and reading), "I plan to send [read] SMS

messages while driving in the next week"; "I intend to send [read] SMS messages while

driving in the next week"; and "It is likely that I will send [read] SMS messages while driving

in the next week". Items were scored (1) *strongly disagree* to (7) *strongly agree*. The mean of

these three items produced a composite scale for each behaviour. The measure of intention

was reliable (Send, Cronbach's α = .90; Read, α = .89).

2.2.2   Attitude.

Attitude toward texting while driving was assessed by creating a composite scale from

4 semantic differential items as specified by Ajzen (1991) for each behaviour, "For me to

send [read] SMS messages while driving in the next week would be...".. Items were scored (1) *good* to (7) *bad*; (1) *worthless* to (7) *valuable*; (1) *wise* to (7) *unwise*; (1) *negative* to (7) *positive.* Scores for the dimensions of *good-bad* and *wise-unwise* were reversed so that higher scores reflected positive attitudes. The measure of attitude was reliable for each behaviour (Send, Cronbach's α = .75; Read, α = .79).

2.2.3   Subjective norm.

Subjective norm was measured using a composite scale comprising 3 items as specified by Ajzen (1991) for each behaviour, "Those people who are important to me would approve of me sending [reading] SMS messages while driving in the next week"; "Those people who are important to me would want me to send [read] SMS messages while driving in the next week"; "Those people who are important to me think I should send [read] SMS messages while driving in the next week".. Items were scored (1) *strongly disagree* to (7) *strongly agree.* The measure of subjective norm was reliable for each behaviour (Send, Cronbach's α = .79; Read, α = .80).

2.2.4   Perceived Behavioural Control.

Perceived behavioural control was assessed using 2 items as specified by Ajzen (1991) for each behaviour: "I have complete control over whether I will send [read] SMS messages while driving in the next week"; and "It is mostly up to me whether I will send [read] SMS messages while driving in the next week". Items were scored (1) *strongly disagree* to (7) *strongly agree.* The mean of the two items produced a composite scale for each behaviour with significant Pearson correlations $r(168) = .44$, $p < .001$ (Send), and $r(168) = .43$, $p < .001$ (Read).

2.2.5   Past Behaviour.

One item for each target behaviour was included to measure the past performance of each behaviour. The item was: "In the past week, how often did you use your mobile phone to send [read] SMS messages while driving?" .

2.2.6   Group Norm.

Participants responded to 4 items adapted from Terry et al. (1999) assessing their perceptions of the reference group for performing the target behaviour. Two questions were asked for each behaviour: "Thinking about your friends and peers, how many of them do you think would send [read] an SMS message while driving during the next week?" and "How many of your friends and peers would think sending [reading] an SMS message while driving is a good thing to do?" Items were scored as (1) *none* to (7) *all.* The mean of the two items produced a composite scale for each behaviour with significant Pearson correlations $r(166) = .48$, $p < .001$ (Send), and $r(167) = .50$, $p < .001$ (Read).

2.2.7   Moral Norm.

A composite scale for each behaviour was created using 3 items adapted from Godin, Conner, and Sheeran (2005): "I would feel guilty if I sent [read] SMS messages while driving"; "I personally think that sending [reading] messages while driving is wrong"; and "Sending [reading] SMS messages while driving goes against my principles". Items were scored (1) *strongly disagree* to (7) *strongly agree.* The measure of moral norm was reliable (Send, Cronbach's $\alpha = .76$; Read, $\alpha = .78$). Higher scores reflected moral norms that were less in favour of texting while driving.

2.2.8   Behaviour

One week after completing the main questionnaire, participants completed a follow-up questionnaire which asked them to report their behaviour retrospectively: "In the previous week, how many SMS messages did you send whilst driving?" and "In the previous week, how many SMS messages did you read whilst driving?" Participants indicated the number of texts for each behaviour.

3. Results

3.1   Descriptive Analysis of the Data

For the two behaviours of sending and reading texts, correlations between the predictors, means, standard deviations, and t-scores demonstrating the difference between the two behaviours, are presented in Table 1. Bivariate correlations for predictor and dependent variables, as well as relevant Cronbach's alpha and Pearson correlation reliability coefficients, are presented in Tables 2 and 3. Participants reported a relatively negative attitude towards texting while driving and perceived that significant others would disapprove of the behaviour. Participants also indicated that they have weak intentions to engage in texting while driving and a high level of perceived control in relation to performing the behaviour. They also reported a relatively strong belief that texting while driving is the wrong thing to do and that others have a positive attitude to and tend to engage in the behaviour. Significant differences were found between sending and reading texts while driving on all predictor variables except perceived behavioural control.

All scores (except moral norm) were higher for reading texts than for sending texts indicating that attitudes to reading texts while driving were more positive, perceived approval from others and intentions were higher, perceptions of the reference group for reading texts were more positive, and the number of text messages sent in the past and at follow-up were greater than for sending texts while driving. A lower mean score for reading than sending for moral norm (indicated that reading texts while driving is less of a moral concern than sending texts while driving). In addition, the number of messages sent and read in the past week was between 4 and 5 messages and between 3 and 4 messages, respectively. In comparison, in the follow-up period, participants reported having sent and read between 2 and 3 messages while driving in that week. For sending texts, all predictor variables except gender were significantly correlated with reported behaviour at follow-up, with attitude and intention being most highly correlated. For reading texts, all predictor variables except perceived behavioural

control and gender were significantly correlated with reported behaviour at follow-up, with past behaviour, then intention being most highly correlated.

Insert Tables 1, 2 and 3 about here

3.2   Analyses Predicting Intentions to Send and Read Texts While Driving

Two hierarchical regressions were conducted (one for sending and one for reading texts while driving) to examine the ability of the TPB and additional variables to predict people's intention to text while driving, (see Table 4). Intention was entered as the dependent variable in each regression. Consistent with TPB-based analyses, background factors were entered in the first step, the standard TPB constructs were entered in the second step and the proposed additional variables were entered in the final step. Thus, gender and past behaviour were entered in step 1; attitude, subjective norm, and perceived behavioural control were entered in step 2; and group norm and moral norm were entered in step 3.

The linear combination of gender and past behaviour accounted for a significant 15.2% (14.2% adjusted) of the variance in intention to send texts while driving, $F(2, 163) = 14.61$, $p < .001$. The addition of attitude, subjective norm, and perceived behavioural control accounted for an additional significant 28% of the variance, $F(3, 160) = 26.32$, $p < .001$, and the subsequent addition of group norm and moral norm accounted for an additional significant 7.6% of the variance in intention. In sum, 50.5% (48.3% adjusted) of variance in intention to send texts while driving was accounted for by the full model, $F(2, 158) = 11.68$, $p < .001$. At the final step of the analysis, the significant predictors for intention to send texts while driving were attitude, subjective norm, perceived behavioural control, group norm, and moral norm. For reading texts while driving, the linear combination of gender and past behaviour accounted for a significant 16.5% (15.5% adjusted) of the variance in intention to read texts while driving, $F(2, 163) = 16.16$, $p < .001$. The addition of attitude, subjective norm, and

perceived behavioural control accounted for an additional significant 28.9% of the variance $F(3, 160) = 28.22$, $p < .001$ and the subsequent addition of group norm and moral norm accounted for an additional significant 4.3% of the variance in intention to read texts while driving. In sum, 49.8% (47.5% adjusted) of variance in intention to read texts while driving was accounted for by the full model, $F(2, 158) = 6.83$ $p < .01$. At the final step of the analysis, the significant predictors for intention to read texts while driving were attitude, group norm, and moral norm.

Insert Table 4 about here

3.3   Analyses Predicting the Behaviour of Sending and Reading Texts While Driving

Two hierarchical regressions were conducted (one for sending texts and one for reading texts) to determine the effect of intention and perceived behavioural control in the prediction of texting while driving (as measured at follow-up) (See Table 5). The number of texts sent and read while driving in the previous week was entered as the dependent variable in each regression, respectively. Consistent with TPB-based analyses, background factors were entered in the first step, the standard TPB constructs expected to influence behaviour were entered in the second step and the standard TPB constructs not expected to influence behaviour directly as well as the proposed additional variables were entered in the final step. Thus, gender and past behaviour were entered in step 1; intention and perceived behavioural control were entered in step 2; and attitude, subjective norm, group norm and moral norm were entered in step 3. The linear combination of gender and past behaviour accounted for a significant 17.7% (16.4% adjusted) of the variance in sending behaviour, $F(2, 129) = 13.88$, $p < .001$. The addition of intention and perceived behavioural control accounted for an additional significant 14.2% of the variance, $F(2, 127) = 13.24$, $p < .001$ and the subsequent addition of attitude, subjective norm, group norm and moral norm accounted for an additional

significant 6.9% of the variance in sending behaviour. In sum, 38.8% (34.8% adjusted) of the variance in sending texts while driving was accounted for by the full model, $F(4, 123) = 3.46$, $p < .05$. At the final step of the equation, the significant predictors in order of beta-weight size were past behaviour, moral norm, and intention.

For reading texts while driving, the linear combination of gender and past behaviour accounted for a significant 35.1% (24.1% adjusted) of the variance in behaviour, $F(2, 129) = 34.95$, $p < .001$. The addition of intention and perceived behavioural control accounted for an additional significant 10% of the variance, $F(2, 127) = 11.52$, $p < .001$ and the subsequent addition of attitude, subjective norm, group norm and moral norm accounted for an additional non-significant 4.0% of the variance. In sum, 49.1% (45.8% adjusted) of the variance in reading texts while driving was accounted for by the full model, $F(4, 123) = 2.43$, $p = .05$. At the final step of the equation, the significant predictors in order of beta-weight size were past behaviour, moral norm, and intention.

Insert Table 5 about here

4. Discussion

The primary aim of the present study was to examine the utility of the TPB in predicting intentions and subsequent behaviour of texting while driving among young Australian drivers. The role of the additional variables of group norm and moral norm within the TPB framework, in predicting young people's behavioural intentions was examined also. Support was found for the ability of the standard TPB variables of attitude, subjective norm, and perceived behavioural control to predict university students' intentions to send texts while driving. For reading texts, attitude, but not subjective norm or perceived behavioural control significantly predicted intention. Partial support was found for the utility of the TPB to predict behaviour, as intention, but not perceived behavioural control, significantly predicted both

sending and reading texts while driving. The ability of the additional social influence variables to improve the predictive ability of the TPB was partially supported as group norm and moral norm significantly predicted intention to text while driving (both sending and reading texts). Further, moral norm significantly predicted the behaviour of texting while driving (both sending and reading texts). Of the demographic factors, only past behaviour, and not gender, significantly predicted university students' behavioural intentions to both send and read texts while driving.

4.1   Efficacy of the Theory of Planned Behaviour

Overall, results of the present study provide considerable support for the efficacy of the TPB model in understanding and predicting texting while driving among university students. Hypothesis 1 was partially supported as, after controlling for gender and past behaviour, the TPB accounted for a significant proportion (28% and 29%, respectively) of the variability in university students' intentions to send and read texts while driving. This result compares favourably with the results of Walsh et al.'s (2007) study which found that the TPB accounted for 32% of variability in using a mobile phone in general while driving, although is somewhat higher than their findings that the TPB accounted for only 11 to 13% of specifically texting while driving. Furthermore, as found by Walsh et al. (2007), although the full TPB model predicted texting intentions while driving, attitude was the only significant TPB predictor, suggesting that having a more positive attitude toward texting while driving will increase the strength of intentions to do so for university students. For sending texts, subjective norm and perceived behavioural control were also significant predictors of intention, suggesting that, among university students, those with greater perceptions of the acceptability and control over sending texts while driving will have stronger intentions to do so. The finding that sending and reading were influenced differentially by the standard TPB constructs is consistent with previous research suggesting that the effects of subjective norm

and perceived behavioural control varied across driving scenarios and for calling and texting

intentions (Walsh et al., 2008).

In addition to the prediction of intention, the TPB specifies predictors of behaviour. In

the present study, partial support was found for Hypothesis 2, with intention, but not

perceived behavioural control, emerging as a significant predictor of texting (both sending

and reading texts) while driving. As suggested by Walsh and White (2007), given that mobile

phone use is a highly prevalent behaviour, the finding that perceived behavioural control did

not significantly predict behaviour may be more reflective of the volitional nature of mobile

phone use.

4.2   Additional Social Influence Variables

In the test of the role of group and moral norms on university students' intention to

text while driving, support was found for Hypothesis 3, as the inclusion of group and moral

norms in the TPB significantly improved prediction of university students' intentions to text

while driving. These results support the argument that incorporating social influence factors

other than subjective norm into the TPB improves the predictive ability of the model (e.g.,

Rivis, Sheeran, & Armitage, 2006; Sparks & Shepherd, 2002; Terry & Hogg, 1996; Walsh &

White, 2007). Thus, the more a person believes that their friends and peers approve of and

engage in texting while driving, the greater their intention to engage in these behaviours

(group norm), and the more a person perceives a texting while driving to be wrong or

immoral, the less their intention to engage in these behaviours (moral norm). Moral norm also

significantly improved the predictive ability of the TPB on self-reported behaviour,

suggesting that moral norm has a further important influence on the texting behaviour of

university students, beyond that of intention.

Whilst the combination of gender and past behaviour accounted for significant

variance in texting intentions and behaviour, past behaviour was the only significant

predictor. In the present study, for reading texts while driving, past behaviour predicted

approximately twice as much variance for reading compared to sending behaviour as measured at follow-up, suggesting that reading behaviour may be more of an habitual process for some people when it comes to texting while driving. Gender did not emerge as an important factor in predicting intention or subsequent behaviour, suggesting that male and female students in the 17 to 24 year age group are equally likely to intend and engage in the behaviour of texting while driving.

The findings of the present study point to a number of important practical strategies that could be used to discourage not only the dangerous and illegal behaviour of texting while driving, but also other risky driving behaviours among university students. As the roles of the extended TPB components varied across the sending and reading behaviours, interventions should treat these behaviours differently and reveal the necessity for strategies which address multiple factors found to contribute to intentions and behaviour of dangerous driving. Because attitude emerged as the strongest predictor of intentions, strategies could benefit from reinforcing the negative consequences associated with texting while driving. For sending texts while driving, programmes designed to discourage sending texts while driving would benefit from heightening the perception that a range of referents would disapprove of this behaviour (e.g., "BTW, Friends would prefer a late TXT to an early death") and emphasising the amount of physical control required to send texts while driving, such as displaying images of erratic driving behaviours of drivers sending texts or having learner drivers in simulators attempt to drive an obstacle course while sending a text. As group norm also emerged as a significant predictor of intentions, campaigns could minimise the perceived texting frequency of other young people, endeavouring to portray texting while driving as a behaviour which few young adults engage in or approve of. To incorporate the moral norm finding, campaigns could increase the importance of the moral dimension as it relates to texting while driving, highlighting university students' responsibility to self and others. With past behaviour emerging as the strongest predictor of intentions and behaviour (and explaining approximately

twice as much variance in behaviour for reading as sending), strategies could provide

alternatives to combat habitual tendencies such as encouraging university students to turn

their phone off when they enter a car or, at the very least, to place the phone on silent mode. .

4.3   Strengths and Limitations of the Present Study

Despite the strengths of the present study including the use of a prospective

component measuring subsequent texting behaviour (albeit in a retrospective manner), the

separation of sending and reading texts while driving highlighting important variations in the

predictors of each type of texting behaviour, and the focus on 17 to 24 year old university

students who are the heaviest users of technology and the least experienced of drivers, the

findings of the present study should also be interpreted in light of its limitations. First, the use

of self-report measures to assess the level of texting while driving may not have been a

reliable measure of actual use. For, example, it has been found that people over or under-

estimate their level of mobile phone use when compared to their actual calling records (Cohen

& Lemish, 2003). Additionally, although mechanisms to ensure anonymity were applied in

the present study, the illegal nature of texting while driving in Australia may have impacted

on the accuracy of self-reporting by people who engage in this behaviour. Also, the actual

constructs of the TPB and moral and group norm were not necessarily operationalised by the

items selected. It is possible that the questions used to operationalise these constructs did not

match the actual constructs themselves, although standard measures that have been used in

previous studies were employed in the present study. In addition, the results may have been

affected by the potential that participation in the survey itself affected subsequent texting

behaviour and by the expectation of reciprocity (which may be created when someone sends a

text to another with the driver receiving the text feeling compelled to quickly read or return

the text). The effect of fear of reprisal (i.e., fear of being fined) on decision-making related to

texting while driving may also have impacted on the results. Another limitation of the present

study relates to the sampling population. Due to sampling constraints, participants were all university students, with a high proportion of female participants (67%).

To overcome the self-report limitations, future research should review mobile phone records or have participants use a diary method to improve accuracy of the measurement of behaviour. Further, future research should include measures assessing levels of reciprocity expectations in texting and fear of reprisal, especially monetary penalties for young people. In addition, future research extending beyond a university environment with more balance between male and female participant numbers would address the issue of sampling constraints.

5   *Conclusion*

In conclusion, the present study provides considerable support for the utility of the extended TPB model in predicting texting while driving among young Australian university students. Results reveal that students with a positive attitude towards texting while driving are more likely to intend to engage in this behaviour. Additionally, university students with stronger intentions to send, but not read, texts while driving believed that others would approve of them doing so and that they have control over factors that might impede them from sending, but not reading, texts while driving. In predicting subsequent texting behaviour, intention predicted texting while driving. In addition, students that had read texts while driving in the past were twice as likely to do so in the future compared to sending texts. The inclusion of additional normative influences to the TPB framework revealed that the more a student believes their friends and peers approve of and engage in texting while driving and the more they believe it is the incorrect thing to do, the stronger their intention to engage in these behaviours. Thus, results suggest that strategies designed to discourage texting while driving among university students should adopt a multi-faceted approach, incorporating the TPB and additional variables in addressing the behaviours of sending and reading texts while driving separately. Importantly, the present findings provide a firm basis for the direction of future

research in efforts to inform strategies to curb young people's dangerous, and often deadly,

driving behaviours.

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Table 1

Means, Standard Deviations, and T-Scores Comparing Sending and Reading Texts While Driving

		SEND		READ		
Variable	r	M	SD	M	SD	t
Attitude$_a$	.75**	2.36	1.14	2.83	1.28	-.707**
Subjective Norm$_c$	.93**	2.26	1.16	2.38	1.18	-.361**
PBC$_c$	.94**	5.92	1.28	5.91	1.25	.00
Intention$_c$	.93**	2.94	1.68	3.18	1.70	-4.60**
Group Norm$_a$	.77**	3.75	1.43	4.41	1.53	-8.50**
Moral Norm$_c$	.90**	4.81	1.46	4.62	1.46	3.79**
Past Behaviour$_b$	.84**	3.68	8.96	4.08	6.92	-2.64*
Reported Behaviour$_d$	.90**	2.38	4.93	2.83	1.28	5.97**

Note. PBC = Perceived Behavioural Control.

$^a n = 167.$ $^b n = 168.$ $^c n = 169.$ $^d n = 133.$

*p < .01, **p < .001.

Table 2

Bivariate Correlations and Reliability Coefficients for Sending Texts While Driving

Variable	1. Attitude	2. Subjective Norm	3. PBC	4. Intention	5. Group Norm	6. Moral Norm	7. Gender	8. Past Behaviour	9. Reported Behaviour
1. Attitude$_a$	(.75)	.45***	-.39***	.59***	.38***	-.55***	-.02	.39***	.48***
2. Subjective Norm$_c$		(.79)	-.27***	.44***	.31***	-.48***	.04	.28***	.24**
3. PBC$_c$			(.44)^e	-.11	-.09	.34***	.08	-.15*	-.20*
4. Intention$_c$				(.90)	.51***	-.47***	.06	.39***	.48***
5. Group Norm$_a$					(.48)^e	-.36***	.05	.27***	.38***
6. Moral Norm$_c$						(.76)	.16*	-.24**	-.42***
7. Gender							-	.06	.03
8. Past Behaviour$_b$								-	.42***
9. Reported Behaviour$_d$									-

Note. Reliability coefficients presented in brackets ( ). PBC = Perceived Behavioural Control.

[a]n = 167. [b]n = 168. [c]n = 169. [d]n = 133. [e] Cronbach's alpha not computed: correlation reported as a two item measure.

p <.05, **p* < .01, ***p* < .001

Table 3

Bivariate Correlations and Reliability Coefficients for Reading Texts While Driving

Variable	1. Attitude	2. Subjective Norm	3. PBC	4. Intention	5. Group Norm	6. Moral Norm	7. Gender	8. Past Behaviour	9. Reported Behaviour
1. Attitude$_a$	(.79)	.54***	-.26**	.59***	.35***	-.58***	.11	.21**	.36***
2. Subjective Norm$_c$		(.80)	-.24**	.46***	.25**	-.52***	.01	.19*	.29**
3. PBC$_c$			(.43)^e	-.10	-.09	.24**	.04	-.03	-.15
4. Intention$_c$				(.89)	.36***	-.54***	.05	.41***	.49***
5. Group Norm$_a$					(.50)^e	-.24**	.05	.19*	.18*
6. Moral Norm$_c$						(.78)	.17*	-.24**	-.42***
7. Gender							-	.04	.04
8. Past Behaviour$_b$								-	.59***
9. Reported Behaviour$_d$									-

Note. Reliability coefficients presented in brackets ( ). PBC = Perceived Behavioural Control.

$^a n$ = 167. $^b n$ = 168. $^c n$ = 169. $^d n$ = 133. ^{e} Cronbach's alpha not computed: correlation reported as a two item measure.

p <.05, **p* < .01, ***p* < .001.

Table 4

Hierarchical Multiple Regression: Extended TPB Predicting Intentions to Send and Read

Texts While Driving (*N* = 169)

Variable	B	β	R^2	ΔR^2
Sending Texts				
Step 1				
Gender	.224	.063	.152***	.152***
Past Behaviour	.024	.128*		
Step 2				
Attitude	.525	.356***	.432***	.280***
Subjective Norm	.204	.137*		
PBC	.198	.151*		
Step 3				
Group Norm	.290	.247***	.505***	.073***
Moral Norm	-.179	-.156*		
Reading Texts				
Step 1				
Gender	.149	.041	.165***	.165***
Past Behaviour	.042	.213***		
Step 2				
Attitude	.408	.307***	.454***	.289***
Subjective Norm	.178	.102		
PBC	.100	.080		

Step 3					
Group Norm		.140	.126*	.498**	.043**
Moral Norm		-.266	-.230**		

Note. Weights provided are those found in final step of the analysis.

*p <.05, **p < .01, ***p < .001

Table 5

Hierarchical Multiple Regression: Extended TPB Predicting Behaviour of Sending and

Reading Texts While Driving (*N* = 133)

Variable	B	β	R^2	ΔR^2
Sending Texts				
Step 1				
Gender	.462	.043	.177***	.177***
Past Behaviour	.164	.263**		
Step 2				
Intention	.600	.203*	.319	.142***
PBC	-.120	-.031		
Step 3				
Attitude	.622	.144	.388	.069*
Subjective Norm	-.675	-.159		
Group Norm	.489	.136		
Moral Norm	-.767	-.214*		
Reading Texts				
Step 1				
Gender	1.673	.111	.351	.351***
Past Behaviour	.459	.494***		
Step 2				
Intention	.826	.199*	.451	.100***
PBC	-.337	-.061		

Step 3					
Attitude	-.090	-.017	.491	.040 [NS]
Subjective Norm	-.244	-.043		
Group Norm	-.102	-.022		
Moral Norm	-1.306	-.268**		

Note. Weights provided are those found in final step of the analysis.
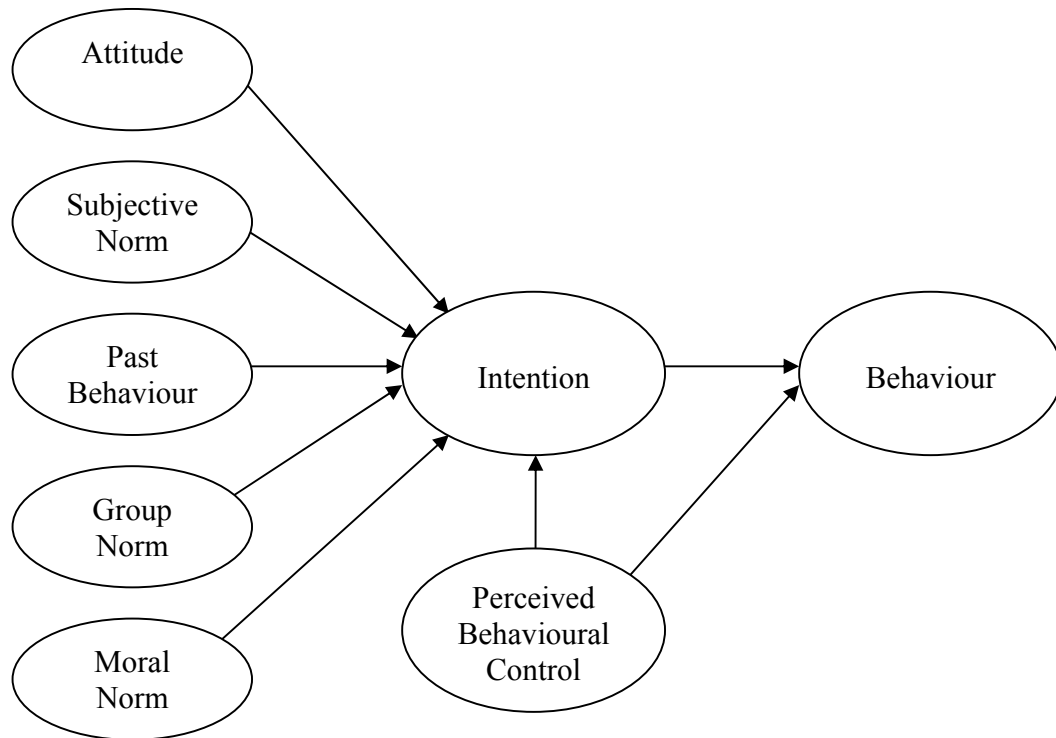
p <.05, ***p* < .01, ****p* < .001

Figure 1. Expected relationships of variables explored in the study of texting while driving.