

## **The challenges of predicting speeding behaviour in young drivers**

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The TPB has been promoted as a theory that predicts behaviour across a variety of domains and has been used with road safety behaviours with some success across a number of years. However the intention-behaviour gap is often an issue. This paper presents the results of a study in semi-rural Western Australia that used the TPB to investigate the speeding behaviour of young drivers. Re-analysis of the data reveals some important lessons that provide useful information for other researchers who wish to investigate this behaviour. Seventy three young drivers in the South West of Western Australia completed TPB questionnaires at two points in time: firstly to establish the underpinnings of intention and expectation to speed, and the second to establish the links between intention, expectation, and behaviour. Between 21.5% and 50% of the variance in intention/ expectation was accounted for. Intention/expectation accounted for 17.4% to 19.2% of the variance in behaviour. Analyses using logistic regression revealed rates of behavioural prediction that were sensitive but not specific and these results fit with Sheeran (2002) description of inclined actors, inclined abstainers, disinclined actors, and disinclined abstainers. The TPB needs refinement to account for increased amounts of variance in intention/ expectation and behaviour for young driver speeding. Theoretical issues are discussed and information to increase the relationships amongst the TPB variables is presented. The analysis provides information to improve prediction of speeding behaviour in young drivers.

### **Introduction**

In 2009 in Western Australia, speeding was a factor in 32% of fatal crashes, 12% of hospitalisation crashes, and 11% of other crashes attended by Police<sup>1</sup>. Speed has a direct relationship with crashes<sup>2,3</sup>; and high speed increases the severity of a crash<sup>4,5</sup>.

Younger drivers and young male drivers drive faster<sup>6-8</sup>, males have a greater affinity with and intention to speed than females<sup>9-11</sup>, and when involved in a crash there is a greater likelihood of excess and inappropriate speed being implicated<sup>12</sup>. Therefore it seems appropriate to investigate speeding behaviour in young drivers.

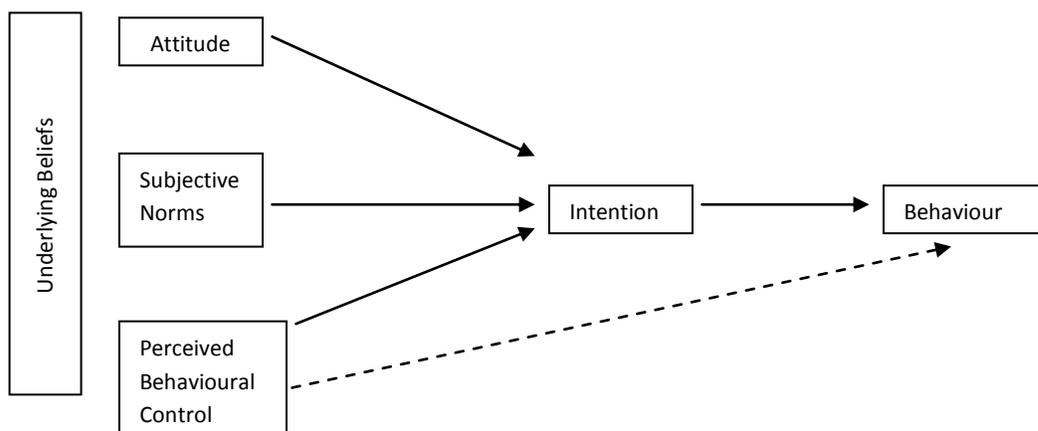
The Theory of Planned Behaviour<sup>13</sup> has been used to investigate and predict intention to speed in a variety of contexts<sup>11, 14-17</sup>; and to a lesser extent to predict speeding behaviour<sup>18-19</sup>. However, one of the benefits of using the TPB is its structure to

investigate data points from the same participant, that is, speeding intention and speeding behaviour. Several researchers have suggested that intention is a good proxy for behaviour, but often the intention-behaviour (I-B) relationship is not strong<sup>20</sup>, unless the intention is strong<sup>21</sup>. Therefore the use of the TPB in a prospective study is warranted.

This paper reports on an exploration of the reasons for poor correspondence between intention and behaviour within TPB research. Using the context of speeding intention and behaviour in young drivers the authors provide information for researchers who plan to use the TPB for such an investigation in an effort to improve their research results. The paper has been constructed as follows. First a brief summary of the TPB is presented; this includes a review of the intention-behaviour relationship. Then the original investigation into the speeding behaviour of young drivers will be reported. The paper will then present the data analysis based on regrouping participants as a result of their speeding intentions and reported behaviour. Finally recommendations to enhance future research using the TPB are presented.

### *The Theory of Planned Behaviour (TPB)*

The TPB shown in Figure 1 indicates that the immediate precursor of behaviour is intention, which in turn is predicted by attitude, subjective norms, and perceived behavioural control. Underlying attitude, subjective norms, and perceived behavioural control are relevant beliefs which can vary within the individual and can provide useful information to generate understanding of a behaviour and underpin potential interventions to change behaviour<sup>22</sup>. Complex synergistic interactions exist among TPB variables<sup>23</sup>, the context, individual or population and across time. The same behaviour investigated in different contexts and populations can produce different results<sup>24 - 26</sup> and additional variables may be added to the TPB to make it context specific<sup>13,27</sup>. In the research reported in this paper, additional variables included moral norm, self identity as a safe driver, and the Deery and Love (1996)<sup>28</sup> driving style scale.



*Figure 1 – Theory of Planned Behaviour (adapted from the literature and Ajzen, 1991)*

### *The Intention-Behaviour (I-B) Gap*

Much of the research using the TPB has focused on the predictors of intention rather than behaviour and this has most likely been as a result of difficulties in obtaining satisfactory I-B relationships which, should in theory exist. A meta-analysis of intention-behaviour experiments revealed that a medium to large change in intention (average effect size 0.66) resulted in a small to medium change in behaviour (average effect size 0.36)<sup>29</sup> suggesting that there is still considerable unaccounted for variance in behaviour. An analysis of intention-behaviour correlations revealed an average of 0.53; and accounted for variance 28%<sup>20</sup> which, when considered in terms of<sup>30</sup> effect sizes is "large" and therefore a good result.

The I-B gap is receiving attention from researchers and progress is being made in developing interventions to reduce the gap. One of these interventions is a form of planning referred to as implementation intentions<sup>31-32</sup> and this intervention has been applied successfully to speeding behaviour<sup>33</sup>. However the I-B gap can result from a range of other reasons. Measurement error is often reported when intention and behaviour are measured by one question only<sup>34</sup> or where intention and behaviour are measured on different scales<sup>35</sup>.

Another reason for the I-B gap is that people do not always do what they have intended to do for a variety of reasons that include a change in beliefs from when intention is expressed to when behaviour is enacted; new information becoming available, lack of compatibility in the questions, lack of congruity in underpinning beliefs or differences in the salient beliefs raised by hypothetical situations tested in questionnaires and the salient beliefs for real life situations<sup>34</sup>. Research has found that the intention-behaviour relationship is moderated by certainty, intention stability, past behaviour, self-schemas, anticipated regret and attitudinal versus normative control<sup>21</sup>; mediated by motivation through different levels of motivation and desire; and affected by cognition through implementation intentions, action control and self regulation. Post-intention measures improve the intention-behaviour relationship<sup>36</sup> which can increase the explained variance in behaviour by between 10% and 18% after accounting for the standard TPB variables<sup>37</sup>. Maximising the intention-behaviour relationship can be improved by appropriate research design, analysis of the behaviour under investigation, the inclusion of implementation intentions (a form of planning), action control, and dimensions of motivation.

Within the domain of speeding behaviour respondents have indicated that their speeding behaviour was 'unintentional'<sup>38</sup> or due to a lack of attention<sup>39</sup>. In such cases, it would be expected that the intention-behaviour gap might be large as these respondents suggested nil intention but undertake the behaviour. Sheeran (2002)<sup>20</sup> proposed four groups that are developed from the I-B gap and describes them as those that intend to act and do (inclined actors); those that intend to act and do not (inclined abstainers); those that do not intend to act and do (disinclined actors); and those that do not intend to act and do not (disinclined abstainers).

### *The original research*

The original research was initially designed to understand and predict the speeding behaviour of young drivers. The participants were young adults from the South West of Western Australia and 73 participants completed the first part of the questionnaire that included TPB measures that underpin intention, with follow up behavioural information received from 65 participants. Sixty two participants were aged 20 years or less at the time of data collection with ages ranging from 18 to 25 years; 64% were male; 45% held a provisional driving licence. The measure used was specifically designed for the research. The content of the measure was based on information from a belief elicitation study<sup>40</sup> and a pilot study.

### *Data analysis and results of original research*

Logistic regression, standard regression, and correlational analyses were conducted to investigate the TPB's usefulness for the prediction of speeding expectation, intention and behaviour. Logistic regression was used where non normal distributions were evident for both intention to speed and speeding behaviour, and as a suitable method for predicting group membership based on intention or non intention to speed (intenders or non intenders). The analyses included a range of models that used the basic TPB variables of attitude, subjective norm and perceived behavioural control and enhanced models that included the TPB variables, plus moral norm, self identity as a safe driver and the driving style scale<sup>28</sup>.

The results indicated a range variability in expectation and intention from 21.5% to 50%, depending upon the model with the most effective model being the model that used expectation as the criterion and included the additional variables, that is the enhanced model. In terms of effect sizes<sup>30</sup> these results indicate medium to large effect sizes. Intention-behaviour (I-B) and expectation-behaviour (E-B) correlations were calculated based on Spearman's correlation as intention and behaviour had non normal distributions. Correlations of .48 (I-B) and .41 (E-B) respectively were found. When examined through logistic regression the models for I-B and E-B indicated accounted for variance of 17.4% and 19.2% respectively, representing medium effect sizes<sup>30</sup>. Comparison with other TPB research<sup>11, 16-18</sup> reveals similarities in results despite different populations, cultures, and time.

Logistic regression provides information on the predictive ability of a scale and ideally produces prediction rates that are both sensitive and specific. In this research, the prediction rates were sensitive but not specific across the analyses. Sensitivity is the proportion of true positives correctly identified by the measure and specificity is the proportion of true negatives<sup>41</sup>. As expectation could not be dichotomized as a result of the scale used, prediction was only assessed for intention and then for the I-B and E-B relationships. These results are displayed in Table one.

When considering results such as these, the researcher needs to consider which is more important, specificity or sensitivity. In this instance is it more important to identify speeders to the detriment of identifying non-speeders as speeders? The classic decisions regarding Type I and Type II error applies here. The data here suggests that

of 100 speeding drivers, approximately 75% will be correctly identified using the intention predictor applied in this research and all non speeding drivers will be misclassified as speeders. However, if the expectation measure is used, of non speeding drivers, only 25% will be correctly classified, and 75% speeding drivers will be correctly classified as speeders.

*Table One*

*Prediction rates for speeding intention and speeding behaviour*

Model	Nil Speeding Prediction Specificity	Any Speeding Prediction Sensitivity
TPB + Additional Variables - Intention	55.2%	81.8%
I - B	Nil	75.4%
E - B	25%	76.9%

### **Methodology for reanalysis of the data**

An analysis of the intention to speed revealed that 29 (40%) participants expressed a nil intention to speed and 44 (60%) an intention (73 participants in total).

When behaviour was measured three weeks later 16 participants (25%) indicated that they had not exceeded the speed limit during the previous three weeks and 49 (75%) indicated that they had. This data is similar to recently reported data<sup>1</sup> in which 73% of young males admitted deliberately speeding.

When intention was cross-tabulated with self reported behaviour at the second data collection it transpired that nine (14%) nil intenders did not report speeding behaviour (the nil/nil group); seven (11%) nil intenders reported speeding (the nil/any group); 16 (24%) intenders reported no speeding behaviour (the any/nil group); and 33 (51%) of those intending to speed reported speeding behaviour (the any/any group). All respondents indicated that they had driven during the behavioural measure period (previous three weeks). Four respondents at the first data collection from each of nil and any intention (eight in total) were not present for the second data collection. This reduced the total number of respondents from 73 to 65. In terms of Sheeran (2002)<sup>20</sup> these groups are described as follows:

Nil intention/Nil behaviour	Disinclined abstainers
Nil intention/Any behaviour**	Disinclined actors
Any intention/Nil behaviour**	Inclined abstainers
Any intention/Any behaviour	Inclined actors

### **Results**

ANOVA was used to determine differences in intention and expectation for these groups with significant differences between the groups being identified for both intention (measured on an open scale)  $F(3, 61) = 13.921, p = .000$ ; and expectation (measured on a scale of 1 – 7 where a high score implied low expectation)  $F(3, 61) = 5.388, p =$

.002. Scheffes post hoc tests for intention revealed that the differences were between disinclined abstainers and inclined actors; and inclined abstainers and inclined actors; with the same group differences found for expectation. This second finding is strange and raises the question of “why would a young driver intend to speed and then not do so?” The answer may be found in qualitative data that had been collected as part of the original research. At the second data collection respondents were asked “Have there been any events in the past three weeks that you think have altered your driving behaviour? If so please detail below”. These comments were categorised as shown in Table two. Reanalysis of the group membership of the respondents revealed that six of the seven respondents identified as inclined abstainers indicated that something had altered their behaviour, with some of these explaining changes in both disinclined actors and inclined abstainers.

*Table two*  
*Categorisation of qualitative comments on behaviour questionnaire*

Comment / category (28 comments)	Number of comments*
Seeing a crash or being involved in a minor crash	8
Speeding ticket/ fines	3
General comments about driving not always related to speed	6
Police presence	2
Running late	4
Completing this survey	3
Effects of Passenger	2

\*Several respondents made more than one comment and some made no comment.

A second ANOVA was used to determine differences amongst the groups on all variables that had been included in the original research. Only the variables that indicated significant differences amongst the groups are reported here.

Significant differences were found for Attitude  $F(3, 61) = 6.561, p = .001$ ; moral norm  $F(3, 61) = 3.592, p = .019$ ; driving style<sup>28</sup>  $F(3, 61) = 4.416, p = .007$ ; Control Question 4,  $F(3, 61) = 4.249, p = .009$ . Scheffes post hoc tests revealed that most of the significant differences were between the disinclined abstainers and the inclined actors and that these differences should be predicted by attitudes, moral norm, driving style scale<sup>28</sup> and control question four “For me to drive faster than the speed limit when travelling to a social event is (easy/difficult)”. For control question four the difference was between nil/any and any/any which is not explained by the trend in the data across the groups and may be an artifact of the small groups in the analysis. For moral norm, differences between disinclined abstainers and inclined actors was not significant (0.053), however

it was decided to retain it in further examination of the data. Table three includes the descriptive data for the variables that indicated significant differences in the ANOVA analyses.

However, the ANOVA results may be affected by non significant differences among disinclined actors and inclined abstainers whom in this research account for 23 respondents (35% of the sample).

*Table three*  
*Descriptive data by group (all measured on a scale of 1 – 5)*

	Nil/nil (n=9)		Nil/any(n=16)		Any/nil (n=7)		Any/any (n= 33)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Attitude	1.74	1.02	2.82	.78	2.58	.99	3.56	1.35
CNL4*	4.44	2.24	3.25	1.61	4.86	1.68	2.82	1.55
Moral norm	2.59	1.42	3.44	1.07	2.86	1.40	4.03	1.42
Deery & Love	2.46	.74	2.83	.69	2.75	.80	3.42	.91

Cnl 4 "For me to drive faster than the speed limit when travelling to a social event is easy/difficult"

To further investigate the data only the nil/nil and any/any respondents were used in a further logisitic regression. This is exploratory and the results must be considered with caution due to low numbers in both groups. As there was direct correspondence between intention and behaviour for this analysis, the results could be applied to either. A logistic regression that included attitude, the significant control question, moral norm and the driving style questionnaire<sup>28</sup> produced the expected result of perfect prediction. However this result does not account for the disinclined actors or the inclined abstainers who collectively represented 35% of the participants.

## **Discussion**

This paper has presented issues for the prediction of driver behaviour and provided an example of the effects of disinclined actors and inclined abstainers on the prediction of speeding behaviour of young drivers when using the TPB. However a limitation on these results is a small sample size, therefore the results are tentative.

There may be a combination of reasons for the lower than expected accounted for variance in intention/expectation and the I-B and E-B relationships in this research. These include measurement issues which may represent the scales which were used to represent the constructs including the compatibility of the measures.

Theoretical issues also may have affected the research, where intention to speed or not speed varied in the three weeks between collection of the intention measure and the behavioural measure. Comments provided by respondents as to what might have affected their driving behaviour were sought and the most affected group were the inclined abstainers. This is evidence of changes between intention and behaviour that cannot be accounted for prior to the research. The positive aspect in this research is

that as a result of asking the appropriate question, some of the variance in the I-B relationship may be accounted for, although it cannot be quantified. Similarly some of the comments made by respondents may account for disinclined actors although the effects for this group are smaller with only three of the 16 participants in this group indicating change.

However, the disinclined actors may be represented by unintentional speeding or intentional due to running late for an appointment. Unfortunately, a question regarding this was not included in the research. However, other research has indicated that there appears to be a considerable amount of unintentional speeding<sup>38</sup> which may occur as a result of inattention<sup>39</sup>. In such circumstances, the prediction of speeding behaviour is compromised. In the current research, 35% of young drivers fell into the categories of disinclined actors, or inclined abstainers and this affected the statistical analysis for the prediction of the behaviour. It is unlikely that any similarly structured research will not have any respondents that fall into these categories.

There are theoretical implications for the TPB in the findings of this reanalysis. The first is that intention cannot be considered a suitable proxy for behaviour as the I-B and E-B relationships are for the most part low. Second, the knowledge of the potential effects of disinclined abstainers, disinclined actors, inclined abstainers and inclined actors on the intention-behaviour relationship should be considered. Asking appropriate questions about potential changes may allow some answers to be provided, the challenge is how to measure these responses to address accounted for variance in the relationship and the effects on rates of prediction. Thirdly, if the TPB is to be developed as a useful theory as the basis for interventions, strategies need to be considered that will reduce the I-B gap. One of the most promising strategies is that of developing implementation intentions which have been applied successfully in the domain of speeding.

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