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Identifying the psychological determinants of risky riding: An application of an extended Theory of Planned Behaviour

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ABSTRACT

The Theory of Planned Behaviour (TPB) plus moral norms, anticipated regret, past behaviour, self-identity and perceived susceptibility was applied to predicting motorcyclists' intention to ride above the speed limit and ride at inappropriate speeds. Past behaviour, control beliefs, attitudes, moral norm, normative beliefs, age and self-identity explained 60% of the variance in motorcyclists' intention to exceed the speed limit on motorways ($N = 1381$). A total of 62% of the variance in motorcyclists' intention to really go for it on rural roads was accounted for, with past behaviour, attitudes, control beliefs, age, normative beliefs, anticipated regret, self-identity, behavioural beliefs and training status being significant ($N = 1116$). Finally, attitudes, past behaviour, control beliefs, moral norm, anticipated regret, behavioural beliefs, normative beliefs, engine size and self-identity explained 57% of the variance in motorcyclists' intention to ride faster than felt safe in order to keep up with the group ($N = 1940$). The belief-based measures also successfully differentiated between those who intended to speed and those who did not. Theoretical and practical implications of the findings are discussed.

1. Introduction

In the UK motorcyclists represent 19% of fatalities in road traffic accidents but only 1% of traffic (Department for Transport, 2009). This high risk group has the highest fatality rate of any road user group, with statistics suggesting that a motorcyclist is 31 times more likely to be involved in a fatal accident than a car driver (Department for Transport, 2009). Whilst much attention has been focused on risky driving behaviours, including speeding, little attention has focused on similar behaviours in motorcyclists, despite these alarming figures.

A small number of studies have identified a diversity of variables found to influence motorcycle accident risk and severity. Shankar and Mannering (1996), for example, noted that rider age, alcohol impairment, speed, rider attention, road surface and road class all influenced accident severity. Riding experience has also been cited as one of the major contributory factors, with a significant number of motorcycling accidents occurring within the first six months of motorcycle riding (Hurt et al., 1981; Mortimer, 1984). However, although such studies provide useful insights, few attempts have been made to relate risky riding behaviours to potentially modifiable motivational variables by means of established theoretical models, despite the reasonable success of this approach in the driving domain (Conner et al., 2007).

One such model, the Theory of Planned Behaviour (TPB: Ajzen, 1985), has been applied in the transport research area. The TPB, based on the earlier Theory of Reasoned Action (TRA: Fishbein and Ajzen, 1975), proposes that intentions and perceived behavioural control (PBC) are the proximal determinants of behaviour. Intentions reflect the cognitive representation of an individual's readiness to perform a given behaviour (Ajzen, 1991); PBC describes the individuals' perception of the ease or difficulty of performing any given behaviour (Ajzen, 1991). PBC is based upon perceptions of the internal (e.g., skill) and external (e.g., opportunities, constraints) factors likely to facilitate or inhibit performance of the behaviour (control beliefs), weighted by their perceived frequency of occurrence. It is assumed that PBC indirectly (via intentions) and directly influences behaviour. As intentions and PBC are held to be direct antecedents of behaviour, the model also states that intentions are influenced by three additional factors. Attitudes, subjective norms, and PBC are direct determinants of intentions. Attitudes towards a behaviour reflect the degree of positive or negative evaluation the individual has towards performing the behaviour and is based upon the extent to which s/he believes that the behaviour will lead to various salient positive or negative outcomes (behavioural beliefs), weighted by an evaluation of these outcomes. Subjective norm refers to the perceived social pressure to engage or not engage in a behaviour and is understood to be based upon beliefs concerning what salient referents

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believe about the individual enacting the behaviour (normative beliefs), weighted by the individual's motivation to comply with this group. As the relative importance of intentions and PBC in predicting behaviour can differ across behaviours and populations, so too can the importance of attitudes, subjective norms and PBC in the prediction of intentions.

Several reviews (Conner and Sparks, 1996, 2005; Jonas and Doll, 1996; Manstead and Parker, 1995; Sparks, 1994) and meta analyses (Ajzen, 1991; Armitage and Conner, 2001; Conner and Sparks, 2005; Godin and Kok, 1996; Hausenblas et al., 1997; McEachan et al., 2011) have clearly demonstrated support for the TPB. The TPB has been widely adopted within the transport safety field, but few have assessed the predictive utility of the model with respect to motorcycling. Rutter et al. (1995) applied aspects of the TRA framework with reasonable success but unlike other driving research (e.g., Parker et al., 1992b), normative beliefs were found to play no role in the prediction of law and rule breaking behaviour. Others have suggested that this may be attributable to the lack of opportunity for direct social pressure from passengers (Elliott et al., 2003b). Thus the key motivational determinants of aberrant riding behaviours may differ from those of car drivers. Moreover, whilst this study provides evidence that motorcyclists' beliefs predict their subsequent behaviour, the full TRA model was not operationalised (i.e. measures of intention were not included). Indeed, given that the TRA has been modified to include the construct of PBC, these results are somewhat limited in contributing to our understanding of the key predictors of aberrant motorcycling behaviour. More recently, Elliott (2010) used components of the TPB to predict motorcyclists' speeding intentions on 30 and 70 mph roads, noting affective attitude and perceived controllability as direct predictors. Again this study failed to operationalise the full standard TPB model.

The present research tackled this issue by examining the impact of variables on intention to engage in three speed-related behaviours, assessed using a series of questionnaires based on the TPB. A focus on intentions seemed appropriate for several reasons. First, intentions are associated with strong impacts on behaviour across both correlational (Armitage et al., 2001) and causal (Webb and Sheeran, 2006) reviews. Second, in cross-sectional studies, such as reported here, intention may constitute a more useful dependent variable than behaviour because it maintains the presumed causal ordering amongst variables (Conner and Sparks, 2005). Understanding speeding behaviour was deemed especially relevant given the contribution of speed to motorcycling accidents and the prevalence of speeding amongst motorcyclists. Statistics suggest that 35% of motorcycles in fatal accidents (in which they were the only vehicle) were exceeding the speed limit or riding too fast for the conditions (Robinson and Campbell, 2006). Elsewhere, Bailey and Bailey (2001) also reported that excessive speed was the most important factor for motorcycle fatal accidents and an in-depth accident analysis conducted in the USA suggested that the percentage of motorcycling fatalities where speeding was recorded as the rider contributing factor was about 42% and this value had not changed significantly in the past 10 years (Shankar, 2001). Consequently, the initial aim of the present study was to provide the first application of the TPB with respect to motorcyclists' intention to speed. As noted above, since completing the study, Elliott (2010) has gone on to apply components of the TPB model to motorcyclists' speeding. Nevertheless the study reported here remains important in that it uses the full TPB model, focuses on those speeding scenarios closely associated with fatal accidents and includes novel riding scenarios such as group riding. This is particularly important given Elliott's (2010) finding that the perceived normative behaviour of a behaviourally relevant group (i.e. other motorcyclists) has an important influence on speeding intentions. Due to practical considerations the present study did not attempt to predict prospective behaviour although previous research has shown a strong relationship between intentions and behaviour generally (Armitage and Conner, 2001) and more specifically in the speeding literature (Conner et al., 2007).

Given the increasing number of studies that have demonstrated the impact of additional variables on intentions and behaviour, even after the TPB variables have been taken into account (for review see Conner and Armitage, 1998; Conner and Sparks, 2005), the present study tested an extended TPB model. This included five additional variables: moral norms, anticipated regret, past behaviour, self-identity and perceived susceptibility.

Moral norm refers to an individual's feelings of personal obligation towards adopting or indeed, refusing to adopt a behaviour (Ajzen, 1991). There is now increasing evidence for the role of moral norm within the TPB. Studies have shown that over and above the components of the TPB, moral norm adds to the predictions of intentions to speed (Conner et al., 2003; DfT, 2000)[1] and observed speeding behaviour (Conner et al., 2007). Thus we predict that an individual's internalised rules of right and wrong provide an important influence on motorcyclists' decision to speed.

Anticipated regret, that is, an individual's consideration of the potential *negative* affective reactions of engaging in a particular behaviour, takes account of the influence of anticipated, post behavioural, affective reactions. Borrowing from regret theory (Loomes and Sugden, 1982), the concept of anticipated regret assumes that the individual compares the outcomes of behavioural alternatives and avoids making a decision that could result in feelings of regret (for discussion see Manstead and Parker, 1995). In a recent meta-analysis of 25 TPB studies using anticipated regret, Sandberg and Conner (2008) found the correlation between regret and intentions to be $r_+ = 0.47$. Anticipated regret explained an additional 7% of the variance explained in intentions over and above the central constructs of the TPB. Within the speeding literature Newman et al. (2004) reported that anticipated regret increased the variance explained in drivers' intentions to speed in personal vehicles and work-related vehicles by 6% and 3%, respectively. Similarly, Parker et al. also supported the independent and direct effect of anticipated regret on intentions to speed across a range of road environments (DfT, 2000; Parker, 1997).

We also predict that *past behaviour* will exert an independent and direct effect on motorcyclists speeding intentions. Ajzen (1991) argues that past behaviour provides a test of the TPB model, in that, according to theory, its influence on behaviour should be mediated by PBC. Studies have shown however, that across a range of behaviours, past behaviour is typically the strongest predictor of intention and behaviour, explaining variance over and above that accounted for by the TPB variables (see Ajzen, 1991; Conner and Armitage, 1998; McEachan et al., 2011; Ouellette and Wood, 1998). Elliott et al. (2003a), for example, found that past behaviour accounted for additional 11% of the variance in intention to comply with the speed limit and 4% of the variance in self-reported behaviour.

Self-identity reflects "the extent to which an actor sees him- or herself as fulfilling the criteria for any societal role" (Conner and Armitage, 1998, p. 1444). Involvement in role-congruent behaviour validates an individual's self-concept and membership of that particular role (Callero et al., 1987). Thus individuals are motivated to make behavioural decisions that are consistent with their self-concept. Within the speeding literature, self-identity has been shown to contribute significantly to the prediction of intention to speed across a range of road environments, above and beyond that

[1] Note that here DfT (2000) aggregates measures of moral norm and anticipated regret to form a measures of 'personal norm'. Thus it is impossible to unequivocally conclude that moral norm independently predicted intention to speed.

of the central constructs of the TPB (DfT, 2000). Here, individuals reporting a strong self-identity as someone who keeps within the speed limit, expressed weaker intentions to speed. Thus, it can be argued, that the extent to which an individual sees himself/herself as a "safe motorcyclist" should predict his or her speeding intentions.

The TPB has also been criticised for its failure to accommodate individuals' risk perceptions or *perceived susceptibility* (e.g., Norman and Conner, 2005). Perceptions of susceptibility or risk are believed to motivate individuals to protect themselves. However, although risk perceptions take particular prominence in several other models of behaviour (e.g., Health Belief Model, Janz and Becker, 1984; Protection Motivation Theory, Rogers, 1983), few have applied such measures within the TPB and those that have produced mixed results (e.g., Conner et al., 2001; Norman et al., 1999). The lack of empirical tests of the construct of perceived susceptibility within the TPB framework and the conflicting evidence would seem to warrant further examination. Indeed, a review of the literature suggests that the utility of perceived susceptibility has not been tested with respect to speeding, nor more generally in the transport domain. However, given the inherent risks involved in aberrant behaviours such as speeding, it is reasonable to expect that perceived susceptibility may be a motivating force behind the adoption of pro-safety riding behaviours. Evidence documenting the relationship between risk perceptions and motorcycling behaviour however is also somewhat at odds. Mannering and Grodsky (1995) reported that from self-reports of speeding, risk-seeking individuals were attracted to motorcycling. Whilst Rutter et al. (1998) found good evidence that perceptions of risk predicted subsequent behaviour, though generally in the direction not of precaution adoption but of precaution abandonment: the greater the perceived risk at time 1, the more frequent the risky behaviour at time 2. The authors suggest that motorcyclists whose behaviour is already established in risky routines may have a positive value for risk. Over time, they conform more to the norm of risk as a favoured value and the increase in their risky behaviour is a way of expressing this. The impact of perceived susceptibility upon intentions therefore requires further investigation.

The final aim of the present research was to examine the beliefs underlying attitudes, PBC and subjective norms within the TPB. Since Fishbein and Ajzen (1975) argue that underlying beliefs will distinguish between groups intending and not intending to perform the behaviour, analysis of these beliefs should provide useful targets for intervention aiming to change intentions and behaviour.

It is worth noting here that the study did not attempt to predict behaviour. Due to the inadequacies of cross-sectional design (e.g., consistency bias), tests of the intention–behaviour relationship should be based on prospective designs in order to preserve causal ordering. Such a design would therefore require follow up questionnaires to collect behavioural measures at a later time-point. Given the scale of the present study (national survey of over 30,000 motorcyclists) and anecdotal evidence that surveys of this nature had attracted negative feedback amongst the motorcycling community (presumably since few attitudinal surveys have examined this cohort in the UK), it was felt that asking for contact details to conduct follow up surveys could have potentially compromised response rates. Consequently, emphasising anonymity to secure a healthy response rate sacrificed prospective tests of the intention–behaviour relationship.

2. Method

2.1. Design

The study was completed as part of a larger research project examining motorcyclists' intentions to engage in a number of risky riding behaviours (Jamson et al., 2005). That study identified 32 behaviours that were more likely to be engaged in by motorcyclists who had been involved in accidents and motorcyclists who had not been involved in accidents. From this set of 32 behaviours a set of seven behaviours were identified that were both more strongly linked to accident involvement and suggested to be particularly risky based on anecdotal evidence from police forces. These seven behaviours were: speeding on a motorway, close following, going for it on a rural road, lack of awareness, riding into a corner, drink riding and group riding (Jamson et al., 2005). For each behaviour, a scenario was developed to describe the behaviour and these were presented as part of a questionnaire presented to motorcyclists. Riding at an excessive or inappropriate speed was common to three of these behaviours: speeding on a motorway, going for it, and group riding. Given the known relationship of speeding to accident rates generally and in motorcycling in particular noted above the present research reports the results for just these three behaviours.

2.2. Participants

The UK licensing database holds the names and addresses of all those in the UK who are licensed to operate a vehicle. We searched this database to extract those individuals who held a motorcycle licence. We then selected a sub-sample of 30,300, using engine size as a stratifying category to reflect the current vehicle fleet. All were sent a posted questionnaire to complete. Four thousand nine hundred and twenty-nine riders responded to the survey, representing a 16% response rate. Of these, 4757 (97%) owned a motorcycle at the time the survey was conducted. The analyses focused on these 4304[2] males (age range 16–85 years, $M = 44.65$, $SD = 11.89$) and 437 females (age range 16–77 years, $M = 39.13$, $SD = 12.92$). Since the survey was lengthy, a number of riders omitted certain items, in addition each questionnaire only contained three out of the seven scenarios, and thus the number of riders included in the analysis for each of the three scenarios examined here therefore varies throughout.

2.3. TPB questionnaire

All participants were sent a questionnaire along with a freepost envelope in which to return the completed questionnaire. The research was presented as an independent piece of government funded research aiming to gather information on motorcyclists' views and attitudes towards motorcycling in a similar way to which previous research had sought car driver's views in relation to car driving. Participants were assured of their anonymity and the fact that all reports of the data would not identify individual responses.

The scenarios related to this analysis focused on speeding on non-built-up roads, particularly rural roads whose characteristics matched those identified in previous research as a 'good motorcycling route' (Jamson et al., 2005). Although statistics (DfT, 2006) suggest that the majority of motorcycling accidents occur on built-up roads, Clarke et al. (2004) reported that rural motorcycling accidents were over one and a half times more likely to be serious and over three times more likely to be fatal than those in built-up areas. Given that speed is inevitably a factor in accidents on these higher speed non built-up roads, it was felt important to concentrate on speeding on motorways (as identified in the accident analysis) and rural roads. The following scenarios were therefore developed:

Speeding: Imagine you are riding alone along a motorway. It is a fine, dry day and the traffic is fairly light. You move into the outside lane where you exceed the 70 mph speed limit.

[2] 16 riders did not provide age/gender details.

Going for it: Imagine you are riding alone, along a broad, relatively straight rural road. It is a fine, dry day with good visibility and the road is almost empty. Ahead the road appears straight and clear. You decide to really go for it, open up the throttle and accelerate the bike up to high speed.
Group riding: Imagine you are riding along a rural road. You are riding with a group of other motorcyclists you know. It is a fine, dry day with good visibility and the road is relatively clear. The other motorcyclists in the group start to accelerate, even though the road has a number of bends marked. Because you don't know the road as well as some of the other riders you are forced to go faster than you feel safe in order to keep up, relying on their judgment.

As is usual with TPB studies, the scenarios were written in the second person singular to allow the respondents to imagine themselves in each particular situation (e.g., Parker et al., 1992b). A photograph (80 mm × 60 mm) depicting the type of road described was also provided to aid the respondent's visualisation of the scenario. All materials were presented on paper.

In order to identify salient referents, behavioural beliefs and control factors (see Conner and Sparks, 2005) that would serve to inhibit/facilitate these behaviours a small pilot study was undertaken. Forty riders were provided with a selection of the scenarios and asked if they could think of the advantages and disadvantages of engaging in each behaviour, any feelings associated with each behaviour and any factors that would make it easier or more difficult to engage in each behaviour. Where possible, identical measures were used across all behaviours.

The questionnaire included direct and indirect measures of the TPB constructs. Reliabilities are presented for each of the three speeding scenarios where relevant.

Intention was assessed using three items (e.g., 'I would intend to exceed the 70 mph speed limit', definitely do not-definitely do, scored −3 to +3). The mean of these three items produced a composite scale for each of the three questionnaires (Speeding, $\alpha = 0.89$; Going for it, $\alpha = 0.88$; Group riding, $\alpha = 0.88$). Higher scores reflect stronger intentions to perform the behaviour.

Attitude was assessed by eight semantic differential scales following the statement, 'Exceeding the 70 mph speed limit would be'. Following the Lawton et al. (1997) distinction, the seven-point scales measured both instrumental (useless–useful, harmful–beneficial, negative–positive, bad–good) and affective (unsafe–safe, unsatisfying–satisfying, not enjoyable–enjoyable, reckless–cautious) attitudes. Factor analysis with varimax rotation revealed inconsistent loading onto two factors across the three questionnaires. The two separate indexes for instrumental and affective attitudes were collapsed to form one attitude scale for each behaviour. The mean of the eight items (all scored −3 to +3) produced a composite scale for each of the behaviours (Speeding, $\alpha = 0.85$; Going for it, $\alpha = 0.87$; Group riding, $\alpha = 0.92$) such that higher scores indicate attitudes that were in favour of the commission of the behaviour.

Perceived behavioural control (PBC) was assessed using six items. These items were differentiated in terms of perceived difficulty (two items; e.g., 'For me to exceed the 70 mph speed limit would be…', difficult–easy, scored +1 to +7), perceived control (three items; e.g., 'How much control would you have over really going for it?', no control–complete control, scored +1 to +7) and self-efficacy (one item; 'How confident are you that you would be able to ride faster than felt safe in order to keep up with the group?', not very confident–very confident, scored +1 to +7), as proposed by Conner and Sparks (1996) and Trafimow et al. (2002). Factor analysis with varimax rotation revealed inconsistent loading onto the three factors (perceived difficulty, perceived control and self-efficacy) across the three questionnaires (see Rodgers et al., 2008). Therefore the three indexes for perceived behavioural control were collapsed to form one scale. The mean of these six items produced a composite scale for each of the behaviours (Speeding, $\alpha = 0.84$; Going for it, $\alpha = 0.78$; Group riding, $\alpha = 0.70$). Higher scores reflected greater perceptions of control in the commission of the behaviour.

Behavioural belief composites were derived from the product of the behavioural belief strength (the perceived likelihood of modal outcomes) and outcome evaluation (evaluation of those outcomes). Behavioural beliefs were measured using six items (e.g., 'Riding faster than felt safe in order to keep up with the group would cause me to lose control of my motorcycle', unlikely–likely, scored −3 to +3). Higher scores reflected beliefs that the outcome was likely. Outcome evaluations were assessed using six items (e.g., 'Being in an accident would be', bad to good, scored −3 to +3). Higher scores reflected outcome evaluations that were positive.

Normative belief composites were derived from the product of the normative belief strength (expectations of significant others) and motivation to comply (the motivation to comply with significant others). Four salient referents were identified following piloting; the police, family, other road users and other bikers. Four items measured normative beliefs (e.g., 'The police would disapprove of my really going for it', strongly disagree–strongly agree, scored −3 to +3). Higher scores reflected normative beliefs that opposed the behaviour. Motivations to comply were assessed using four items (e.g., 'Generally speaking how much do you want to do what your family think you should do?', not at all–very much, scored +1 to +7). Higher scores reflected a stronger motivation to comply with the referents. Note that direct measures of subjective norm were not included as it has been suggested that individuals may find it difficult to average out the manner in which all significant others would expect them to behave (McMillan, 1998).

Control belief composites were derived from the product of the control belief frequency (the frequency of occurrence of factor which would either facilitate or inhibit the behaviour) and the control belief power (the perceived power of these factors to facilitate or inhibit the behaviour). Control frequency was measured using five items (e.g., 'I ride a powerful and reliable bike', never–frequently, scored +1 to +7). Higher scores reflected factors that were more frequent. Control beliefs were measured using five items (e.g., 'A high police presence makes my exceeding the speed limit on a motorway', unlikely–likely, scored −3 to +3). Higher scores reflected beliefs that the outcome was likely.

Moral norm was assessed using a single seven-point item (e.g., 'It would be quite wrong for me to exceed the 70 mph speed limit', strongly disagree–strongly agree, scored +1 to +7). Higher scores reflected stronger moral norms.

Anticipated regret was measured as the mean of two seven-point items (e.g., 'I would regret really going for it', unlikely–likely, scored −3 to +3). The two items showed good reliability (Speeding, $\alpha = 0.87$; Going for it, $\alpha = 0.86$; Group riding, $\alpha = 0.89$). Higher scores reflected stronger feelings of anticipated regret.

Past behaviour was tapped by two seven-point items (e.g., 'In the past I have frequently ridden faster than felt safe in order to keep up with the group', strongly disagree–strongly agree, scored +1 to +7). The two items showed reasonable reliability (Speeding, $\alpha = 0.69$; Going for it, $\alpha = 0.74$; Group riding, $\alpha = 0.84$). Higher scores reflected more frequent commission of the behaviour in the past.

Self-identity was measured using one single item ('I see myself as a safe motorcyclist', strongly disagree–strongly agree, scored +1 to +7). Higher scores reflected a stronger sense of self-identity.

Perceived susceptibility was assessed using two items (e.g., 'What is the risk of being involved in an accident if you exceed the 70 mph speed limit?'; 'What is the risk of being involved in an accident if you do not exceed the 70 mph speed limit?', very low risk–very high risk, scored −3 to +3). For each respondent the difference between the two scales was calculated for each scenario, by subtracting the score if they did engage in the behaviour from that

for if they did not. Thus the greater the difference, the greater the effect of engaging in the behaviour, with a positive score suggesting that engaging in the behaviour made them more susceptible. This item therefore represented a conditional risk item (i.e. the probability of an event if no preventive action is taken/probability of an event if action if preventive action is taken) which is believed to more closely resemble the concept of susceptibility than unconditional risk items (subjective probability that an event will occur based on an unspecified range of factors) (Van der Velde et al., 1996).

2.4. Demographic and motorcycling characteristics

The following demographic variables were also measured: age, sex (1 = male, 2 = female), marital status (1 = married/living with partner, 2 = not married/living with partner), child dependency status (1 = 1 or more dependent children living at home, 2 = no dependent children living at home), income (1 = low income, 2 = high income; based on median split) and National Statistic Socio Economic Classification[3] (1 = managerial/profession, 2 = intermediate occupations, 3 = small employers and own account workers, 4 = lower supervisory and technical occupations, 5 = semi routine and routing occupations). Several riding measures were also assessed: engine size (cc), annual mileage, experience (total number of years riding), training status (1 = licence gained through direct/accelerated[4] access, 2 = licence not gained through direct/accelerated access) and accident involvement (1 = accident involved in last 12 months, 2 = not accident involved in last 12 months).

3. Results

In Tables 1, 3 and 5, means, standard deviations and zero-order correlation coefficients for all measures are reported for the three scenarios (respectively for speeding, going for it, group riding). Riders tended to be male, married with no dependent children living at home, and falling within the NS-SEC class 2 (intermediate occupations). Riders had, on average 16 years of motorcycling experience, accruing an annual mileage of between 4500 and 5000 miles. In general, riders had not been involved in any accidents in the previous 12 months and rode a motorcycle with an engine capacity of approximately 700 cc. Riders were unlikely to have gained their licence through direct/accelerated access. There were no obvious differences between scenarios in the demographics of the sample suggesting the importance of the tested variables in determining intentions to engage in these risk behaviours by motorcyclists.

On average, riders showed weak intentions to engage in the three behaviours and generally held relatively neutral attitudes and behavioural beliefs towards each, except for the group riding scenario, where riders tended to express a strong negative attitude towards riding faster than felt safe. PBC scores suggested that riders felt reasonable control over their behaviour. Riders perceived least pressure to refrain from speeding on the motorway and most

Table 1
Correlations and descriptive statistics for intention to speed on a motorway ($N = 1381$).

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	*M*	*SD*
1. Age (years)	–	−0.13	−0.25	0.18	0.09	−0.13	0.10	−0.06	0.58	0.19	0.29	−0.26	−0.17	−0.04	−0.05	0.18	−0.18	0.11	0.20	0.10	0.11	−0.19	43.68	10.96
2. Sex		–	0.09	0.08	−0.09	−0.12	−0.20	−0.05	−0.20	−0.04	−0.11	−0.08	−0.08	−0.16	−0.11	0.05	0.01	0.08	0.12	0.02	0.05	−0.15	1.07	0.25
3. Marital status			–	0.27	−0.14	0.08	−0.11	0.10	−0.11	−0.07	−0.05	0.05	0.01	−0.04	0.02	−0.03	0.06	−0.02	−0.03	−0.11	−0.02	0.04	1.23	0.42
4. Dependent children				–	−0.13	−0.01	0.02	0.05	0.15	0.06	−0.01	−0.05	−0.01	0.03	−0.02	0.02	0.00	0.01	0.02	0.00	0.00	−0.02	1.62	0.49
5. Income					–	−0.40	0.17	0.02	0.04	0.08	0.04	0.13	0.09	0.14	0.05	−0.13	0.06	−0.10	−0.09	−0.02	−0.10	0.13	1.52	0.50
6. NS-SEC						–	−0.05	0.05	0.02	−0.02	−0.01	−0.06	−0.01	−0.05	−0.01	0.08	−0.07	0.05	0.02	0.01	0.05	−0.05	2.29	1.54
7. Engine size (cc)							–	0.15	0.19	0.11	−0.04	0.21	0.25	0.47	0.22	−0.17	0.08	−0.16	−0.20	0.08	−0.23	0.33	706.82	340.67
8. Annual mileage (thousands)								–	0.07	−0.11	0.01	0.10	0.12	0.13	0.11	−0.07	0.04	−0.06	−0.08	0.04	−0.05	0.13	4656.20	5666.24
9. Experience (years)									–	0.14	0.40	−0.11	−0.02	0.06	0.03	0.08	−0.10	0.02	0.07	0.11	0.01	−0.04	16.28	11.47
10. Accident history										–	0.07	−0.03	−0.05	0.09	−0.02	0.03	−0.03	0.03	0.03	0.05	−0.03	−0.02	1.87	0.34
11. Training											–	−0.11	−0.07	−0.07	−0.02	0.11	−0.06	0.05	0.07	0.02	0.05	−0.12	1.82	0.39
12. Behavioural intention												–	0.59	0.42	0.37	−0.51	0.54	−0.53	−0.56	−0.17	−0.35	0.68	−0.17	1.75
13. Attitude													–	0.45	0.44	−0.50	0.44	−0.52	−0.59	−0.06	−0.49	0.57	0.33	1.17
14. PBC														–	0.34	−0.32	0.29	−0.30	−0.44	0.07	−0.35	0.54	5.86	1.23
15. BE															–	−0.38	0.25	−0.39	−0.40	−0.03	−0.34	0.40	0.01	2.27
16. NBMC																–	−0.34	0.54	0.56	0.13	0.43	−0.48	1.31	5.79
17. CBF																	–	−0.34	−0.41	−0.12	−0.24	0.50	1.52	4.66
18. Moral norms																		–	0.61	0.12	0.41	−0.51	4.25	2.00
19. Anticipated regret																			–	0.08	0.41	−0.62	−1.25	1.80
20. Self-identity																				–	0.07	−0.12	5.82	1.23
21. Perceived susceptibility																					–	−0.41	0.60	1.76
22. Past behaviour																						–	4.87	1.89

Note: $r \geq 0.05$, $p < 0.05$; $r \geq 0.07$, $p < 0.01$; $r \geq 0.09$, $p < 0.001$.

[3] The National Statistics Socio-economic Classification (NS-SEC), introduced in 2001, is used for all official statistics and surveys. It replaces Social Class (SC) based on Occupation (formerly Registrar General's Social Class) and Socio-economic Groups (SEG). http://www.statistics.gov.uk/methods_quality/ns_sec/default.asp.

[4] Accelerated access is a scheme that allows a person who has passed a test on a standard category A machine to avoid the two-year qualification period on machines of 25 kW (33 bhp) with a power to weight ratio of 0.16 kW/kg. To qualify, a person needs to be over the age of 21. Passing the test gives access to any size of machine. Direct access is a scheme which allows a person over the age of 21 to avoid the two-year/25 kW restriction by taking a test on a machine of at least 35 kW (46.6 bhp). Any instruction given on a machine that exceeds the normal learner motorcycle specification must be supervised by a certified motorcycle instructor. Direct access is optional and was introduced in 1997.

Table 2
Regression analysis to predict intentions to exceed the 70 mph speed limit on a motorway ($N = 1381$).

Step/predictor	R^2	ΔR^2	F	β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6
1.									
Age	0.11	0.11	26.94	−0.30***	−0.30***	−0.16***	−0.12***	−0.11***	−0.09***
Sex				−0.11***	−0.08**	−0.04	−0.04	−0.02	−0.00
Marital status				0.01	0.02	0.04	0.02	0.01	0.01
Dependent children				0.03	0.01	−0.02	−0.02	−0.02	−0.02
Income Group				0.13***	0.10***	0.06**	0.05*	0.04*	0.04
NS-SEC				−0.06*	−0.07*	−0.05*	−0.02	−0.02	−0.02
2.									
Engine size	0.15	0.04	21.72		0.20***	0.01	0.02	0.03	0.00
Annual mileage					0.04	0.01	0.01	0.02	0.01
Experience					0.02	−0.01	−0.01	0.00	−0.01
Accident involvement					−0.00	0.01	0.01	0.01	0.02
Training					−0.04	−0.02	−0.02	−0.02	−0.00
3.									
Attitude	0.42	0.27	75.08			0.47***	0.26***	0.20***	0.18***
PBC						0.18***	0.11***	0.11***	0.04
4.									
BB × OE	0.52	0.11	93.16				0.06**	0.04	0.02
NB × MC							−0.20***	−0.12***	−0.11***
CB × F							0.28***	0.25***	0.18***
5.									
Moral norm	0.55	0.03	83.63					−0.15***	−0.12***
Anticipated regret								−0.09***	−0.02
Self-identity								−0.08***	−0.06***
Perceived susceptibility								0.04	0.05*
6.									
Past behaviour	0.60	0.05	95.91						0.33***

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

pressure to avoid riding faster than felt safe in order to keep up with the group. Riders showed a strong moral objection to riding faster than felt safe in the group riding scenario but this was less true for the other scenarios, especially speeding on a motorway. Similarly, across the three scenarios, riders were only likely to regret riding faster than felt safe. Perceived susceptibility was relatively low for the motorway scenario but higher for the group riding scenario. Riders were most likely to have exceeded the speed limit on a motorway and had infrequently ridden faster than felt safe in order to keep up with the group.

Examination of the simple correlations across speeding scenarios reveals remarkably similar patterns for the key predictors of intentions (see Tables 1, 3 and 5). In general, the components of the TPB (attitude, PBC, behavioural beliefs, normative beliefs, control beliefs) emerged as strong predictors with attitude a particularly strong predictor. Of the additional variables, moral norms, anticipated regret, self-identity and perceived susceptibility also consistently emerged as strong predictors with past behaviour being the strongest additional predictor. Demographic variables and motorcycling characteristics of the rider were weaker predictors.

The multiple regression results, which take account of the intercorrelations of predictors, reveal a somewhat more differentiated pattern of findings (Tables 2, 4 and 6). Focusing on the last step of the regression analysis for each riding scenario, past behaviour emerges as the most consistent, strong and significant predictor of intentions. It is highly significant in all three scenarios ($p < 0.001$) with a mean beta weight of 0.28.

Of the TPB variables, attitude most consistently emerged as a predictor of intentions across scenarios, being significant in all three speeding scenarios with a mean beta of 0.24. Behavioural beliefs also emerge as significant direct predictors of intentions in two out of three speeding scenarios. Thus attitudes as directly or indirectly tapped through behavioural beliefs, emerge as important and consistent predictors of intentions. Control beliefs emerge as significant direct predictors of intentions in all three speeding scenarios with a mean beta of 0.18. PBC however failed to predict intentions within the three scenarios. Thus only control measured indirectly through control beliefs appears to be an important predictor of intentions to engage in these risky riding behaviours. Normative beliefs emerge as significant direct predictors of intentions in all three speeding scenarios with a mean beta of −0.08.

Of the additional variables there was generally more variation across scenarios in their power to predict intentions. Self-identity emerged as significant direct predictors of intentions in all three speeding scenarios (mean beta of −0.05). Anticipated regret (mean beta of −0.09) and moral norms (mean beta of −0.07) emerged as significant direct predictors of intentions in 2 out of 3 speeding scenarios. Perceived susceptibility failed to predict intentions in any of the speeding scenarios. Generally speaking there was considerably less consistency in the power of other measured variables to predict intentions across scenarios. Of the demographic variables, only age showed any consistency of prediction, emerging as an unmediated significant predictor in 2 out of 3 scenarios. In each case younger riders were more likely to intend to engage in the risky behaviour. Training status also emerged as a significant predictor in one scenario such that those who had gained their licence through direct/accelerated access expressed stronger intentions to engage to really go for it. This relationship was also demonstrated in the simple correlations of another scenario.

3.1. Distinguishing intenders from non-intenders

Identifying the beliefs that differentiate intenders from non-intenders should prove a useful method for identifying suitable targets for intervention. In order to examine any systematic differences across those riders who intend to engage in the aberrant behaviours and those who do not, statistical comparisons were made across behavioural beliefs × outcome evaluations, normative beliefs × motivations to comply, and control beliefs × power for the three behaviours. Intenders were defined as those riders who tended to agree that they would intend, plan and want to

Table 3
Correlations and descriptive statistics for intentions to really go for it ($N = 1116$).

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	*M*	*SD*
1. Age (years)	–	−0.16	−0.15	0.19	0.00	−0.03	0.09	−0.07	0.63	0.13	0.28	−0.32	−0.12	−0.10	−0.11	0.20	−0.25	0.20	0.25	0.09	0.14	−0.23	44.17	10.61
2. Sex		–	0.01	0.04	−0.12	−0.07	−0.23	−0.08	−0.23	−0.09	0.00	−0.06	−0.12	−0.17	−0.11	−0.02	−0.02	0.03	0.08	−0.04	0.06	−0.15	1.07	0.26
3. Marital status			–	0.27	−0.14	0.05	−0.05	0.05	−0.10	−0.04	−0.05	0.05	0.05	0.02	0.06	−0.07	0.04	−0.04	−0.07	0.01	−0.07	0.04	1.22	0.41
4. Dependent children				–	−0.17	0.06	0.00	0.00	0.14	−0.03	−0.01	−0.08	0.01	−0.05	−0.02	0.01	−0.07	0.04	0.08	0.00	−0.02	−0.05	1.60	0.49
5. Income					–	−0.39	0.16	0.01	−0.07	0.00	−0.04	0.03	0.00	0.00	0.00	0.03	0.06	−0.05	−0.04	−0.05	−0.04	0.00	1.51	0.50
6. NS-SEC						–	−0.06	−0.04	0.11	0.02	0.05	−0.01	−0.01	0.02	−0.01	−0.01	−0.11	0.08	0.00	0.03	0.06	0.02	2.34	1.54
7. Engine size (cc)							–	0.16	0.14	0.10	−0.01	0.05	0.14	0.18	0.17	−0.06	0.06	−0.09	−0.12	0.03	−0.10	0.12	692.27	336.98
8. Annual mileage (thousands)								–	0.05	−0.23	0.00	0.04	0.00	0.15	0.05	−0.05	0.04	−0.03	−0.06	−0.03	−0.08	0.12	4543.41	4232.57
9. Experience (years)									–	0.14	0.39	−0.16	−0.05	0.08	0.00	0.07	−0.16	0.09	0.11	0.15	0.04	0.01	16.61	12.31
10. Accident history										–	0.10	−0.03	0.02	−0.03	0.04	0.03	−0.04	0.00	0.01	0.06	0.04	−0.04	1.88	0.33
11. Training											–	−0.18	−0.14	−0.04	−0.10	0.06	−0.11	0.08	0.14	0.06	0.08	−0.07	1.81	0.39
12. Behavioural intention												–	0.62	0.37	0.43	−0.48	0.58	−0.53	−0.58	−0.13	−0.36	0.63	−0.72	1.68
13. Attitude													–	0.41	0.51	−0.46	0.47	−0.53	−0.57	−0.01	−0.36	0.48	−0.02	1.23
14. PBC														–	0.43	−0.32	0.31	−0.33	−0.48	0.06	−0.28	0.49	5.30	1.16
15. BE															–	−0.36	0.33	−0.42	−0.50	0.02	−0.34	0.35	−0.40	2.61
16. NBMC																–	−0.37	0.49	0.52	0.08	0.35	−0.42	5.76	5.39
17. CBF																	–	−0.44	−0.50	−0.07	−0.21	0.51	0.43	7.05
18. Moral norms																		–	0.60	0.06	0.42	−0.48	5.12	1.68
19. Anticipated regret																			–	0.09	0.39	−0.54	−0.44	1.90
20. Self-identity																				–	0.12	−0.07	5.94	1.17
21. Perceived susceptibility																					–	−0.33	2.84	1.91
22. Past behaviour																						–	3.84	1.70

Note: $r \geq 0.06$, $p < 0.05$; $r \geq 0.07$, $p < 0.01$; $r \geq 0.10$, $p < 0.001$.

exceed the speed limit (i.e. a mean behavioural intention score above the neutral point zero). Non-intenders were riders whose mean behavioural intention score fell on or below the neutral point zero (i.e. they did not intend, plan nor want to exceed the speed limit).[5] The numbers of non-intenders and intenders were 1079 vs. 803, 1104 vs. 470, and 2311 vs. 374 for speeding, going for it and riding faster than feel safe, respectively.

3.1.1. *Behavioural beliefs*

In relation to speeding on a motorway, intenders were more likely to believe (i.e. belief × evaluation) speeding would allow them to 'beat the traffic' and 'feel exhilarated', but less likely to believe it would 'increase the risk of an accident', 'get caught by the police' or 'feel anxious'. There were no differences in relation to the belief that speeding on the motorway would allow them to 'test my motorcycles top speed'.

In relation to intending to go for it, intenders were more likely to believe that speeding would 'test my motorcycles top speed' and 'make me feel exhilarated', but less likely to believe it would 'increase risk of accident', 'damage my motorcycle' or 'feel anxious'. There were no differences in relation to the belief of 'test my riding skills'.

In relation to intending to go faster than they felt safe, intenders were more likely to believe that speeding would 'make me feel part of the group', 'test my riding skills', and 'make me feel exhilarated', but less likely to believe it would 'cause me to lose control of my motorcycle', 'increase risk of an accident', or 'feel anxious'. Across all three scenarios intenders and non-intenders differed most significantly on their beliefs regarding the affective reactions that speeding would evoke.

3.1.2. *Normative beliefs*

Examination of riders' normative beliefs (normative beliefs × motivation to comply) suggested that non-intenders and intenders differed significantly in their appraisal of all the referent groups in a consistent manner across the three behaviours. Non-intenders were more likely to believe that 'the police', 'other road users', 'family', and 'other bikers' would not want them to engage in the behaviour compared to intenders and to be more likely to wish to comply with these groups. In general, the family were the most influential group, with both non-intenders and intenders being strongly motivated to comply with these referents.

3.1.3. *Control beliefs*

In relation to speeding on a motorway intenders were more likely to believe that the following factors (i.e. control belief × frequency) would promote speeding: 'weather is fine and dry', 'smooth and even road surfaces', 'powerful and reliable bike', and 'little traffic'. There were no differences for 'high police presence'.

In relation to intending to go for it and go faster than they felt safe, intenders were more likely than non-intenders to believe that the following would promote speeding: 'weather is fine and dry', 'smooth and even road surfaces', 'powerful and reliable bike', and 'little traffic'. In addition, intenders were more likely to believe that 'a familiar road' for going for it would promote speeding, but that 'other slow riders' would inhibit speeding for going faster than they felt safe.

[5] Note that the mid-point of the scale was chosen rather than the median because it appears theoretically most justified, although it sacrifices some statistical power. Tables showing the means and standard deviations for non-intenders and intenders are available from the authors.

Table 4
Regression analysis to predict intentions to really go for it ($N = 1116$).

Step/predictor	R^2	ΔR^2	F	β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6	β Step 7
1.										
Age	0.12	.012	24.67	−0.34***	−0.36***	−0.25***	−0.17***	−0.16***	−0.11***	−0.11***
Sex				−0.12***	−0.09**	−0.02	−0.03	−0.03	0.00	0.00
Marital status				0.00	0.01	−0.01	−0.01	−0.02	−0.01	−0.02
Dependent children				−0.01	−0.02	−0.03	−0.02	−0.02	−0.02	−0.02
Income Group				−0.00	−0.01	0.02	0.02	0.01	0.01	0.01
NS-SEC				−0.03	−0.03	−0.01	0.02	0.02	0.02	0.02
2.										
Engine size	0.13	0.02	15.38		0.05	−0.04	−0.04	−0.04*	−0.04*	−0.04
Annual mileage					−0.01	0.01	0.00	0.00	−0.01	−0.01
Experience					0.09*	0.04	0.04	0.05	0.00	0.00
Accident involvement					0.00	0.00	0.00	0.00	0.01	0.01
Training					−0.11***	−0.05	−0.06*	−0.05*	−0.05*	−0.05*
3.										
Attitude	0.46	0.33	72.51			0.54***	0.34***	0.29***	0.27***	0.27***
PBC						0.12***	0.04	0.02***	−0.04	−0.04
4.										
BB × OE	0.55	0.09	84.96				0.07**	0.04	0.05*	0.05*
NB × MC							−0.15***	−0.09***	−0.07**	−0.07**
CB × F							0.29***	0.25***	0.18***	0.19***
5.										
Moral norm	0.58	0.02	74.10					−0.08**	−0.05	−0.04
Anticipated regret								−0.10***	−0.06*	−0.07*
Self-identity								−0.07***	−0.06**	−0.06**
Perceived susceptibility								−0.05*	−0.04	−0.04
6.										
Past behaviour	0.62	0.04	83.34						0.28***	0.28***

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

4. Discussion

This research examined the determinants of riders' intentions to engage in excessive or inappropriate speeding behaviour and provided the first test of the TPB model with respect to aberrant motorcycling behaviours. The tested predictor variables accounted for between 56.5% (group riding) and 61.8% (going for it) of the variance in intentions with a mean value of 59.2%. This compares favourably with reviews of the TPB which estimate that attitude, subjective norm and perceived behavioural control account for 39% of the variance in intentions across 154 applications (Armitage and Conner, 2001). Even taking account of additional variables this figure remains below 50% on average (Conner and Armitage, 1998). Thus the present findings would indicate a good level of prediction of intentions across speeding scenarios.

4.1. Key predictors of intentions

This study supports and extends previous research on driving based on the TPB (e.g., Parker et al., 1992b). The role of attitudes in predicting speeding intentions has been consistently reported across a number of studies (e.g., Parker et al., 1992b). Unlike Rutter et al. (1995), normative influences were found to influence riders' intentions. This is again in line with the general speeding literature in the driving domain. Although control beliefs were found to predict intentions, PBC did not. This is somewhat at odds with earlier research by Parker et al. (1992b) which concluded that PBC was the single most important predictor of intentions to speed amongst car drivers. As drivers' perceptions of the ease with which they could avoid committing violations increased, behavioural intentions to commit such decreased. However, Sutton et al. (1999) note that when considering the wider literature on the TPB, one third of studies have failed to find a significant independent effect of PBC. The findings in showing effects for moral norms (Parker et al., 1995), anticipated regret (Newman et al., 2004; Parker et al., 1995), and past behaviour (Elliott et al., 2003a) also confirm previous findings in the literature on speeding and for other behaviours.

In line with previous research in the driving domain (DfT, 2000), support is also found for the role of self-identity. Since self-identity had a direct effect on intentions, the study demonstrates that other forms of normative influence have an important effect on intentions. Most recently, Elliott (2010) also noted that the more likely a motorcyclist was to believe that being a 'speeder' was an important part of their self-concept, the more likely they were to intend to speed. It becomes important therefore to address those individuals who do not regard themselves as a safe motorcyclist, emphasising that it would benefit themselves, their family and improve their societal role if they did begin to act and regard themselves as a safe and responsible rider. Encouraging the formation of such a self-identity is clearly a complex process. Nevertheless, campaigns which attempt to emphasise the positive aspects of this identity (e.g., thoughtful of others, calm) and counter the negative aspects (e.g., carefree, living for today), emphasising such a negative identity as out of fashion, might increase this self-identity. Indeed, Mannetti et al. (2004) point out that commercial advertising has already exploited this association with regards to 'green' consumerism, such that many products are now promoted on the basis that their manufacturers 'help the environment'.

Perceived susceptibility to an accident failed to exert a significant direct effect on intentions. Although previously untested with respect to motorcycling, the results lend some support to Rutter et al.'s (1995) application of the Health Belief Model. Here, perceived vulnerability failed to predict law and rule-breaking motorcycling behaviour in motorcyclists when controlling for demographic variables. The authors concluded that it was expectancy-value beliefs that were the most important predictors of motorcycling behaviour. Indeed, in the wider TPB literature, evidence regarding the predictive utility of perceived susceptibility has been somewhat mixed. Whilst some researchers have demonstrated a direct effect on intentions (Norman et al., 1999), others have not (Godin et al., 1991). Norman and Conner (2005) suggest

Table 5
Correlations and descriptive statistics for riders intentions to ride faster than they feel safe in order to keep up with the group (N = 1940).

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	M	SD
1. Age (years)	–	−0.13	−0.25	0.16	0.10	−0.11	0.20	−0.01	0.63	0.15	0.29	−0.18	−0.20	−0.05	−0.06	0.15	−0.16	0.16	0.20	0.13	0.13	−0.16	42.69	10.41
2. Sex		–	0.03	0.09	−0.12	−0.11	−0.18	−0.07	−0.21	0.01	−0.09	−0.02	−0.03	−0.08	−0.06	−0.04	0.01	0.02	0.05	0.02	0.00	0.00	1.06	0.24
3. Marital status			–	0.26	−0.13	0.05	−0.09	0.08	−0.14	−0.08	−0.06	0.09	0.10	0.01	0.07	−0.09	0.06	−0.09	−0.05	−0.07	−0.08	0.04	1.23	0.42
4. Dependent children				–	−0.11	−0.04	0.04	0.06	0.11	0.02	−0.02	0.00	0.00	−0.02	0.00	−0.06	0.01	−0.01	0.01	−0.01	−0.02	−0.01	1.61	0.49
5. Income					–	−0.39	0.13	0.01	0.01	0.02	−0.02	−0.03	−0.03	0.03	−0.02	0.03	0.02	0.01	0.05	−0.06	−0.04	−0.03	1.51	0.50
6. NS-SEC						–	−0.06	0.01	0.05	−0.02	0.02	0.01	0.00	0.00	0.01	−0.03	−0.09	0.00	−0.07	0.00	0.05	0.00	2.39	1.55
7. Engine size (cc)							–	0.15	0.20	0.08	0.04	−0.12	−0.11	0.11	−0.01	0.02	−0.11	0.05	0.05	0.06	0.02	−0.02	766.97	322.07
8. Annual mileage (thousands)								–	0.09	−0.13	0.02	−0.03	0.00	0.08	0.05	−0.06	−0.06	0.00	−0.03	0.01	0.00	−0.01	4907.14	5199.73
9. Experience (years)									–	0.15	0.43	−0.13	−0.14	0.02	0.00	0.10	−0.12	0.08	0.09	0.13	0.09	−0.07	16.65	11.47
10. Accident history										–	0.07	−0.08	−0.04	−0.03	−0.04	0.04	−0.03	0.07	0.08	0.07	0.04	−0.06	1.88	0.33
11. Training											–	−0.02	−0.05	−0.02	0.01	0.01	0.02	0.02	0.01	0.04	0.03	−0.02	1.80	0.40
12. Behavioural intention												–	0.62	0.17	0.41	−0.37	0.52	−0.56	−0.51	−0.20	−0.34	0.54	−1.64	1.40
13. Attitude													–	0.25	0.52	−0.37	0.43	−0.55	−0.54	−0.17	−0.40	0.41	−1.81	1.13
14. PBC														–	0.23	−0.13	0.18	−0.18	−0.33	0.00	−0.16	0.15	4.45	1.13
15. BE															–	−0.23	0.26	−0.40	−0.42	−0.08	−0.29	0.25	−1.73	2.32
16. NBMC																–	−0.23	0.44	0.44	0.11	0.30	−0.27	9.20	4.82
17. CBF																	–	−0.40	−0.37	−0.15	−0.28	0.42	−3.50	6.13
18. Moral norms																		–	0.58	0.16	0.42	−0.39	6.17	1.21
19. Anticipated regret																			–	0.15	0.35	−0.40	1.18	1.69
20. Self-identity																				–	0.12	−0.18	5.88	1.21
21. Perceived susceptibility																					–	−0.26	3.59	1.73
22. Past behaviour																						–	2.76	1.47

Note: $r \geq 0.04$, $p < 0.06$; $r \geq 0.07$, $p < 0.01$; $r > 0.06$, $p < 0.001$.

that optimistic bias may account for the weak relationship between perceived susceptibility, intentions and behaviour. Optimistic bias or unrealistic optimism (Weinstein and Klein, 1996) relates to the idea that individuals feel at less risk than others are to disease or danger. Thus perceptions of risk may not affect intentions if the risk is not understood to be relevant. Indeed, research has suggested that motorcyclists tend to be optimistic about their personal risk, believing themselves to be less likely to be involved in an accident than the average motorcyclist (Rutter et al., 1998). In support of this, additional measures of comparative and absolute risk collected as part of the wider project suggested that the motorcyclists included in this survey did display some signs of unrealistic optimism (Jamson et al., 2005). It is possible therefore, that the motorcyclists in this study were inaccurate in their risk perceptions and this may account for the poor predictive value of perceived susceptibility. Thus the results of the current study support the recent consensus that risk perceptions are more distal determinants of intentions (e.g., Conner and Abraham, 2001) and therefore more likely to play an important role in the early stages of behaviour, where they encourage individuals to consider the benefits of engaging in health protective behaviours, rather than directly predicting future behaviour (Norman and Conner, 2005).

The powerful influence of past behaviour presents a problem as this represents a key determinant that is difficult to tackle in interventions. Nevertheless, our analyses do show the power of other variables to predict intentions when controlling for past behaviour and suggest that these other variables may constitute appropriate targets for intervention even for those who have frequently performed the behaviour in the past.

It is interesting to note that demographic variables such as gender, riding experience, and accident involvement generally failed to add to the prediction of intentions. Only age demonstrated a consistent effect. This is not surprising given that speeding tends to be more prevalent in motorcyclists under the age of 30 years (Shankar, 2001). Previous work has documented a clear contribution of both age and sex to the prediction of intentions. Young males tend to demonstrate a lesser ability to refrain from committing violations, view the outcomes of violations less negatively and feel less control over committing violations (Parker et al., 1992a,b). Although there was a consistent effect of age, the present research would suggest that the extended TPB was able to mediate the influence of other demographics variables. Indeed, Parker et al. (1992b) argue that previous failed attempts to demonstrate this may have been the result of a “failure to assess the models components fully or reliably enough” (p. 100).

Training status emerged as a significant predictor in one scenario such that those who had gained their licence through direct/accelerated access expressed stronger intentions to speed. This relationship was also demonstrated in the simple correlations of another scenario. These licences allow riders to avoid the two-year qualification period on machines of 25 kW (33 bhp) with a power to weight ratio of 0.16 kW/kg. This seems to suggest that accelerating riders’ access does not provide riders with sufficient experience to master good handling skills on lower powered machines or the appropriate education regarding the risks involved in motorcycling. These venues therefore provide an important opportunity to start any campaign in earnest, since those gaining their licence via these courses are progressing to high-capacity machines over a relatively short period of time and forfeiting the benefit of graduated learning through experience.

4.2. Key beliefs distinguishing intenders from non-intenders

One of the important analyses reported in relation to interventions was the analysis of the beliefs which distinguish those who intend to engage in a risky riding behaviour from those who

Table 6
Regression analysis to predict intentions to ride faster than felt safe when group riding ($N = 1940$).

Step/predictor	R^2	ΔR^2	F	β Step 1	β Step 2	β Step 3	β Step 4	β Step 5	β Step 6
1.									
Age	0.04	0.04	12.39	−0.18***	−0.15***	−0.04	−0.01	0.01	0.03
Sex				−0.06*	−0.07**	−0.02	−0.02	−0.02	−0.02
Marital status				0.04	0.03	0.01	0.00	0.00	0.01
Dependent children				0.02	0.03	0.02	0.00	−0.01	0.00
Income Group				−0.02	−0.02	0.00	−0.01	−0.01	−0.01
NS-SEC				−0.03	−0.03	−0.01	0.02	0.01	0.01
2.									
Engine size	0.05	0.01	9.37		−0.08***	−0.04	−0.03	−0.02	−0.04*
Annual mileage					−0.04	−0.04*	−0.03	−0.03	−0.02
Experience					−0.04	−0.02	−0.01	−0.02	−0.04
Accident involvement					−0.06*	−0.05**	−0.05**	−0.04*	−0.03
Training					0.04	0.03	0.00	0.00	0.00
3.									
Attitude	0.40	0.35	98.04			0.60***	0.39***	0.30***	0.27***
PBC						0.03	−0.01	−0.03	−0.03
4.									
BB × OE	0.49	0.10	117.26				0.10***	0.07***	0.07***
NB × MC							−0.14***	−0.07***	−0.06***
CB × F							0.29***	0.24***	0.18***
5.									
Moral norm	0.53	0.03	106.41					−0.17***	−0.15***
Anticipated regret								−0.10***	−0.07***
Self-identity								−0.05**	−0.03*
Perceived susceptibility								−0.00	0.01
6.									
Past behaviour	0.57	0.04	118.42						0.23***

* $p < 0.05$.
** $p < 0.01$.
*** $p < 0.001$.

do not. In general, motorcyclists differed most significantly in their beliefs regarding the affective reactions related to the speeding behaviours, with intenders expressing a stronger belief that speeding would make them feel exhilarated. Thus amongst those expressing stronger intentions to ride at excessive or inappropriate speeds, speeding is valued for its own sake and for rather more than the utility of saving time. Intenders were also more likely to believe that these behaviours afforded the opportunity to test their riding skills and motorcycles top speed. On the basis of such, riders might be directed to specific track and training days that allow them to ride at high speeds on specifically designed tracks in a controlled environment.

A similar pattern also emerged for normative beliefs. Across scenarios, all four referent groups (police, other road users, family and other bikers) emerged as groups that were perceived differently by intenders and non-intenders. It was interesting to note that motorcyclists who expressed a stronger intention to engage in speeding were generally less likely to believe that other motorcyclists would disapprove of this behaviour and more motivated to comply with this referent group than those not intending to speed. This perhaps suggests that riders engaging in this particular behaviour may view fellow motorcyclists as risk-takers and feel some pressure to conform to this identity. This is in line with Elliott's (2010) assertion that the behaviour of other relevant groups (i.e. other motorcyclists) has an important influence on intentions. Addressing this belief would form a useful target for intervention.

A slightly different pattern emerged for control beliefs. Here there was more variation across beliefs in terms of how factors were perceived to facilitate or inhibit performing the behaviour by intenders and non-intenders. Both intenders and non-intenders agreed that riding on a fine and dry day would make them more likely to speed. Given evidence that the nature of motorcycling is changing to that of a leisure activity enjoyed throughout the summer months (Jamson et al., 2005), targeted campaigns would be best suited to the dry summer months when motorcycling and the propensity to speed are at their peak. Intenders were also significantly more likely to believe that less congested roads facilitated speeding. Since previous research has also identified 'little traffic' as an important characteristic of a good motorcycling route (Jamson et al., 2005), it follows that campaigns should be targeted at known motorcycling hot spots where the traffic conditions are optimal for speeding. In general, motorcyclists also believed that riding a powerful and reliable motorcycle facilitated speeding. The implication of curtailing the power to weight ratio of motorcycles is somewhat controversial, but campaigns would benefit from persuading riders that a powerful and reliable machine does not in any way forfeit the need to engage in cautious, safe behaviours. Similarly, manufacturers could be encouraged to promote and advertise more powerful motorcycles without reference to speed.

4.3. Limitations

The present research benefited from a very large sample and the examination of several different riding behaviours in the same sample. However, there are also a number of limitations to the present work. First, the research has focused on only one aspect of motorcycling. In particular, we chose to focus on riding behaviours on mainly open roads. This had the consequence that the impact of other road users (e.g., cars and lorries) was not specifically examined and we do not know the impact of this factor on the relationships to speeding intentions reported here. Second, the survey only achieved a 16% response rate. Although not unusual in this area it does leave open the possibility of the sample being biased. As data on non-respondents were not available we were unable to explore potential biases in our sample. Third, we chose to measure the impact of past behaviour through a measure of frequency of past commission of the behaviours. Past behaviour proved to be a strong predictor of each of the intentions examined. Other research has explored the impact of past behaviour through measuring habit (e.g., Verplanken and Orbell, 2003). Although the two measures do show some degree of overlap, our data do not allow us to specifically examine the impact of habit on these intentions. Fourth, our

measure of self-identity focused on one particular form of identity, that of being a 'safe motorcyclist'. Other more general forms of identity (e.g., I see myself as a motorcyclist) and their impacts on intentions to perform these three riding behaviour were not explored here, although they may represent an interesting focus for future research. Fifth, and finally, the extent to which the present findings extend beyond the UK context to motorcyclists in other countries is unclear. Fishbein and Ajzen (1975) make clear that the pattern of prediction of intentions within models such as the TPB is a function of both the behaviour and the population. Therefore we should be cautious in assuming similar patterns of prediction would emerge with different populations, although the present research should provide important guidance in factors to examine.

5. Conclusions

In summary, this study found support for the use of the TPB to predict motorcyclists' intentions to engage in various speeding behaviours. Regression on intention supported the inclusion of the additional variables of past behaviour, self-identity, anticipated regret and moral norms within the model. Analysis of beliefs highlighted those which distinguished intenders from non-intenders and may provide useful targets for intervention. Given the power of the beliefs to predict intentions in this analysis, tackling these beliefs should offer the best opportunity to change intentions and behaviour in relation to speeding behaviour. Indeed, the power of persuasive messages to change such beliefs in motorcyclists urgently needs to be tested in this domain as it has been in others (Hardeman et al., 2002). On the whole, the results of this study also suggest that the key motivational factors influencing motorcyclists' intentions to engage in aberrant riding behaviours are similar to those observed in the driving domain.

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References

Ajzen, I., 1985. From intentions to actions: a theory of planned behavior. In: Kuhl, J., Beckman, J. (Eds.), Action Control: From Cognition to Behavior. Springer, Heidelberg, Germany, pp. 11–39.
Ajzen, I., 1991. The theory of planned behavior. Organizational Behavior and Human Decision Processes 50, 179–211.
Armitage, C.J., Conner, M., 2001. Efficacy of the theory of planned behaviour: a meta-analytic review. British Journal of Social Psychology 40, 471–500.
Bailey, J., Bailey, M., 2001. Analysis of fatal motorcycle accidents using in-depth fatal accident databases. Technical report prepared for the Accident Compensation Corporation. Bailey Partnership Ltd., Porirua, New Zealand.
Callero, P.L., Howard, L.A., Piliavin, L.A., 1987. Helping behaviour as role behaviour: disclosing social structure and history in the analysis of pro-social action. Social Psychology Quarterly 50, 247–256.
Clarke, D.D., Ward, P., Bartle, C., Truman, W., 2004. An in-depth case study of motorcycle accidents. Road Safety Research Report No. 54. Department for Transport, London.
Conner, M., Abraham, C., 2001. Conscientiousness and the theory of planned behavior: toward a more complete model of the antecedents of intentions and behavior. Personality and Social Psychology Bulletin 27 (11), 1547–1561.
Conner, M., Armitage, C.J., 1998. Extending the theory of planned behavior: a review and avenues for further research. Journal of Applied Social Psychology 28, 1429–1464.
Conner, M., Kirk, S.F., Cade, J.E., Barrett, J.H., 2001. Why do women use dietary supplements? The use of the theory of planned behaviour to explore beliefs about their use. Social Science & Medicine 52 (4), 621–633.
Conner, M., Lawton, R., Parker, D., Chorlton, K., Manstead, A.S., Stradling, S., 2007. Application of the theory of planned behaviour to the prediction of objectively assessed breaking of posted speed limits. British Journal of Psychology 98 (3), 429–453.
Conner, M., Smith, N., McMillan, B., 2003. Examining normative pressure in the theory of planned behaviour: impact of gender and passengers on intentions to break the speed limit. Current Psychology 22 (3), 252–263.
Conner, M., Sparks, P., 1996. The theory of planned behaviour and health behaviours. In: Conner, M., Norman, P. (Eds.), Predicting Health Behaviour: Research and Practice with Social Cognition Models. The Open University, Bristol, pp. 121–162.
Conner, M., Sparks, P., 2005. Theory of planned behaviour and health behaviour. In: Conner, M., Norman, P. (Eds.), Predicting Health Behaviour. , 2nd ed. Open University Press, Maidenhead, pp. 170–222.
Department for Transport, 2009. Road Casualties Great Britain 2008. The Stationary Office, London.
DfT, 2000. The attitudinal determinants of driving violations. Road Safety Research Report No.13. The Department for Transport, London.
DfT, 2006. Road Casualties Great Britain 2005. The Stationary Office, London.
Elliott, M.A., 2010. Predicting motorcyclists' intentions to speed: effects of selected cognitions from the theory of planned behaviour, self-identity and social identity. Accident Analysis & Prevention 42 (2), 718–725.
Elliott, M.A., Armitage, C.J., Baughan, C.J., 2003a. Drivers' compliance with speed limits: an application of the theory of planned behavior. Journal of Applied Psychology 88 (5), 964–972.
Elliott, M.A., Baughan, C.J., Broughton, J., Chinn, B., Grayson, G.B., Knowles, J., et al., 2003b. Motorcycle safety: a scoping study. TRL Report 581. Crowthorne: Transport Research Laboratory.
Fishbein, M., Ajzen, I., 1975. Belief, Attitude, Intention and Behavior: An Introduction to Theory and Research. Addison-Wesley, Reading, MA.
Godin, G., Kok, G., 1996. The theory of planned behavior: a review of its applications to health-related behaviour. American Journal of Health Promotion 11, 87–98.
Godin, G., Valois, P., Jobin, J., Ross, A., 1991. Prediction of intention to exercise of individuals who have suffered from coronary heart disease. Journal of Clinical Psychology 47 (6), 762–772.
Hardeman, W., Johnston, M., Johnston, D.W., Bonetti, D., Wareham, N., Kinmonth, A.L., 2002. Application of the theory of planned behaviour in behaviour change interventions: a systematic review. Psychology and Health 17, 123–158.
Hausenblas, H.A., Carron, A.V., Mack, D.E., 1997. Application of the theories of reasoned action and planned behavior to exercise behavior: a meta-analysis. Journal of Sport and Exercise Psychology 19, 36–51.
Hurt, H., Ouellet, J., Thom, D., 1981. Summary of findings reprinted from motorcycle accident cause factors and identification of countermeasures, vol. 1. Technical Report. Traffic Safety Centre, University of Southern California, Los Angeles.
Jamson, S., Chorlton, K., Conner, M., 2005. The Older Motorcyclist, Road Safety Research Report No. 55. Department for Transport, London, England.
Janz, N.K., Becker, M.H., 1984. The health belief model: a decade later. Health Education Quarterly 11 (1), 1–47.
Jonas, K., Doll, J., 1996. A critical evaluation of the theory reasoned action and the theory of planned behaviour. Zeischrift fur Sozialpsychologie, 18–31.
Lawton, R., Parker, D., Manstead, A.S., Stradling, S.G., 1997. The role of affect in predicting social behaviours: the case of road traffic violations. Journal of Applied Social Psychology 27 (14), 1258–1276.
Loomes, G., Sugden, R., 1982. Regret theory: an alternative theory of rational choice under uncertainty. Economic Journal 92, 805–824.
Mannering, F.L., Grodsky, L.L., 1995. Statistical analysis of motorcyclists' perceived accident risk. Accident Analysis and Prevention 27, 21–31.
Mannetti, L., Pierro, A., Livi, S., 2004. Recycling: planned and self-expressive behaviour. Journal of Environmental Psychology 24 (2), 227–236.
Manstead, A.S., Parker, D., 1995. Evaluating and extending the theory of planned behaviour. European Review of Social Psychology 6, 69–95.
McEachan, R.R.C., Conner, M., Taylor, N.J., Lawton, R.J., 2011. Prospective prediction of health-related behaviors with the theory of planned behavior: a meta-analysis. Health Psychology Review, doi:10.1080/17437199.2010.521684.
McMillan, B., 1998. The psycho-social determinants of drug use amongst young people. Unpublished PhD. University of Leeds, Leeds, UK.
Mortimer, R., 1984. Evaluation of the motorcycling riding course. Accident Analysis and Prevention 16 (1), 63–71.
Newman, S., Watson, B., Murray, W., 2004. Factors predicting intentions to speed in a work and personal vehicle. Transportation Research Part F: Traffic Psychology and Behaviour 7 (4–5), 287–300.
Norman, P., Conner, M., 2005. Predicting and changing behaviours: future directions. In: Conner, M., Norman, P. (Eds.), Predicting Health Behaviour. , 2nd ed. Open University Press, England, pp. 324–371.
Norman, P., Conner, M., Bell, R., 1999. The theory of planned behavior and smoking cessation. Health Psychology 18 (1), 89–94.
Ouellette, J.A., Wood, W., 1998. Habit and intention in everyday life: the multiple processes by which past behavior predicts future behavior. Psychological Bulletin 124 (1), 54–74.
Parker, D., 1997. The relationship between speeding attitudes and speeding behaviour. In: Grayson, G.B. (Ed.), Behavioural Research in Road Safety VII. Transport Research Laboratory, Crowthorne, pp. 176–184.
Parker, D., Manstead, A.S., Stradling, S.G., 1995. Extending the theory of planned behaviour: the role of personal norm. British Journal of Social Psychology 34 (2), 127–137.
Parker, D., Manstead, A.S., Stradling, S.G., Reason, J.T., 1992a. Determinants of intention to commit driving violations. Accident Analysis & Prevention 24 (2), 117–131.
Parker, D., Manstead, A.S., Stradling, S.G., Reason, J.T., Baxter, J.S., 1992b. Intention to commit driving violations: an application of the theory of planned behavior. Journal of Applied Psychology 77 (1), 94–101.
Robinson, D., Campbell, R., 2006. Contributory factors to road accidents. <http://www.dft.gov.uk/pgr/statistics/datatablespublications/accidents/casualtiesgbar/coll_roadcasualtiesgreatbritain2/contributoryfactorstoroadacc1802> (retrieved 20.04.2007).

Rodgers, W., Conner, M., Murray, T., 2008. Distinguishing among perceived control, perceived difficulty and self-efficacy as determinants of intentions and behaviours. British Journal of Social Psychology 47 (4), 607–630.
Rogers, R.W., 1983. Cognitive and physiological processes in fear appeals and attitude change: a revised theory of protection motivation. In: Cacioppo, J., Petty, R. (Eds.), Social Psychophysiology. New York, Guilford Press.
Rutter, D., Quine, L., Albery, I.P., 1998. Perceptions of risk in motorcyclists: unrealistic optimism, relative realism and predictions of behaviour. British Journal of Psychology 89, 681–696.
Rutter, D.R., Quine, L., Chesham, D.J., 1995. Predicting safe riding behaviour and accidents: demography, beliefs, and behaviour in motorcycling safety. Psychology & Health 10, 369–386.
Sandberg, T., Conner, M.T., 2008. Anticipated regret as an additional predictor in the theory of planned behaviour: a meta-analysis. British Journal of Social Psychology 47 (4), 589–606.
Shankar, U., 2001. Recent Trends in Fatal Motorcycle Crashes (DOT HS 809 271). National Highway Traffic Road Safety Administration, Washington, DC.
Shankar, V., Mannering, F., 1996. An exploratory multinomial logit analysis of single-vehicle motorcycle accident severity. Journal of Safety Research 27 (3), 183–194.
Sparks, P., 1994. Attitudes towards food: applying, assessing and extending the 'theory of planned behaviour'. In: Rutter, D.R., Quine, L. (Eds.), Social Psychology and Health: European Perspectives. Avebury Press, Aldershot, pp. 25–46.
Sutton, S., McVey, D., Glanz, A., 1999. A comparative test of the theory of reasoned action and theory of planned behaviour in the prediction of condom use intentions in a national sample of English young people. Health Psychology 18 (1), 72–81.
Trafimow, D., Sheeran, P., Conner, M., Findlay, K.A., 2002. Evidence that perceived behavioral control is a multidimensional construct: perceived control and perceived difficulty. British Journal of Social Psychology 41, 101–121.
Van der Velde, F.W., Hooykaas, C., Van der Pligt, J., 1996. Conditional versus unconditional risk estimates in models of AIDS-related risk behaviours. Psychology and Health 12 (1), 87–100.
Verplanken, B., Orbell, S., 2003. Reflections on past behavior: a self-report index of habit strength. Journal of Applied Social Psychology 33, 1313–1330.
Webb, T.L., Sheeran, P., 2006. Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. Psychological Bulletin 132 (2), 249–268.
Weinstein, N.D., Klein, W., 1996. Unrealistic optimism: present and future. Journal of Social and Clinical Psychology 15, 1–8.