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Running Head: PROTOTYPE WILLINGNESS MODEL

An application of the prototype willingness model to drivers' speeding behaviour

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Abstract

We tested the prototype willingness model (PWM). The participants (*N*=198) completed online questionnaire measures of PWM constructs (time 1) and subsequent speeding behaviour (time 2). Path analyses showed that the PWM accounted for 89% of the variance in subsequent (self-reported) speeding behaviour. This significantly exceeded the variance accounted for by the theory of planned behaviour. In line with the PWM, both behavioural intention and behavioural willingness had direct effects on behaviour. Behavioural willingness had a significantly larger effect. Attitude and subjective norm both had indirect effects on behaviour through both behavioural intention and behavioural willingness. Prototype (similarity) perceptions had indirect effects on behaviour through behavioural willingness only. The findings support the notion that driving is governed by reactive decision-making (willingness), underpinned by prototype perceptions, attitudes and subjective norms, to a greater extent than it is deliberative decision-making (intentions), underpinned by attitudes and subjective norms. The implications for safety interventions are discussed.

KEY WORDS: Prototype willingness model; Rationale decision-making; Reactive decision-making; Speeding; Driving.

Introduction

There is a widespread acknowledgement that driving requires the deployment of higher-order, meta-cognitive skills (e.g., Reason et al., 1990; Hatakka et al., 2002). Consistent with this idea, many studies have focused on identifying the socio-cognitive constructs that underpin driving. In particular, the theory of planned behaviour (TPB; Ajzen, 1985; Ajzen, 1991) has been successfully used to predict and explain driver behaviour. According to this model (see figure 1), behaviour is dictated by behavioural intentions (plans of action) that are pre-formed on the basis of a rational decision-making process during which individuals' deliberate on their attitudes (positive or negative evaluations about performing the behaviour), subjective norms (beliefs about whether the behaviour will receive social approval or disapproval) and perceptions of control (beliefs about how easy or difficult the behaviour is to perform the behaviour). Previous research shows that the TPB is a good model for predicting driving. In line with reviews of general social and health behaviours (e.g., Armitage & Conner, 2001; McEachan et al., 2011) it has been shown to account for 'large' proportions of the variance (in excess of $R^2 = 0.25$; see Cohen, 1992) in behavioural intentions and 'moderate-to-large' proportions of the variance ($R^2 = 0.10$ to 0.25) in subsequently performed speeding, drink-driving, tailgating, dangerous overtaking, red light running and mobile phone use while driving (e.g., Cestac et al., 2011; Conner et al., 2007; Elliott, 2012; Elliott et al., 2013; Lheureux et al., 2015; Nemme & White, 2010).

It is notable, however, that a large proportion of the variance in behaviour remains unaccounted for by the TPB. While several constructs have been found to account for this unexplained variance (see Conner et al., 2007; Elliott & Thomson, 2010), it is likely that other modes of decision-making than those proposed by the TPB are also important in governing driving. Indeed driving is a highly demanding, dynamic task that often requires reactive decisions about how to behave in response to constantly changing situational factors

(i.e., traffic; Elliott et al., 2015b). A model that focuses on reactive decision-making in addition to deliberative decision-making would therefore seem better equipped to predict driver behaviour than would a model that focuses on deliberative decision-making only. One model that focuses on both deliberative and reactive decision-making is the prototype willingness model (PWM; Gerrard et al., 2008; Gibbons & Gerrard, 1995). This paper presents a study designed to test the PWM using the TPB as a baseline comparator.

The prototype willingness model

Consistent with dual processing models (e.g., Chaiken & Trope, 1999), the PWM posits that behaviour is co-determined by two constructs: one that reflects deliberative decision-making and one that reflects more reactive decision-making. Specifically, it is proposed that behaviour is co-determined by behavioural intentions and behavioural willingness. In line with the TPB, behavioural intentions are deliberatively formed plans of action that are derived on the basis of individuals' attitudes and subjective norms (note that, unlike the TPB, the PWM does not specify perceptions of control as determinants of behaviour). Behavioural willingness, however, is a general openness to behave that increases the likelihood of a behaviour when an individual encounters 'facilitating situations'. It is therefore acknowledged that, under certain circumstances (e.g., when a driver is late or in a hurry), individuals can perform a behaviour (e.g., break the speed limit) for which they may not have formed a prior intention. Instead, the execution of the behaviour is a 'reaction' to the encountered situations (e.g., Gerrard et al., 2008).

As is the case with behavioural intentions, behavioural willingness is assumed to be underpinned by attitudes and subjective norms. However, the PWM proposes that behavioural willingness is also determined by prototype perceptions. Prototype perceptions are positive or negative valences that are attached to the cognitive representations (i.e., the prototypes) that people hold for the typical members of social categories (e.g., the typical

'speeder'). Within the PWM there are two types of prototype perceptions that are typically studied: prototype favourability perceptions (the extent to which individuals' positively or negatively evaluate the prototype) and prototype similarity perceptions (the extent to which an individual believes they are similar to the prototype). Critically, prototype perceptions are held to influence behaviour through reactive decision-making (behavioural willingness) rather than deliberative decision-making (behavioural intention). This assumption is supported by a long history of priming studies in Psychology showing that prototypes are activated from memory and bias behavioural responding efficiently (i.e., quickly) and often with low levels of conscious intent (e.g., Devine, 1989; Wigboldus et al., 2004). Prototypes therefore possess key features of automaticity (see Bargh, 1994). They are therefore likely to be important in the prediction of readily repeatable (i.e., highly habitual) behaviours such as those often found in the context of driving. Indeed, measures of both past behaviour and habit have been shown to be strong predictors of driver behaviour (e.g., Elliott et al., 2003; Elliott & Thomson, 2010; Lheureux et al., 2015; Tseng et al., 2013).

Although previous research has tested elements of the PWM, there are few studies in which the full model has been tested. Several studies, for example, have shown that both behavioural intentions and behavioural willingness can independently predict behaviour, with behavioural willingness usually emerging as the bigger predictor of the two (e.g., Gerrard et al., 2006; Gibbons et al., 1998a, 1998b and 2004; Rivis et al., 2010; van Lettow et al., 2016). However, these studies have not included all of the antecedents of both behavioural intentions and behavioural willingness, meaning that the potential causes of these theoretically distinct processes have not been tested fully. Additionally, measures of behavioural expectations (e.g., 'I expect that I will exceed the speed limit over the next month') have typically been used in these studies instead of measures of behavioural intentions (e.g., 'I plan to exceed the speed limit') or the measures of behavioural expectations and behavioural intentions have

been conflated. However, behavioural expectations and behavioural intentions are theoretically distinct. For example, Warshaw and Davis (1985) have argued that behavioural expectations tap into perceptions of behavioural inhibitors and facilitators whereas behavioural intentions do not (e.g., a person people may not intend to exceed the speed limit while driving but still think they are likely to do it because they know they are likely to encounter situations that tempt the behaviour or make it difficult to avoid). Likewise, Armitage et al. (2015) have argued that asking people about their behavioural expectations elicits more reflective processing than does asking them about their behavioural intentions. Behavioural expectations and behavioural intentions are also empirically distinct. For instance, Armitage et al. (2015) conducted two studies in which the correlation between behavioural expectation and behavioural intention was either significantly weaker than unity (study 1) or only modestly correlated ($r < .25$; study 2). Behavioural intentions and behavioural expectations cannot, therefore, be treated synonymously. More generally, just one of the above cited PWM studies (Gibbons et al., 1998b) focused on driver behaviour (drink-driving).

Similarly, several have shown that attitudes, subjective norms and prototype perceptions (in particular prototype similarity perceptions) can independently predict both behavioural intentions (e.g., Cestac et al., 2011; Cristea et al., 2013; Norman et al., 2007; Rivis & Sheeran, 2003; Rivis et al., 2006; Scott-Parker et al., 2013) and behavioural willingness (e.g., Gerrard et al., 2005; Ouellette et al., 1999; Rivis et al., 2011; Rozario et al., 2010). However, while many of these studies have been conducted on driving behaviours, researchers have used either behavioural intentions (typically operationalised as behavioural expectations) or behavioural willingness as dependent variables. Behavioural intentions and behavioural willingness have not both been included in these studies together. This is problematic because behavioural intentions and behavioural willingness share variance (e.g.,

Gibbons et al., 1998a and b; Rivis et al., 2010) and this shared variance could be responsible for the observed findings. For example, Cestac et al. (2011) found that prototype similarity perceptions (β = .29, p < .001) were independent predictors of behavioural intentions to break the speed limit in a regression model that also included attitudes (β = .18, p < .001) and subjective norms (β =.04, p < .01). However, these relationships might have been attributable to the variance that is shared between behavioural intentions and behavioural willingness, which the researchers were unable to take into account because behavioural willingness was not measured. Similarly, it is not known the extent to which the relationships between PWM constructs and behavioural willingness are attributable to shared variance in the studies that have not included measures of behavioural intentions. Researchers therefore need to covary their measures of behavioural intentions and behavioural willingness in tests of the PWM (i.e., remove the variance that is shared between these two constructs). Additionally, without including measures of both behavioural intentions and behavioural willingness, research reveals little about the potential interplay between the proposed deliberative (intention) and reactive (willingness) process that are hypothesised to underpin behaviour in the PWM.

The present study

The aim of this study was to apply the PWM to drivers' speeding behaviour. Given that the TPB has been found to account for a substantial proportion of variance subsequent speeding behaviour in many studies, we used this model as a baseline, against which we tested the PWM. Consistent with previous research, hypothesis 1 was that the TPB would account for a significant proportion of the variance in drivers' subsequently measured speeding behaviour. Hypothesis 2 was that the PWM would account for a significantly larger proportion of variance in subsequently measured speeding behaviour than would the TPB. In line with the PWM, we also hypothesised that both behavioural intention and behavioural willingness would have independent direct effects on subsequently measured speeding

behaviour (hypothesis 3). However, given that the driving context is highly dynamic and therefore requires reactive decision-making, we hypothesised that behavioural willingness would be a bigger direct predictor of subsequently measured behaviour than would behavioural intention (hypothesis 4). Finally, in line with the PWM, we hypothesised that attitude and subjective norm would have indirect effects on subsequently measured behaviour through both behavioural intention and behavioural willingness (hypothesis 5) but that prototype (favourability and similarity) perceptions would have indirect effects through behavioural willingness only (hypothesis 6).

Method

Participants

A final sample of 198 drivers took part in the study. The mean age was 38.37 years old (SD = 16.54) and 49% (*n* = 96) was male[1]. The mean weekly mileage was 149.08 (SD = 144.42) and the mean number of years that the participants were licensed to drive was 17.71 (SD = 14.86).

Design

A correlational design was employed. The participants completed two questionnaires, one month a part. The time 1 questionnaire measured basic demography (age, gender, weekly mileage and number of years the participants were licensed to drive) and the constructs specified by the PWM and the TPB. The time 2 questionnaire measured subsequent (i.e., post-time 1) speeding behaviour.

Procedure

The participants were recruited from a large university in the west of Scotland and from high-streets, supermarkets and households in Glasgow. The participants sampled from the

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[1] We acknowledge that age and gender are associated with many behaviours including speeding (see Elliott et al., 2003) and are therefore potential moderators of the relationships between socio-cognitive constructs, such as those proposed by the PWM, and subsequently performed behaviour. However, when the path analyses presented in the main text (see figures 1 and 2) were re-run with age, gender and their respective interactions with the predictor variables, none of the interactions were statistically significant.

university received one course credit for taking part. They were recruited using advertisements placed on notice boards (electronic and physical) and announcements made in lectures. The participants sampled from the high-street, supermarkets and households did not receive any compensation for taking part. They were sampled using leaflets handed in person (i.e., foot-in-door-technique). The recruitment materials stated that volunteers were needed for a study on driver behaviour, that participation would involve the completion of two short questionnaires, one month apart, and that the participants needed to hold a full UK driving license and to drive at least once a week. Three hundred and thirty drivers volunteered to take part. These drivers were asked for their email addresses and were sent a link to an online (time 1) questionnaire. At the beginning of the questionnaire, the participants were told that: (a) the study was about drivers' attitudes towards speeding and their speeding behaviour; (b) the two questionnaires they needed to complete would take about 10 minutes each; (c) there are no right or wrong answers to any of the questions; and (d) their questionnaire responses would be anonymous and used for research purposes only. The participants were then informed of their ethical rights and asked if they would give their informed consent to participate.

After providing their consent, the participants were presented with a series of standard questionnaire items (i.e., commonly used in previous research) to measure basic demography and the constructs specified by the PWM (e.g., Gerrard et al., 2008) and the TPB (e.g., Fishbein & Ajzen, 2010). The PWM/TPB items asked about exceeding the speed limit over the next month. These items were presented in a pseudo random order to help avoid possible consistency biases (e.g., Budd, 1987) and the item response scales were counterbalanced to avoid response set biases (e.g., Coolican, 2014). The participants provided their responses to all items using 9-point scales (see next section). After completing the items, the participants clicked on a 'submit' button. They then received an 'end of survey' message that thanked

them for their time and stated that they would be contacted in one month and asked to complete a second (time 2) questionnaire.

One month after completing the time 1 questionnaire, the participants were sent an email that contained a link to the time 2 questionnaire. The time 2 questionnaire contained standard items (e.g., Fishbein & Ajzen, 2010; Elliott et al., 2003 and 2007) to measure subsequent (self-reported) behaviour. The items asked about exceeding the speed limit over the last month (i.e., since the completion of the item 1 questionnaire). To avoid consistency and response set biases, these items were presented amongst filler items about general driving practices and the item response scales were counter-balanced. After completing the items, the participants clicked on a 'submit' button. They were then thanked for completing the study and debriefed via an end of survey message. Only the participants who completed the time 2 questionnaire within two weeks of receiving the email asking them to complete it were included in the final sample in order to ensure that the time 1 PWM/TPB measures (about speeding over the next month) and the time 2 behaviour measures (about speeding over that period) did not unduly diverge in terms of the specified time-frame and therefore violate the principal of correspondence (Fishbein & Ajzen, 1975).

Both the time 1 and time 2 questionnaires were developed and administered using 'Qualtrics Online Survey Design and Administration Software'. The questionnaire data were stored online and downloaded into separate (time 1 and time 2) SPSS databases. The time 1 and time 2 databases were merged using self-generated unique identifiers to produce a final database. More specifically, the participants were asked, in both questionnaires, to provide the first and last letters of both their first and last names and the first letter of their mother's maiden name. Along with the age and gender information that they provided in both questionnaires, this generated a unique code that successfully matched 97% of the time 1 participants with their time 2 data, while maintaining anonymity. Of the 330 participants who

completed the time 1 questionnaire, 60% completed the time 2 questionnaire and were

successfully matched, producing a final sample of $N = 198$ participants. This completion rate

compared extremely favourably with previously published research using a similar design

(e.g., Elliott et al., 2015a [study 3]). Overall, the study ran for 9 months, from July 2014 to

March 2015.

Time 1 measures

Behavioural intention. Four items were used to measure drivers' intentions to speed: 'I

[plan/intend/want/would like] to drive faster than the speed limit over the next month? (1 =

strongly disagree to 9= *strongly disagree*)'. The arithmetic mean of the scores on these four

items was calculated for each participant and served as the final measure of behavioural

intention for use in the subsequent data analyses ($\alpha = .87$).

Behavioural willingness. Behavioural willingness was measured with three items.

Following previous research in other domains (see Gerrard et al., 2008), all items were

designed to measure the participants' general willingness to perform the target behaviour

when confronted by situations that provide the opportunity to do so. The three items were:

'Suppose you were late (e.g., for work, university or an appointment) over the next month.

How willing would you be to drive faster than the speed limit? (1 = *not at all willing* to 9 =

very willing)'; 'Would you be willing to drive faster than the speed limit if you were in a

hurry over the next month? (1 = *definitely no* to 9 = *definitely yes*)'; and 'Imagine that other

drivers around you are speeding. To what extent would you be willing to drive faster than the

speed limit too? (1 = *no extent at all* to 9 = *a great extent*)'. The arithmetic mean of the scores

on these three items was calculated for each participant and this served as the final measure

of behavioural willingness ($\alpha = .91$).

Attitude. To measure attitudes towards speeding, the participants were presented with

the following item stem: 'For me, driving faster than the speed limit over the next month

would be…' They were then asked to complete this sentence using three semantic differential scales: *extremely unpleasant* (scored 1) to *extremely pleasant* (scored 9); *extremely dull* (scored 1) to *extremely fun* (scored 9); and *extremely unenjoyable* (scored 1) to *extremely enjoyable* (scored 9). A final measure of attitude was produced for each participant by taking the arithmetic mean of the scores on the three items ($\alpha = .79$).

Subjective norm. The arithmetic mean of two items produced the measure of subjective norm for each participant ($\alpha = .65$): 'How often will the people important to you drive faster than the speed limit over the next month? (1 = *never* to 9 = *very often*)'; and 'Of the people you know, how many do you think will drive faster than the speed limit over the next month (1 = *none of them* to 9 = *all of them*)'.

Perceived behavioural control. A measure of perceived behavioural control was obtained using a single semantic differential scale that measured the perceived ease/difficulty of behavioural performance (e.g., Parker et al., 1992): 'For me, avoiding driving faster than the speed limit over the next month would be… (1 = *extremely difficult* to 9 = *extremely easy*)'.

Prototype perceptions. Prototype similarity was measured with four items: 'Do you resemble the typical person your age that regularly drives faster than the speed limit? (1 = *definitely no* to 9 = *definitely yes*)'; 'How similar or different are you to the type of person your age that regularly drives faster than the speed limit (1 = *very different* to 9 = *very similar*)'; 'I am comparable to the typical person my age that regularly drives faster than the speed limit (1 = *strongly disagree* to 9 = *strongly agree*)'; and 'To what extent are you like the typical person your age that regularly drives faster than the speed limit (1 = *no extent at all* to 9 = *a great extent*). The arithmetic mean of the four items served as the final measure of prototype similarity for each participant ($\alpha = .88$).

Prototype favourability was measured with six items. The participants were asked to

'think about the typical person your age who regularly drives faster than the speed limit'.

They were then asked to rate the prototypical speeder by indicating the extent to which they

felt (s)he possessed three positive attributes (*dynamic, cool* and *important*) and three negative

attributes (*careless, childish* and *dull/boring*). All attributes were rated on scales from *no*

extent at all (scored 1) to *a great extent* (scored 9). The arithmetic mean of the ratings for the

three positive attributes was calculated for each participant to produce a final measure of

prototype favourability: ratings of positive attributes ($\alpha = .79$). The arithmetic mean of the

scores on the three negative attributes was calculated for each participant to produce a final

measure of prototype favourability: ratings of negative attributes ($\alpha = .64$). The positive and

negative ratings were treated as separate constructs because a factor analysis (principal

components with varimax rotation) showed that the prototype favorability items loaded onto

two distinct factors: all of the ratings of the positive attributes loaded exclusively onto factor

1 (greater than 0.80), which accounted for 36% of the variance in the correlation matrix, and

all of the ratings of the negative attributes loaded exclusively onto factor 2 (greater than

0.66), which accounted for 29% of the variance in the correlation matrix[2].

Time 2 measures

   Subsequent (self-reported) speeding behaviour. Four items were used in the time 2

questionnaire to measure speeding behaviour: 'I have driven faster than the speed limit in the

last month (1 = *strongly disagree* to 9 = *strongly agree*)'; 'How many times have you found

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[2] We acknowledge that the separation of the positive and negative prototype favourability ratings is not consistent with how prototype favourability is often treated in other studies in which researchers have used overall measures of prototype favourability that combine the positive and negative ratings. The factor analytic findings presented in the main text, however, demonstrate that the positive and negative prototype favourability items tapped different (positive and negative) components of prototype favourability and the findings are consistent with research into bi-dimensional attitudes, in which positive and negative valences have been shown to be independent of one another (see Conner et al., 2002; Elliott et al., 2015a). Additionally, it should be noted that when the analyses reported in the main text were re-run with an overall measure of prototype favourability (the mean of all the positive and negative items), rather than the separate positive and negative prototype favourability measures, the findings and resulting conclusions were the same. There were no statistically significant path coefficients for the relationships between prototype favourability and any other construct. All of the other non-significant paths in figure 2 remained non-significant. All the significant paths in figure 2 remained significant.

yourself driving faster than the speed limit over the last month? (1 = *none* to 9 = *lots of times*)'; 'Overall, how often have you found yourself driving faster than the speed limit over the last month? (1 = *never* to 9 = *frequently*)'; and 'Overall, to what extent have you driven faster than the speed limit over the last month? (1 = *not at all* to 9 = *very often*)'. The arithmetic mean of the four items was used as a composite scale for each participant in the subsequent analyses (α = .95).

Analyses

We first conducted a power analysis to ensure that the final sample of N = 198 provided sufficient power for the study. We also used standard analyses (e.g., MANOVA) to test whether any systematic biases were introduced into the final sample through attrition and we computed descriptive statistics (Ms and SDs) zero order correlation coefficients for each of the measures in order to explore the general trends in the data.

We tested the hypotheses using a number of techniques. Two path analyses were conducted: one to test the TPB and one to test the PWM. We used path analysis because it allows for an endogenous variable to not only serve as a dependent variable but also an independent variable in the same model. It therefore provides a simultaneous test of direct and indirect effects, which makes it possible to directly compare models that contain a mediator, such as the PWM (i.e., behavioural intention and behavioural willingness) and the TPB (i.e., behavioural intention).

The first path analysis provided a test of hypothesis 1 (that the TPB would account for a significant proportion of the variance in subsequently measured speeding behaviour). The second path analysis allowed us to test hypothesis 2 (that the PWM would account for a significantly larger proportion of variance in subsequently measured speeding behaviour than would the TPB). The second path analysis also provided a test of hypothesis 3 (that both behavioural intention and behavioural willingness would have independent direct effects on

subsequently measured speeding behaviour). To test hypothesis 4, we employed a t-test to establish whether the path coefficient for the direct relationship between behavioural willingness and subsequently measured speeding behaviour in the second path analysis was significantly bigger than was the path coefficient for the direct relationship between behavioural intention and subsequently measured speeding behaviour. The second path analysis also provided a test of hypothesis 5 (that attitude and subjective norm would have indirect effects on subsequently measured speeding behaviour through both behavioural intention and behavioural willingness) and hypothesis 6 (that prototype perceptions would have indirect effects on subsequently measured speeding behaviour through behavioural willingness only). These indirect effects were additionally tested using standard mediation analyses. More specifically, we employed Preacher and Hayes' (2007) bootstrapping procedure. This procedure is preferable to the use of Sobel tests because indirect effects are not normally distributed, meaning that bootstrapping is necessary (Preacher & Hayes, 2007). It involves re-sampling random subsets of the data to derive a non-parametric estimation of the sampling distribution of the products of the paths between the independent variables (e.g., antecedent PWM constructs) and the proposed mediator (e.g., behavioural intention or willingness) and between the proposed mediator and the dependent variable (e.g., speeding behaviour). One thousand random subsets of the data were re-sampled in the present analyses. Additional re-samples made no difference to the findings.

<div align="center">Results</div>

Power analyses

The power analyses showed that the power to detect an effect size of $f^2 = 0.15$ at $\alpha = 0.05$ was power $= 0.99$ in the path analysis of the TPB (four predictors) and power $= 0.98$ in the path analysis of the PWM (seven predators). Given that these power estimates were greater than 0.80, it was concluded that the present analyses had sufficient power to detect

meaningful sized effects (cf. Cohen, 1988, 1992).

Tests of attrition

A MANOVA was conducted with the time 1 (TPB/PWM) measures, age, weekly mileage and number of years licensed to drive as the dependent variables and attrition (0 = dropped out of the study at time 2; 1 = completed the study at time 2) as the independent variable. The MANOVA showed that that there was no overall, multivariate difference between the study 'drop-outs' (n = 132) and 'completers' (n = 198), $F(11, 318)$= 0.84, p = .582, f = 0.05. An inspection of the univariate statistics confirmed that the completers and drop-outs did not differ on any of the dependent variables: behavioural intention, $F(1, 328)$ = 0.01, p = .931, f = 0.01; behavioural willingness, $F(1, 328)$ = 0.95, p = .331, f = 0.05; attitude, $F(1, 328)$ = 0.11, p = .738, f = 0.02; subjective norm, $F(1, 328)$ = 1.60, p = .207, f = 0.07; prototype similarity, $F(1, 328)$ = 3.11, p = .079, f = 0.10; prototype favourability: ratings of positive attributes, $F(1, 328)$ = 0.35, p = .555. f = 0.03; prototype favourability: ratings of negative attributes, $F(1, 328)$ = 0.03, p = .867, f = 0.01; perceived behavioural control, $F(1, 328)$ = 2.56, p = .154, f = 0.09; age, $F(1, 328)$ = 0.13, p = .724, f = 0.02; weekly mileage, $F(1, 328)$ = 0.72, p = .397, f = 0.05; and the number of years licensed to drive, $F(1, 328)$ = 0.34, p = .562, f = 0.03. A chi-square analysis also showed that there was no gender difference between the drop-outs and study completers, $\chi^2(1)$ = 0.85, p = .910, φ = 0.05. Therefore, no systematic biases were introduced into the final sample through attrition and the subsequently presented analyses focused only on the study completers.

Descriptive statistics and correlations

As the descriptive statistics in table 1 show, the participants reported exceeding the speed limit to a moderate extent over the study period (i.e., the mean on the measure of subsequent speeding behaviour was around the scale mid-point, 5). The table also shows that the participants, on average, reported that they had a reasonably weak behavioural intention

to speed. However, they reported a reasonably strong level of behavioural willingness to speed when confronted by situations that provide the opportunity to do so. The participants also reported that they had a slightly negative attitude towards speeding, on average, that important others would exceed the speed limit reasonably often over the next month (subjective norm), that they themselves had a lot of control over their ability to avoid speeding (perceived behavioural control) and that they were reasonably similar to the prototypical speeder (prototype similarity). Finally, the participants, on average, did not rate the prototypical speeder very positively (prototype favourability: positive attributes) and they rated the prototypical speeder as moderately negative (prototype favourability: negative attributes).

In line with both the PWM and the TPB, the correlations in table 1 show that behavioural intention was positively associated with the measure of subsequent speeding behaviour and that both attitude and subjective norm were associated with behavioural intention. In line with the PWM, behavioural willingness was also correlated with speeding behaviour and attitude, subjective norm, prototype similarly and prototype favourability (ratings of both positive and negative attributes) were all correlated with behavioural willingness. In line with the TPB, perceived behavioural control was also correlated with both behavioural intention and the behaviour measure.

Testing the TPB

The path analysis testing the TPB is shown in figure 1. In support of hypothesis 1, it can be seen that the model accounted for 72% of the variance in the measure of subsequent speeding behaviour (total direct + indirect effects). As also shown in figure 1, and consistent with the TPB, behavioural intention was a direct predictor of the behaviour measure, attitude and subjective norm had indirect effects on the behaviour measure through behavioural intention, and perceived behavioural control had both direct and indirect effects on the

behaviour measure. Preacher and Hayes' (2007) bootstrapping analysis showed that the 99% confidence intervals for the indirect effects of attitude, subjective norm and perceived behavioural control on the measure of subsequent behaviour through behavioural intention were 0.082 to 0.386, 0.003 to 0.213 and -0.162 to -0.012, respectively. This confirms that behavioural intention was a significant mediator of the attitude–subsequent behaviour, subjective norm–subsequent behaviour and perceived behavioural control–subsequent behaviour paths at $p < .01$ (i.e., none of the 99% confidence intervals spanned zero).

Testing the PWM

The path analysis testing the PWM can be seen in figure 2. As the figure shows, the total direct + indirect effects of the model accounted for 89% of the variance in the measure of subsequent speeding behaviour. In support of hypothesis 2, this represented a significantly better fit to the data than was provided by the TPB ($Q = 0.39$, $W = 84.40$, $p < .01$).

It can also be seen in figure 2 that both behavioural intention and behavioural willingness were direct independent predictors of subsequently measured speeding, in support of hypothesis 3. However, in support of hypothesis 4, behavioural willingness was a significantly stronger predictor of the behaviour measure than was behavioural intention, $t(392) = 2.06$, $p = .041$, $d = 0.21$.

In support of hypothesis 5, figure 2 also shows that attitude and subjective norm had indirect effects on the measure of subsequent speeding behaviour through both behavioural intention and behavioural willingness. The Preacher and Hayes' (2007) bootstrapping analysis confirmed that the attitude-subsequent behaviour path was mediated by both behavioural intention (99% CI = 0.025 to 0.339) and behavioural willingness (99% CI = 0.095 to 0.451). It also confirmed that the subjective norm-subsequent behaviour path was mediated by both behavioural intention (99% CI = 0.004 to 0.167) and behavioural willingness (99% CI = 0.049 to 0.311).

Finally, in support of hypothesis 6, it can be seen in figure 2 that prototype similarity had an indirect relationship with the measure of subsequent speeding behaviour through behavioural willingness but not behavioural intention. Furthermore, The Preacher and Hayes' (2007) bootstrapping analysis confirmed that the path between prototype similarity and subsequent behaviour was significantly mediated by behavioural willingness (99% CI = 0.115 to 0.408). However, the measures of prototype favourability did not have any effects (direct or indirect) on subsequent speeding behaviour (see figure 2)[3].

Discussion

The aim of this study was to test the PWM in relation to drivers' speeding behaviour using the TPB as a baseline comparator. We hypothesised that: the TPB would account for a significant proportion of the variance in subsequently measured speeding behaviour (hypothesis 1); the PWM would account for a significantly larger proportion of variance in subsequently measured behaviour than would the TPB (hypothesis 2); both behavioural intention and behavioural willingness would have independent direct effects on subsequently measured behaviour (hypothesis 3); behavioural willingness would be a bigger direct predictor of subsequently measured behaviour than would behavioural intention (hypothesis 4); attitude and subjective norm would have indirect effects on subsequently measured behaviour through both behavioural intention and behavioural willingness (hypothesis 5); and prototype (favourability and similarity) perceptions would have indirect effects on subsequently measured behaviour through behavioural willingness only (hypothesis 6).

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[3] We also re-ran the path analysis of the PWM (figure 2) with the interactions included between prototype similarity and prototype favourability perceptions. While these interactions were not required to test the hypotheses, several previous studies of the PWM have modelled them on the basis of the a priori prediction that prototype perceptions are most strongly related to a behaviour when people believe that they are similar to the typical person who engages in that behaviour and when they evaluate that type of person favourably. In this study, however, the interactions did not have statistically significant paths to behavioural willingness, behavioural intention or subsequently measured behaviour. While several studies have found these relationships (e.g., Ouellette et al., 1999; Rivis et al., 2011) other studies have not (e.g., Norman et al., 2007). The conclusions regarding the relationships between prototype perceptions and speeding behaviour (see discussion) are not altered by the analysis of the prototype similarity X prototype favourability interactions.

In support of hypothesis 1, a path analysis showed that the TPB accounted for 72% of the variance in the measure of (self-reported) subsequent speeding behaviour. Consistent with the TPB and previous research on both driving (e.g., Conner et al., 2007; Lheureux et al., 2015; Elliott, 2012) and non-driving behaviours (e.g., McEachan et al., 2011), behavioural intention had a direct effect on the subsequent behaviour measure and attitudes and subjective norms had indirect effects through behavioural intention. Perceived behavioural control had both direct and indirect effects on the measure of behaviour. More important, however, another path analysis showed that the PWM accounted for 89% of the variance in the measure of subsequent speeding behaviour, which was a significantly greater proportion of explained variance than accounted for by the TPB. The findings therefore demonstrate, consistent with the rationale of this study, that the PWM provides a more complete account of driver behaviour that does the TPB.

On a related point, behavioural intention and behavioural willingness were both direct independent predictors of the measure of subsequent speeding behaviour, in support of hypothesis 3. Also, in support of hypothesis 4, behavioural willingness was the bigger predictor of the two. The findings are therefore in line with the notion that driver behaviour is governed by processes that reflect both prior deliberation (i.e., behavioural intention) and reactive decision-making in behaviourally facilitating situations (i.e., behavioural willingness). However, the findings also imply that reactive decision-making is more important in dictating action in the context of driving. This is consistent with the dynamic nature of the driving task in which dictates that reactive decision-making is required to cope with changing environmental demands.

More generally, the finding that behavioural intention and behavioural willingness were both direct independent predictors of the subsequent behaviour measure is consistent with several previous PWM studies in which researchers have focused on other health

behaviours (e.g., Gibbons et al., 1998a, 1998b and 2004; van Lettow et al., 2016). However, unlike these other studies, we did not confound our measure of behavioural intention with measures of behavioural expectations. Given that behavioural intentions and behavioural expectations are both theoretically and empirically different (e.g., Armitage et al., 2015), it means that we provided a more theoretically exacting test of the PWM. Additionally, we tested all of the antecedents of both behavioural intentions and behavioural willingness that are proposed by the PWM.

In support of hypothesis 5, the path analysis of the PWM and the follow-up mediation tests showed that attitudes and subjective norms both had indirect effects on the measure of subsequent behaviour through both behavioural intention and behavioural willingness. These findings are consistent with previous research, which has also shown that these constructs are important antecedents of behaviour in both driving (e.g., Cestac et al, 2011; Cristea et al, 2013; Rivis et al., 2011; Rozario et al., 2010) and non-driving (e.g., McEachan et al., 2011; Rivis et al., 2006) contexts. However, these studies have typically assessed the predictive validity of attitudes and subjective norms using the TPB, which includes behavioural intention and not behavioural willingness as a direct predictor of behaviour, or operationalizations of the PWM that have included measures of behavioural intentions (usually behavioural expectations) or behavioural willingness, not both. As a result, previous research has demonstrated that attitudes and subjective norms can have indirect effects on behaviour through measures of behavioural intentions or through measures of behavioural willingness that have not had the shared variance with behavioural intentions removed. On the other hand, we covaried our measures of behavioural intention and behavioural willingness to ensure that the antecedent constructs (e.g., attitudes and subjective norm) were predicting unique variance. Therefore, the findings of this study not only show that deliberative decision-making (i.e., behavioural intentions) can mediate the relationships

between attitudes and subjective norms, on the one hand, and subsequent behaviour, on the other, but that reactive decision-making (i.e., behavioural willingness) can mediate these relationships too (cf. Elliott et al., 2015b).

Finally, the findings of this study also showed that prototype similarity perceptions independently predicted the measure of subsequent speeding behaviour. In support of hypothesis 6, prototype similarity perceptions had indirect effects on the measure of behaviour that were mediated by behavioural willingness but not behavioural intentions. This finding is consistent with the proposition that prototype perceptions exert an effect on behaviour that is exclusively through reactive decision-making (e.g., Gerrard et al., 2008). However, it is notable that prototype favourability perceptions did not predict behaviour. This finding is consistent with several studies, which also show that prototype similarity perceptions are more important in the prediction of behaviour than are prototype favourability perceptions (e.g., Cestac et al, 2011; Norman et al., 2007; Rivis & Sheeran, 2003; Rivis et al., 2006). One possible reason why prototype favourability perceptions did not emerge as significant predictors of drivers' speeding behaivor is that they were subsumed by prototype similarity perceptions or the other antecedents of behaviour that were included in the path analysis for the PWM. However, that explanation seems unlikely given that the correlations between prototype favourability perceptions and the other antecedents of behaviour were quite low (between -.16 and .27). Instead, a theoretical explanation that social comparisons (i.e., prototype similarity) are more important in shaping behaviour than are social evaluations (e.g., prototype favourability) seems more likely. This idea is supported by research on social identity theory (Tajfel & Turner, 1986) in which it has been demonstrated that the norms of an in-group (e.g., a group that is similar to an individual) serve to guide behaviour independently of whether or not those norms are evaluated positively (e.g., Elliott, 2010; Fielding et al., 2008).

Implications for safety interventions

From an applied perspective, the findings of this study suggest that the PWM is a potentially useful model on which to base interventions to reduce speeding. In particular, attitudes, subjective norms and prototype similarity perceptions would seem to represent good intervention targets because they were independent predictors of behavioural intentions and/or behavioural willingness, both of which, in turn, predicted subsequently measured speeding behaviour. The standard technique for altering these constructs is education, which is provided through media campaigns (e.g., Stead et al., 2004), leaflets (e.g., Elliott & Armitage, 2009) or classroom-based sessions within driver improvement courses (e.g., Stephenson et al., 2010). The participants are encouraged to think about or discuss the reasons why speeding is unsafe, who would disapprove of this behaviour and how to drive more safely (note that similar techniques are used to change other health-risk behaviours). Unfortunately, this approach has rarely been shown to generate behaviour-change (for a general review see Hardeman et al., 2002). Further research is therefore needed to identify effective techniques for changing the constructs that were found in this study to underpin drivers' speeding behaviour. In particular, given that attitudes based on direct experience are known to be stable and reliable predictors of behaviour (e.g., Glasman & Albarracín, 2006), interventions that provide direct experience of the negative consequences of speeding (e.g., driving simulations that allow drivers to experience traffic crashes or near misses as a result of their speeding behaivor) and help drivers disassociate themselves from the prototypical speeder are worthy of investigation.

Methodological Considerations

While this study has important implications for theory and practice, the findings need to be interpreted in light of some methodological considerations. First, a self-reported behaviour measure was used to test to the PWM and self-reported behaviour measures are

often criticised on the basis that they are potentially susceptible to cognitive (e.g., Fulcher, 2003), affective (e.g., Watkins et al., 1996) and self-presentational (e.g., Paulhus, 2002) biases. However, while future research might usefully test the PWM using an objective measure of driver behaviour, the findings are held with confidence on the basis that self-reported and objective measures of speeding correlate highly (e.g., Aberg et al., 1997; Elliott et al., 2007; Helman & Reed, 2015). Additionally, we tested the PWM using the TPB as a baseline comparator and the PWM was found to out-perform the TPB even though a self-reported measure of behaviour was used to test both models.

A second methodological issue that needs to be considered is that a correlational design was used. While correlational designs are commonly employed to test the predictive validity of social cognition models such as the PWM (see Conner & Norman, 2005), they do not allow researchers to draw conclusions about cause and effect. Therefore, while the path coefficients presented in this article are consistent with the causal direction of the relationships proposed by the PWM (e.g., behavioural willingness → behaviour), the direction of causality could be the reverse (e.g., behaviour → behavioural willingness). Alternatively, correlational designs do not rule out spuriousness whereby an observed relationship is attributable to a third (unmeasured) variable. However, experimental research does provide support for some of the theoretically proposed causal relationships that were tested in this study. For example, in a meta-analysis of 47 studies, Webb and Sheeran (2006) showed that experimentally induced changes in behavioural intentions generated changes in subsequent behaviour (i.e., behavioural intentions → behaviour). The occasional study has also shown that changes in attitudes and subjective norms, on the one hand, can generate changes in behavioural intentions, on the other (e.g., Armitage & Talibudeen, 2010; Chatzisarantis & Hagger, 2005). Similar research is needed to establish the causal directions of the other relationships proposed by the PWM.

A third methodological issue that needs to be considered is that the gap between the two time points of the study was relatively short, with the participants completing the behaviour measures approximately one month after the PWM/TPB measures. However, readily repeatable behaviours, such as speeding, are known to be stable over time (e.g., Elliott & Thomson, 2010) and there is evidence showing that behaviours performed over a one month time period tend to persist for much longer (e.g., Armitage, 2005). Additionally, previous studies have shown that the theoretical constructs examined in this research can predict behaviour as measured years later (e.g., Gerrard et al., 2006; Gibbons et al., 2004). It is also worth noting that the aim of the present research was to test the predictive validity of the PWM relative to the TPB and the data that was used to test both models were collected from the same participants at the same time intervals. More generally, the prediction of subsequently performed (self-reported) behaviour should be viewed as a strength of the study (e.g., Randall & Wolff, 1994).

Conclusions

In conclusion, the present study supported the application of the PWM to drivers' speeding behaviour. The PWM was found to be a superior model than the TPB, which has been the most commonly used model to predict driver behaviour. The findings were consistent with the idea that driving is governed by both deliberative and reactive decision-making. They were also consistent with the idea that attitudes and subjective norms are important determinants of both deliberative and reactive decision-making but that prototype perceptions are only important determinants of reactive decision-making. Behaviour-change interventions might usefully target attitudes, subjective norms and prototype similarity perceptions. Further empirical research is needed to develop effective interventions to alter these constructs and to test the causal directions of the relationships proposed by the PWM.

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Table 1. *Means, standard deviations and zero order corrections*

Variable	*M (SD)*	1.	2.	3.	4.	5.	6.	7.	8.	9.
						r (p)				
1. Speeding Behaviour	5.29 (2.47)	–	.57 (.000)	.70 (.000)	.42 (.000)	.43 (.000)	.49 (.000)	.27 (.000)	-.24 (.001)	-.60 (.000)
2. Behavioural Intention	3.31 (2.07)		–	.58 (.000)	.61 (.000)	.40 (.000)	.45 (.000)	.27 (.000)	-.22 (.000)	-.45 (.000)
3. Behavioural Willingness	5.71 (2.43)			–	.52 (.000)	.45 (.000)	.55 (.000)	.27 (.000)	-.16 (.000)	-.56 (.000)
4. Attitudes	4.44 (1.78)				–	.29 (.000)	.35 (.000)	.21 (.003)	-.20 (.006)	-.35 (.000)
5. Subjective Norms	5.77 (1.80)					–	.35 (.000)	.26 (.000)	-.27 (.000)	-.46 (.000)
6. Prototype Similarity	4.39 (1.94)						–	.26 (.000)	-.24 (.001)	-.45 (.000)
7. Prototype Favourability: Positive Attributes	3.74 (1.92)							–	-.26 (.000)	-.11 (.140)
8. Prototype Favourability: Negative Attributes	4.90 (1.88)								–	-.15 (.031)
9. Perceived Behavioural Control	6.25 (2.52)									–

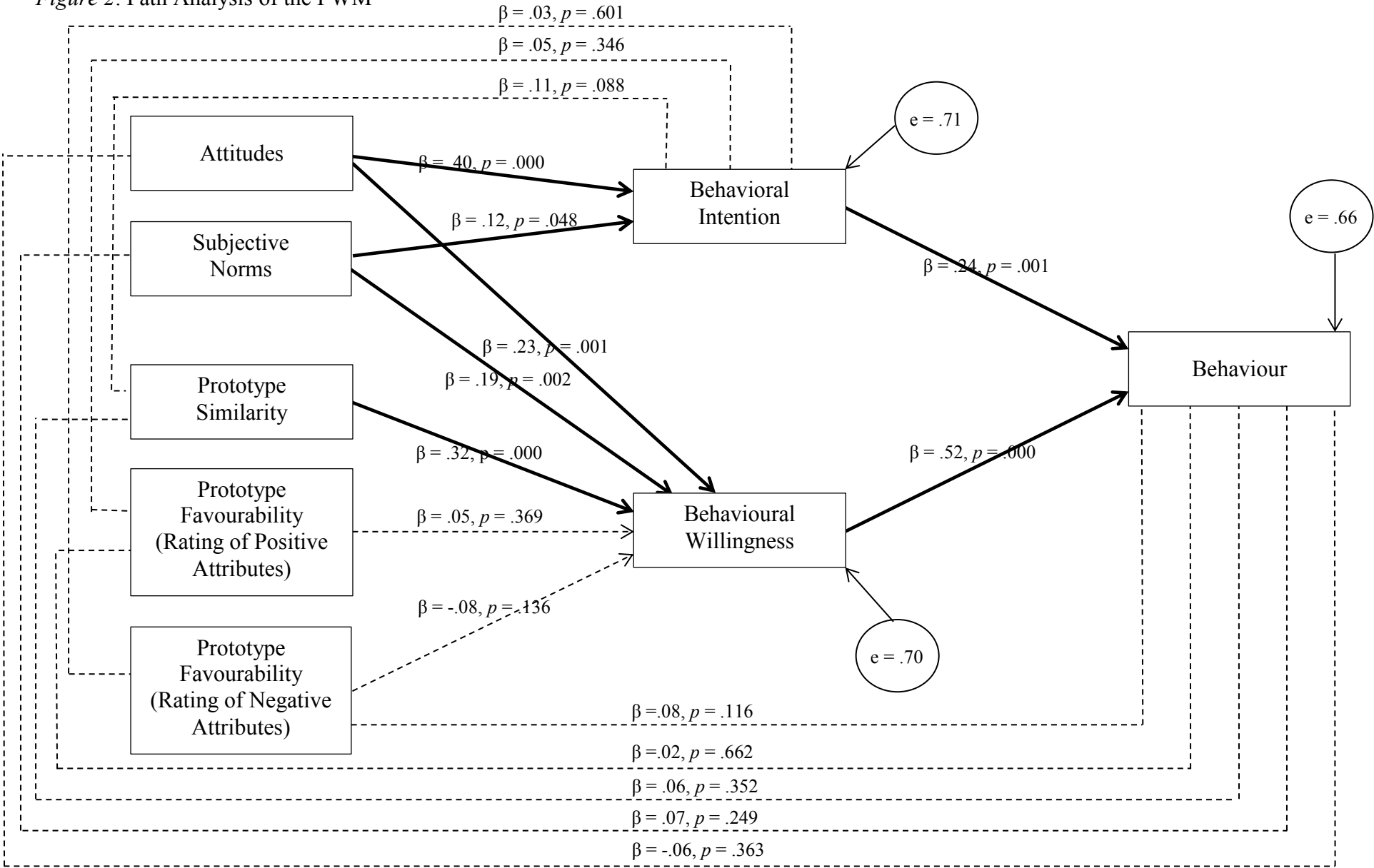*Note*. Scores on each measure ranged between 1 and 9.

Figure 1. Path analysis of the TPB
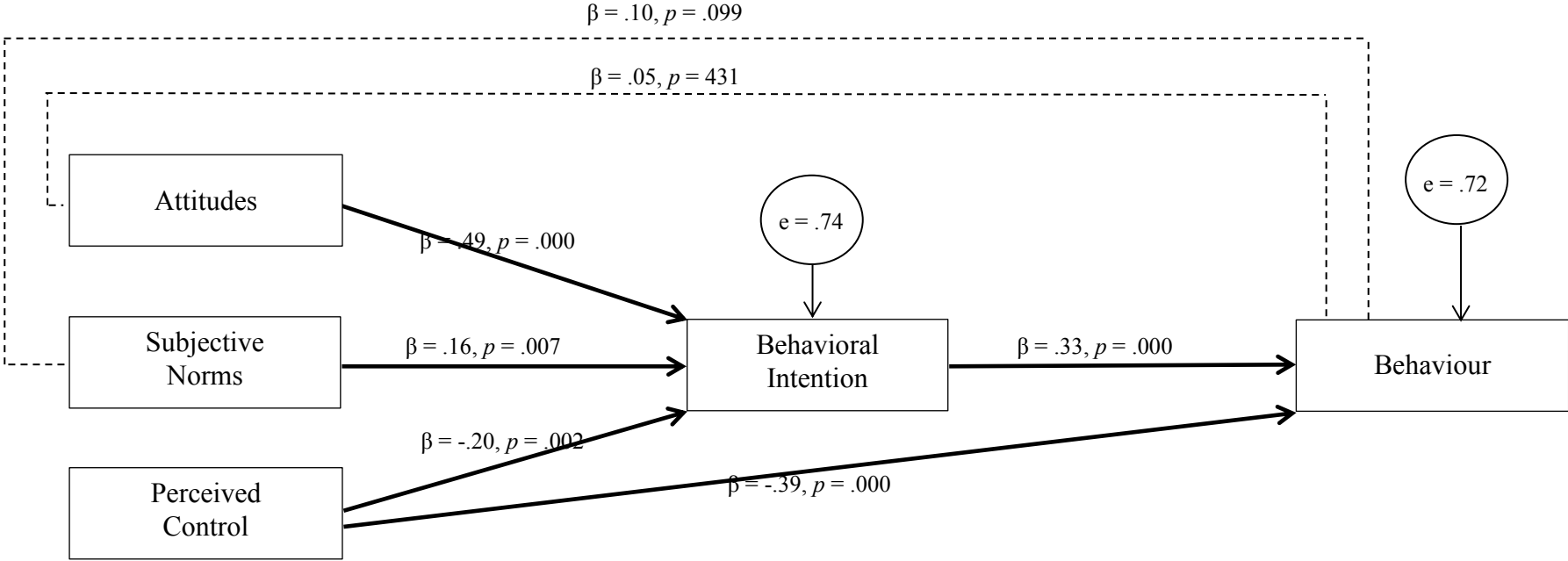
Note. Lines with arrowheads indicate hypothesised relationships. Bold lines indicate significant paths. Dotted lines indicate non-significant paths. Covariances between the predictors of behavioural intention are not shown for presentational reasons only. $R^2_{\text{(total direct and indirect effects)}} = .72$.

Figure 2. Path Analysis of the PWM

β = .03, *p* = .601

β = .05, *p* = .346

β = .11, *p* = .088

e = .71

Attitudes

β = 40, *p* = .000

Behavioral
Intention

Subjective
Norms

β = .12, *p* = .048

e = .66

β = .24, *p* = .001

β = .23, *p* = .001

β = .19, *p* = .002

Behaviour

Prototype
Similarity

β = .32, *p* = .000

β = .52, *p* = .000

Prototype
Favourability
(Rating of Positive
Attributes)

β = .05, *p* = .369

Behavioural
Willingness

β = -.08, *p* = .136

e = .70

Prototype
Favourability
(Rating of Negative
Attributes)

β =.08, *p* = .116

β =.02, *p* = .662

β = .06, *p* = .352

β = .07, *p* = .249

β = -.06, *p* = .363

Note. Lines with arrowheads indicate hypothesised relationships. Bold lines indicate significant paths. Dotted lines indicate non-significant paths. Covariances between the predictors of behavioural intention/willingness and between behavioural intention and behavioural willingness are not shown for presentational reasons only. R^2 (total direct and indirect effects) = .89.