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What's driving illegal mobile phone use? Psychosocial influences on drivers' intentions to use hand-held mobile phones

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ABSTRACT

Australian drivers' use of hand-held mobile phones is increasing in prevalence, despite the illegal nature of this behaviour. Research investigating the psychosocial influences on drivers' intentions to use hand-held mobile phones is limited. The present research utilised the theory of planned behaviour, extended with descriptive norm, to investigate the psychosocial influences on drivers' intentions to use a hand-held mobile phone. The behaviours associated with mobile phone use were categorised into initiating and responding behaviour. Answering calls and reading text messages were categorised as responding behaviour, on the basis that these two behaviours have been associated with social pressure to respond. Making calls and sending text messages were categorised as initiating behaviour. A sample of 181 drivers from the general population, aged 18–66 years, completed an online survey. The survey assessed attitude, subjective norm, perceived behavioural control, descriptive norm, past behaviour and intention, in relation to initiating and responding behaviour. Hierarchical multiple regression analyses revealed attitude, subjective norm, perceived behavioural control and descriptive norm were all significant predictors of drivers' intentions to engage in both initiating and responding behaviour. However, drivers reported significantly greater intentions to engage in responding behaviour and reported engaging in responding behaviour more frequently than initiating behaviour, indicating that social pressure to respond may play an important role in drivers' illegal use of hand-held mobile phones.

1. Introduction

Hand-held mobile phone use while driving increases the risk of motor vehicle accidents and is illegal in Australia and many countries worldwide (Backer-Grondahl & Sagberg, 2011; Roads, 2011; Rozario, Lewis, & White, 2010). Laws regarding drivers' hand-held mobile phone use have been instigated due to safety concerns related to cognitive and physical distractions associated with the behaviour (White, Eiser, & Harris, 2004; Zhou, Rau, Zhang, & Zhuang, 2012). Australia currently has a "deterrence-based approach" (Walsh, White, Hyde, & Watson, 2008, p. 1893) to drivers' hand-held mobile phone use, involving a combination of law enforcement and educational campaigns (CARRS-Q, 2011). However, legal sanctions have had little impact on the prevalence of the behaviour (Nelson, Atchley, & Little, 2009) and current campaigns do not appear to be discouraging drivers from using their mobile phones while driving.

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Drivers' mobile phone use has been steadily increasing (Pennay, 2008; White et al., 2004). In an Australian-wide survey of 1555 drivers, 54% of drivers reported answering calls while driving and just over a quarter reported making calls (Petroulias, 2011). However, the majority of Australian drivers (64%) do not own a hands-free device (White, Hyde, Walsh, & Watson, 2010) and among drivers who do, use is inconsistent (Petroulias, 2011).

The practice of reading text messages while driving has almost doubled among Australian drivers from 16% in 2005 (Pennay, 2008) to 31% in 2011 (Petroulias, 2011). While the number of Australian drivers who report sending text messages while driving has remained relatively stable since 2006, with figures varying from 13% to 16% (Petroulias, 2011), McEvoy, Stevenson, and Woodward (2006) found higher rates, with almost one-third of young Australian drivers in New South Wales and Western Australia reporting that they had sent text messages while driving.

Psychological and social factors are likely to influence drivers' use of hand-held mobile phones however these factors have received limited attention in the research literature (Walsh et al., 2008). As such, additional research into the psychosocial factors influencing drivers' decisions to use hand-held mobile phones is important in informing road safety interventions (Rozario et al., 2010) aimed at reducing the incidence of this illegal and unsafe driver behaviour.

1.1. Defining mobile phone use

Australian surveys of drivers' mobile phone use have commonly investigated four specific behaviours: making calls, answering calls, reading text messages and sending text messages (McEvoy et al., 2006; Pennay, 2008; Petroulias, 2011). However, previous research investigating the psychosocial influences on drivers' intentions has investigated these behaviours in different ways, with mobile phone use alternatively defined in terms of general usage, behaviour categories or specific behaviours.

Rozario et al. (2010) and Walsh et al. (2008) investigated general mobile phone use without distinguishing between making and answering calls and sending and reading text messages. While research into general mobile phone use provides valuable insights into driver behaviour, the variety of unique behaviours incorporated within such a broad definition, makes interpretation of results difficult. In fact, Hallett, Lambert, and Regan (2011) claim that the general term, 'cell phone use', or mobile phone use, is a "misleading... blanket term", (p. 862) that includes such a wide range of behaviour that different outcomes may be measured, making comparisons of studies difficult. Walsh et al. (2008) also examined categories of mobile phone use behaviour, making distinctions between calling and texting. Nemme and White (2010) and Atchley, Atwood, and Boulton (2011) focused on specific texting behaviours used by drivers and made distinctions between reading and sending text messages. When categories of behaviour or specific behaviours have been used in previous research, significant differences were found not only in the psychosocial influences on intention (Nemme & White, 2010; Walsh et al., 2008) but also in the frequency of performance and the perception of risk (Atchley et al., 2011) between the categories or behaviours.

1.2. Social pressure to respond

There are indications in the research literature that drivers experience social pressure to respond as quickly as possible to incoming calls and text messages (Atchley et al., 2011; Lindqvist & Hong, 2011; Nemme & White, 2010). This pressure has not previously been considered as a potential way of differentiating between the specific behaviours used in mobile phone research.

Lindqvist and Hong (2011) have proposed that drivers experience, "social pressure and [a] perceived need to answer a phone call or text message as soon as they arrive" (para.2). Similarly, Nemme and White (2010) have suggested that texting behaviour may be affected by an "expectation of reciprocity" where drivers feel "compelled to quickly read or return" text messages they receive (p. 1264).

In addition, Atchley et al. (2011), found that young American drivers reported reading text messages was the behaviour they engaged in most frequently. In terms of sending text messages, drivers in this study replied to texts messages more frequently than they initiated text messages. Atchley et al. (2011) proposed that differences in the reported incidence of these texting behaviours resulted from drivers experiencing greater social pressure to reply to text messages than to initiate text messages. This social pressure was significant enough to result in drivers' perceptions of the risks associated with the behaviour becoming less important to them than responding to incoming text messages. Atchley and colleagues' research demonstrates the importance of social pressure to respond, as a point of difference between specific texting behaviours.

Given these findings, it is possible that similar social pressure to respond may also be a point of difference between calling behaviours. Social pressure to respond particularly influences drivers' decisions to answer incoming calls while driving (Lindqvist & Hong, 2011). While the impact of social pressure to respond in relation to drivers' mobile phone use has received limited attention in the literature, the studies above indicate that this pressure to respond may have an important impact on driver behaviour. For this reason, the current study proposes an exploratory categorisation of the specific behaviours used in surveys of Australian mobile phone use (McEvoy et al., 2006; Pennay, 2008; Petroulias, 2011) based on the level of social pressure to respond that drivers may experience.

1.3. Initiating and responding behaviour

The specific behaviours involved in hand-held mobile phone use can be categorised as either initiating or responding behaviour, a categorisation reflecting the level of social pressure to respond associated with each of the behaviours. As previous research has indicated that drivers are likely to answer calls and read texts as a result of social pressure to respond (Atchley et al., 2011; Lindqvist & Hong, 2011; Nemme & White, 2010), these two behaviours are categorised as responding behaviour in the current study. Social pressure to respond is reflected indirectly in the responding behaviour of drivers.

The term 'initiating', was originally used by Atchley et al. (2011) to describe the writing and sending of text messages that were not in reply to incoming text messages. In this study, initiating behaviour includes both sending text messages and making calls, behaviours that are initiated by drivers. Whilst it could be argued that drivers who send text messages and make calls in reply to incoming texts and calls, are also influenced somewhat by social pressure to respond, the current categorisation is based on whether the behaviour is an initial or subsequent response to social pressure to respond. For example, in response to an incoming call or text message, a driver initially decides whether to answer the call or read the text, and subsequently decides whether to make a call or send a text in reply. Only the initial responses to incoming calls and texts, that is, answering calls and reading texts are categorised as responding behaviour. Replying, whether in the form of calling or texting, is a secondary behavioural response. Therefore, in the current study, making calls and sending text messages, even in reply, will be categorised as initiating behaviour.

Given the suggested influence of social pressure to respond quickly to incoming calls and texts (Atchley et al., 2011; Lindqvist & Hong, 2011; Nemme & White, 2010), the frequency with which drivers engage in initiating and responding behaviour is likely to differ. Petroulias (2011) reported that the behaviours Australian drivers reported engaging in most frequently were answering calls and reading text messages. In fact, twice as many drivers reported answering calls (54%) than making calls (27%). Similarly, drivers reported reading texts (31%) much more frequently than sending text messages (14%). These frequency differences suggest that drivers experience greater social pressure to engage in responding behaviour than initiating behaviour.

There may also be differences in the psychosocial influences on drivers' intentions to engage in initiating and responding behaviour. Previous research has indicated that the psychosocial influences on drivers' intentions to engage in mobile phone use vary between categories of behaviour, such as calling and texting (Walsh et al., 2008) and between specific texting behaviours (Nemme & White, 2010). This study aims to investigate the psychosocial influences on drivers' intentions to engage in initiating and responding behaviour on a hand-held mobile.

1.4. The theory of planned behaviour

The theory of planned behaviour (Ajzen, 1991) has demonstrated efficacy in predicting intention and behaviour in many road safety contexts, including speeding (Conner, Smith, & McMillan, 2003), driving violations (Forward, 2009; Poulter, Chapman, Bibby, Clarke, & Crundall, 2008), drink driving (Chan, Wu, & Hung, 2010; Moan & Rise, 2011) and road crossing in risky situations (Diaz, 2002; Evans & Norman, 2003). The TPB has also been used to investigate the psychosocial influences on drivers' intentions and behaviour relating to mobile phone use (Nemme & White, 2010; Walsh et al., 2008; Zhou, Wu, Rau, & Zhang, 2009).

According to the TPB, behaviour is primarily predicted by intentions (Ajzen, 2002), which are, in turn, influenced by attitudes towards the behaviour, subjective norms regarding the behaviour and perceived behavioural control over the behaviour.

Attitudes are the overall positive or negative evaluation of a particular behaviour (White et al., 2010). Subjective norm refers to the perceived social pressure from significant others to behave in a particular way (Elliott, Armitage, & Baughan, 2003). Perceived behavioural control is the perception of the ease or difficulty of performing a particular behaviour (Ajzen, 1991) that not only influences intention, but also exerts a direct influence on behaviour (Churchill, Jessop, & Sparks, 2008).

Previous research using the TPB model has reported that the TPB predictor variables have accounted for 11–48% of the variance in drivers' intentions to use mobile phones (Nemme & White, 2010; Walsh et al., 2008; Zhou et al., 2009). The influence of each of the TPB variables on intention has been inconsistent. Attitudes, subjective norm and perceived behavioural control were all significant predictors of Chinese learner drivers' intentions to use a hand-held mobile phone (Zhou et al., 2009), and university students' intentions to send text messages (Nemme & White, 2010). In contrast, only attitude significantly predicted students' intentions to read text messages (Nemme & White, 2010) and intentions to text in general, while attitude and subjective norm both significantly predicted drivers' intentions to engage in general mobile phone use and calling behaviour (Walsh et al., 2008).

1.5. Descriptive norm

Ajzen (1991) claims that additional predictors can be included in the TPB model if their addition contributes to the prediction of intention after the TPB predictors have been considered. The subjective norm component of the TPB is often the weakest predictor in the model and Armitage and Conner (2001) suggest that one reason for this weakness is the narrow conceptualisation of the subjective norm construct.

Descriptive norms provide evidence of what is typically done and what is considered normal behaviour across population groups (Moan & Rise, 2011). Descriptive norms are a measure of beliefs concerning the behaviour of others (Forward, 2009) that are likely to influence how individuals decide to act themselves (Rivis & Sheeran, 2003). Therefore, drivers may not only be influenced by normative pressures concerning what others think they should do (subjective norm), but also by social pressure resulting from what they believe other drivers actually do (descriptive norm).

The inclusion of a descriptive norm measure in the TPB model as recommended by Ajzen (2002) has enhanced the predictive ability of the normative component in the TPB model (Armitage & Conner, 2001). Descriptive norms have been found to significantly contribute to the prediction of drivers' intentions to drink and drive (Moan & Rise, 2011), intentions to speed in urban areas and overtake in situations of poor visibility (Forward, 2009) and intentions to drive through yellow traffic lights (Palat & Delhomme, 2012). Although to date, to the authors' knowledge, descriptive norm has not been used in the prediction of drivers' intentions to use hand-held phones, past research into the prediction of other traffic behaviours indicates that the inclusion of descriptive norm in research investigating drivers' mobile phone use is warranted.

1.6. The current study

The current study has three main aims. First, to examine the psychosocial influences on drivers' intentions to engage in initiating and responding behaviour on a hand-held mobile. Second, to determine whether descriptive norm improves the predictive ability of the TPB model and finally, to examine the frequency of drivers' initiating and responding behaviour.

1.7. Research hypotheses

Hypothesis 1. Attitude, subjective norm and perceived behavioural control will predict drivers' intentions to engage in *initiating* behaviour, after controlling for age and gender.

Hypothesis 2. Descriptive norm will improve the prediction of drivers' intentions to engage in *initiating* behaviour, after controlling for demographic and TPB variables.

Hypothesis 3. Attitude, subjective norm and perceived behavioural control will predict drivers' intentions to engage in *responding* behaviour after controlling for age and gender.

Hypothesis 4. Descriptive norm will improve the prediction of drivers' intentions to engage in *responding* behaviour after controlling for demographic and TPB variables.

Hypothesis 5. Drivers will engage more frequently in responding behaviour than initiating behaviour.

2. Method

2.1. Participants

214 drivers volunteered to participate, with 181 drivers completing the online survey (85% response rate). The drivers (21% male, $n = 38$, 79% female, $n = 143$) ranged in age from 18 to 66 years ($M = 36$ years, $SD = 12.8$). All drivers held a current drivers' licence and owned or had access to a mobile phone. Two-thirds of the drivers did not own or have access to a hands-free device (66%). Among those drivers who owned or had access to a hands-free device, only 8% reported using this most of the time.

2.2. Procedure

Drivers were recruited from the general public and from students and general staff members at Charles Sturt University (CSU). The online survey link was posted on the chief investigator's Facebook profile, on the Australian Psychological Society Student HQ Facebook page, on the online CSU news site and on a number of CSU student forums.

Four target behaviours were investigated separately: making a call, answering a call, sending a text message and reading a text message. Each of the target behaviours was defined in terms of the target (hand-held mobile phone), action (use of mobile phone), time (one week) and context (while driving) as proposed by Fishbein and Ajzen (1975). A one-week time frame was used in line with previous mobile phone research (Nemme & White, 2010). In order to reflect current Australian legislation regarding hand-held mobile phone use (Roads & Maritime Services, 2011), drivers were advised that the term, 'while driving', included being stopped at traffic lights or in traffic.

Twelve randomly presented items assessing intention, subjective norm, perceived behavioural control and descriptive norm, were used to assess each of the target behaviours. The items assessing attitude were presented together as a block and the final question assessed past behaviour for each target behaviour.

All measures, with the exception of attitude and past behaviour were measured using 7 point Likert scales from (1) *strongly disagree* to (7) *strongly agree*. Higher scores indicated more positive responses. The mean of the total scores for making a call and sending a text message provided a composite measure for initiating behaviour. The mean of the total scores for answering a call and reading a text message provided a composite measure for responding behaviour.

2.3. Measures

2.3.1. Demographics/general items

Two questions related to age and gender and four questions related to drivers' licence type, mobile phone ownership, and ownership and use of a hands-free device.

2.3.2. Intention

Three items assessed intention, as specified by Ajzen (1991) and used by Nemme and White (2010): "I plan to make/answer a call/send/read a text message while driving in the next week", "I intend to make/answer a call/send/read a text message while driving in the next week", and "It is likely that I will make/answer a call/send/read a text message while driving in the next week.

The measure of intention to engage in initiating behaviour was reliable (Chronbach's $\alpha = .91$). One item assessing intention to read a text message contained a wording error and consequently this item was not used. Therefore only two items were used to assess intention to read a text message; "I plan to read a text message while driving in the next week" and "It is likely that I will read a text message while driving in the next week". As the measure of intention to engage in responding behaviours was a composite scale consisting of five items including three items assessing answering calls and two items assessing reading text messages, the omission of one item did not result in an unreliable measure (Chronbach's $\alpha = .90$). While the omission of one item did not affect the reliability of the scale, future research utilising all three items may be worthwhile.

2.3.3. Attitude

Attitude was assessed with four semantic differential items, as proposed by Ajzen (1991) and used by Nemme and White (2010). Drivers completed the sentence, "For me to make/answer a call/send/read a text message on a hand-held mobile while driving in the next week, would be": (1) *bad* to (7) *good*, (1) *wise* to (7) *unwise*, (1) *worthless* to (7) *valuable*, and (1) *positive* to (7) *negative*. In order to reduce response bias, the adjective pairs wise/unwise and positive/negative were reverse scored. The measure of attitude for each behaviour was reliable (initiating, Chronbach's $\alpha = .86$, responding, Chronbach's $\alpha = .89$).

2.3.4. Subjective norm

Three items, as specified by Ajzen (1991) and used by Nemme and White (2010) assessed subjective norm for each target behaviour: "Those people who are important to me would approve of me making/answering a call/sending/reading a text message while driving in the next week", "Those people who are important to me would want me to make/answer a call/send/read a text message while driving in the next week", and "Those people who are important to me think I should make/answer a call/send/read a text message while driving in the next week". The measure of subjective norm for each behaviour was reliable (initiating, Chronbach's $\alpha = .85$, responding, Chronbach's $\alpha = .90$)

2.3.5. Perceived behavioural control

Perceived behavioural control was assessed with three items, as specified by Ajzen (1991). Two of the items were adapted from Chan et al. (2010) to mobile phone use: "I believe I have the ability to make/answer a call/send/read a text message while driving in the next week", and "It would be very easy for me to make/answer a call/send/read a text message while driving in the next week". The third item, as used by Nemme and White (2010), was: "I have complete control over whether I will make/answer a call/send/read a text message while driving in the next week".

The measure of perceived behavioural control for each behaviour was reliable (initiating, Chronbach's $\alpha = .68$, responding, Chronbach's $\alpha = .75$).

2.3.6. Descriptive norm

Three items, adapted from Rhodes and Courneya (2003), and based on a descriptive norm measure proposed by Ajzen (2002) were used to assess descriptive norm: "Most of my friends would make/answer a call/send/read a text message while driving in the next week", "Most of my family would make/answer a call/send/read a text message while driving in the next week", "Most of my co-workers would make/answer a call/send/read a text message while driving in the next week".

The measure of descriptive norm for each behaviour was reliable (initiating, Chronbach's $\alpha = .79$, responding, Chronbach's $\alpha = .79$).

2.3.7. Past behaviour

One item (as used by Nemme & White, 2010) and suggested by Ajzen (2002) was used to assess past behaviour: "In the past week how often did you make/answer/send text/read text while driving?" This item was measured on a 5-point scale (1-*never*, to 5-*every day*), adapted from a scale proposed by Ajzen (2002).

3. Results

Prior to analyses, data checks were carried out on all variables to ensure that the appropriate statistical assumptions were met.

3.1. Descriptive analysis

Examination of the mean scores in Table 1 shows that drivers held somewhat negative attitudes towards engaging in initiating and responding behaviour, and that normative pressure from significant others was not of great concern. In addition, drivers reported relatively weak intentions to engage in both behaviours. The mean scores for perceived behavioural control and descriptive norm were relatively high in comparison to the scores for attitude and subjective norm indicating that drivers felt they had good levels of control over performing both behaviours and believed that other drivers regularly used a hand-held mobile while driving.

Paired *t*-test analyses showed that drivers held more positive attitudes to responding behaviour, perceived greater normative pressure to engage in responding behaviour, and experienced greater perceptions of behavioural control over responding behaviour. Drivers also reported stronger intentions to engage in responding behaviour and believed that other drivers engaged more in responding behaviour than in initiating behaviour. The differences between initiating and responding behaviour scores across all variables, demonstrated medium effect sizes (Cohen, 1988).

Bivariate correlations for initiating and responding behaviour are presented in Tables 2 and 3 respectively.

Attitude, subjective norm, perceived behavioural control and descriptive norm had significant positive correlations with intention for both initiating and responding behaviour. Perceived behavioural control and descriptive norm had the strongest positive correlations with intention for both behaviours. Age had a significant negative correlation with intention for both behaviours, while gender was not significantly correlated with intention for either behaviour.

Two hierarchical multiple regression analyses were conducted to test the study's first four hypotheses. Hypotheses 1 and 2, relating to initiating behaviour, were tested in the first hierarchical multiple regression analysis (see Table 4), while hypotheses 3 and 4, relating to responding behaviour, were tested in the second hierarchical multiple regression analysis (see Table 5). For both analyses, demographic variables were entered in the first step, TPB variables in the second step and descriptive norm in the third step.

Table 1
Means, standard deviations, *t*-scores and Cohen's *d* values for initiating and responding behaviour.

Variable	Initiating behaviour		Responding behaviour		*t*	Cohen's *d*
	M	*SD*	*M*	*SD*		
Attitude	2.11	1.00	2.54	1.18	−8.49***	0.39
Subjective norm	2.06	1.00	2.60	1.21	−7.92***	0.49
PBC[a]	4.52	1.18	5.05	1.19	−9.50***	0.45
Descriptive norm	3.58	1.13	4.19	1.08	−10.89***	0.55
Intention	2.55	1.56	3.47	1.65	−11.28***	0.57

[a] PBC – perceived behavioural control.
*** $p < .001$.

Table 2
Bivariate correlations for initiating behaviour.

Variable	1	2	3	4	5	6	7
1. Gender	1	−.09	−.09	−.10	.05	.09	−.01
2. Age		1	−.26**	−.15	−.38**	−.37**	−.29**
3. Attitude			1	.43**	.52**	.34**	.53**
4. Subjective norm				1	.40**	.48**	.58**
5. PBC[a]					1	.53**	.64**
6. Descriptive norm						1	.61**
7. Intention							1

$N = 181$.
[a] PBC – perceived behavioural control.
** Correlation is significant at 0.01 level (2-tailed).

Table 3
Bivariate correlations for responding behaviour.

Variable	1	2	3	4	5	6	7
1. Gender	1	−.09	−.13	−.12	−.04	−.002	−.08
2. Age		1	−.17*	−.09	−.29**	−.32**	−.25**
3. Attitude			1	.51**	.50**	.44**	.55**
4. Subjective norm				1	.39**	.49**	.52**
5. PBC[a]					1	.55**	.66**
6. Descriptive norm						1	.59**
7. Intention							1

$N = 181$.
[a] PBC – perceived behavioural control.
* Correlation is significant at 0.05 level (2-tailed).
** Correlation is significant at 0.01 level (2-tailed).

Table 4
hierarchical multiple regression analysis predicting intention to engage in initiating behaviour.

Variable	*B*	*β*	*p*	R^2	ΔR^2	*p*
Step 1						
Gender	−.15	−.04	.58	.08	.08	$p < .001$
Age	−.04	−.29	$p < .001$			
Step 2						
Gender	.04	.01	.82			
Age	−.005	−.04	.43	.55	.47	$p < .001$
Attitude	.25	.16	.01			
Subjective norm	.54	.35	$p < .001$			
PBC[a]	.53	.40	$p < .001$			
Step 3						
Gender	−.05	−.01	.81			
Age	.001	.008	.88			
Attitude	.26	.16	.006	.59	.04	$p < .001$
Subjective norm	.40	.26	$p < .001$			
PBC[a]	.42	.31	$p < .001$			
Descriptive norm	.36	.26	$p < .001$			

[a] PBC – perceived behavioural control.

Table 5
Hierarchical multiple regression analysis predicting intention to engage in responding behaviour.

Variable	*B*	*β*	*p*	R^2	ΔR^2	*p*
Step 1						
Gender	−.43	−.11	.14	.07	.07	.001
Age	−.03	−.26	$p < .001$			
Step 2						
Gender	−.08	−.02	.72			
Age	−.009	−.07	.21	.54	.47	$p < .001$
Attitude	.27	.19	.004			
Subjective norm	.33	.24	$p < .001$			
PBC[a]	.62	.48	$p < .001$			
Step 3						
Gender	−.11	−.03	.59			
Age	−.004	−.03	.55			
Attitude	.24	.17	.008	.56	.02	$p < .001$
Subjective norm	.25	.18	.004			
PBC[a]	.53	.38	$p < .001$			
Descriptive norm	.31	.20	.002			

[a] PBC – perceived behavioural control.

3.2. Analyses predicting intention to engage in initiating and responding behaviour

Attitude, subjective norm and perceived behavioural control significantly accounted for 47% of the variance in intention to engage in initiating behaviour, $F(3,175) = 61.34$, $p < .001$, and 47% of the variance in intention to engage in responding

behaviour, $F(3,175) = 60.43$, $p < .001$. All three TPB variables significantly contributed to the prediction of intention for both behaviours. Perceived behavioural control and subjective norm had the strongest influence in the prediction of intention to engage in both behaviours, while attitude was the weakest predictor.

Descriptive norm explained an additional 4% of the variance in intention to engage in initiating behaviour, $F(1,174) = 17.51$, $p < .001$ and an additional 2% of the variance in intention to engage in responding behaviour $F(1,174) = 9.44$, $p = .002$, after demographic and TPB variables were controlled for.

The final model accounted for 59% of the variance in intention to engage in initiating behaviour, $F(6,174) = 42.57$, $p < .001$ and 56% of the variance in intention to engage in responding behaviour, $F(6,174) = 38.27$, $p < .001$. For both behaviours, perceived behavioural control remained the strongest predictor, descriptive and subjective norm were the next most influential, and attitude remained the weakest predictor.

3.3. Self-reported frequency of initiating and responding behaviour

Examination of driver's self-reports of their mobile phone use while driving found that 29% of drivers reported making a call on a hand-held mobile and 28% had sent a text message while 44% of drivers reported answering a call on a handheld mobile and over half (57%) reported reading a text message while driving. These results indicate that the behaviours categorised as responding behaviour, were performed more frequently than the behaviours categorised as initiating behaviour.

4. Discussion

4.1. The influence of attitude, subjective norm and perceived behavioural control on intention to engage in initiating and responding behaviour

All three TPB variables predicted drivers' intentions to engage in both initiating and responding behaviour with perceived behavioural control the strongest predictor of intention for both behaviours. Normative pressure also had a marked influence on drivers' intentions to engage in both behaviours while drivers' attitudes, although predictive, had less influence on their intentions to engage in both behaviours.

These findings are consistent with some previous research findings (Nemme & White, 2010; Zhou et al., 2009), however other research has indicated that only one or two of the TPB predictors significantly influenced drivers' intentions to use a mobile phone (Nemme & White, 2010; Walsh et al., 2008). In addition, previous research comparing specific texting behaviours (Nemme & White, 2010) and categories of calling and texting behaviour (Walsh et al., 2008) found differences in the psychosocial influences on intention between the texting behaviours and between calling and texting. In the current study, however, there were no differences in the psychosocial influences on intention between initiating and responding behaviour. That is, all three TPB variables significantly predicted drivers' intentions to engage in both behaviours, and in both cases, perceived behavioural control was the strongest predictor.

These inconsistencies in the influence of the TPB predictors on drivers' intentions to engage in mobile phone use may be accounted for by a number of variations in research design. Firstly, mobile phone use has been defined in a variety of ways, including 'general' use, in terms of behaviour categories such as calling and texting, and by specific behaviours such as sending and reading text messages. The current study categorised mobile phone use behaviours according to levels of social pressure to respond, a factor that has not been considered previously. This new categorisation limits direct comparison of our findings with those of previous research.

Differences in operationalising the TPB constructs in mobile phone research have also made comparison of results less straightforward. For example, while the current study used three items to assess perceived behavioural control, this construct has been assessed using single item measures in some studies (Rozario et al., 2010; Walsh et al., 2008) and with scales of up to three items in other studies (Nemme & White, 2010; Zhou et al., 2009). Other research has operationalised the constructs by relating the items to hypothetical driving scenarios (Rozario et al., 2010; Walsh et al., 2008; Zhou et al., 2009).

Differences in sample populations and modes of data collection may also have contributed to the variations in research findings. Previous studies have primarily investigated university students' intentions to use mobile phones while driving (Atchley et al., 2011; Nemme & White, 2010; Rozario et al., 2010), while Zhou et al. (2009) examined learner drivers' intentions. The current study surveyed drivers from the general population, including university students, ranging in age from 18 to 66 years using an online survey. All of these differences in research design and methodology are likely to account for the reported inconsistent results.

While differences in research design make direct comparison of findings difficult, the current study provides good support for the utility of the TPB as a framework to investigate the psychosocial influences on drivers' intentions. The findings of this study also have practical implications for the development of interventions aimed at reducing drivers' use of hand-held mobile phones. A multifaceted approach may more effectively reduce drivers' mobile phone use, whereby attitudes, subjective norm, and perceived behavioural control are selectively targeted. Given that perceived behavioural control was the strongest predictor of intention for both initiating and responding behaviour, it may be especially important to challenge drivers' perceptions of their driving ability while using a hand-held mobile. For example, advertisements or educational campaigns could be used to remind drivers of the significant physical and cognitive distractions that result from hand-held mobile

use while driving (Charlton, 2009; Strayer, Drews, & Crouch, 2006; Tornros & Bolling, 2005). Addressing drivers' overconfidence in relation to perceptions of behavioural control through practical intervention programs and educational campaigns may help to discourage drivers' use of hand-held mobile phones.

4.2. The influence of descriptive norm on intention to engage in initiating and responding behaviour

Descriptive norm added to the prediction of drivers' intentions to engage in both initiating and responding behaviour. This contribution compares favourably to those reported in previous driver behaviour research (Forward, 2009: Moan & Rise, 2011) and supports the inclusion of descriptive norm in investigations of road user behaviour (Forward, 2009).

The influence of descriptive norm on initiating and responding behaviour has practical implications for the development of interventions aimed at reducing drivers' hand-held mobile phone use. For instance, drivers' perceptions that other drivers regularly engage in initiating and responding behaviour, and that these behaviours are 'normal'', need to be challenged. Interventions reinforcing alternative perceptions of 'normal' driving behaviour, for example, that the majority of drivers do not use hand-held mobile phones while driving, may be beneficial.

4.3. Self-reported frequency of initiating and responding behaviour

Drivers' self-reports showed that over half the drivers reported reading texts while driving. Similarly, almost half the drivers reported answering a call on a hand-held mobile while driving. While the incidence of initiating behaviour was less, the rates were still high enough to be of concern, with almost one third of drivers reporting they had made a call on a hand-held mobile or sent a text while driving in the previous week.

The higher incidence of responding behaviour reported by drivers in this study is consistent with the literature (Nemme & White, 2010; Petroulias, 2011). These findings reflect drivers' stronger intentions for engaging in responding behaviour in comparison to initiating behaviour. Therefore, while answering calls and reading text messages appear to be very different behaviours functionally, the frequency with which drivers report engaging in these responding behaviours suggests that social pressure to respond may contribute to differences in the frequency of drivers' initiating and responding behaviour. Interventions aimed at addressing drivers' awareness of this social pressure to respond could further reduce drivers' use of hand-held mobile devices while driving.

4.4. Limitations and directions for future research

Generalisation of these findings is limited given the small sample size and the gender imbalance, with over three-quarters (79%) of the participants being female drivers. In addition, the illegal and unsafe nature of this specific driving behaviour suggests that drivers may be reluctant to admit to this type of driving conduct and therefore a measure of social desirability may help to reduce limitations associated with the use of self-report measures in future mobile phone research. However, the current data did not indicate that drivers were reluctant to disclose information. In fact, many drivers readily admitted to engaging in illegal mobile phone use. It is possible that the actual frequency of hand-held mobile phone use may be even higher than that reported.

The present study indirectly investigated social pressure to respond, using this construct as a basis for the classification of drivers' mobile phone use into initiating and responding behaviour. Future research could examine the influence of this construct more directly. While the current study's categorisation of sending texts and making calls as initiating behaviour has been justified, further discrimination between these two behaviours would be useful in future research. For example, Atchley et al. (2011) made distinctions between initiating texts and sending texts in reply, and similar distinctions could be made between initiating calls and making calls.

Drivers were advised that "while driving" included situations where their vehicle was stationary, such as when stopped at traffic lights or stopped in traffic and it is possible that the use of this particular definition influenced our results. For example, drivers' perceptions of control over their mobile phone use may have varied according to whether they used their phone while driving in traffic, stopped in traffic or stopped at traffic lights. In addition, the high frequency with which drivers reported engaging in responding behaviour in the current study may have reflected drivers' perceptions that some driving situations are 'safer' than others for responding to incoming calls and texts. Although hand-held phone use in any driving context is illegal, future research that makes distinctions between different driving contexts would address any limitations associated with the 'driving' definition used in this research.

Finally, as the current study found that descriptive norm influenced drivers' intentions to use hand-held phones, further research confirming the influence of descriptive norms on drivers' mobile phone use may be useful.

5. Conclusion

The current study aimed to increase understanding of the psychosocial factors contributing to drivers' continued use of hand-held mobile phones, despite the legal sanctions and safety risks associated with this behaviour. Attitude, subjective norm, perceived behavioural control and descriptive norm were all found to be significant psychosocial influences on drivers'

intentions to engage in both initiating and responding behaviour. However, while similar factors influenced drivers' intentions to engage in both behaviours, drivers had greater intentions of engaging in responding behaviour and reported engaging more frequently in this behaviour. These results suggest that future empirical research directly testing the impact of social pressure to respond on drivers' intentions and behaviour is justified.

The results of the current research suggest that future intervention programs should address all four of the psychosocial influences investigated. In addition, social pressure to respond should be considered an additional psychosocial influence on drivers' mobile phone use, an influence warranting more direct investigation.

In conclusion, this research has provided new insights into the psychosocial factors driving hand-held mobile phone use, insights that may ultimately prove useful in informing both future research and the development of more effective road safety interventions.

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