Theory of Planned behaviour and Young Romanians' Self-Reported Speed

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Abstract—Speeding represents one of the main concerns for road safety and it still is a subject for research. The need to address this problem and to understand why drivers over speed increases especially in Romania, where in 2011, speed was the main cause of car accidents. This article addresses this problem by using the theory of planned behaviour. A questionnaire was administered to a sample of young Romanian drivers (18 to 25 years) and several path analyses were made in order to verify if the model proposed by the theory of planned behaviour fits the data. One interesting result is that perceived behavioural control does not predict the intention to speed or self-reported driving speed, but subjective norms do. This implies that peers and social environment have a greater impact on young Romanian drivers than we thought.

Keywords—speed, traffic safety, theory of planned behaviour, young drivers

I. INTRODUCTION

SPEED represents one of the main reasons of car crashes regardless of driving experience or drivers' age[1] and it is a key factor in traffic safety[2]. The employed speed not only reduces the control of the vehicle but it also increases the odds of having a car crash and it influences the severity of the crash [3].

In their effort to explain and predict drivers' behaviour, including chosen speed, many researchers have used Ajzen's theory of planned behaviour [4]. The theory of planned behaviour represents a modification of Fishbein and Ajzen's theory of reasoned action [5] created in the 80's.

Briefly, the theory considers intentions to be the proximal determinant of actual behaviour, representing the individual's motivation to engage in that behaviour. The motivation is understood as a conscious plan or decision to exert effort to enact the behaviour. Intention is predicted by attitudes towards the behaviour (behavioural beliefs and their importance), subjective norms (perceived social pressure by significant others to engage or to refrain from engaging in that behaviour), and perceived behavioural control (the extent to which the subject considers that he or she can successfully perform that behaviour, that he or she controls it). Perceived behavioural control is the only concept added to the theory of reasoned action following the received criticism and, in contrast to attitudes and subjective norms, is considered to be predictor of both intentions and behaviour.

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The theory of planned behaviour is intensively used in many domains [6] and has proved to be somewhat successful in predicting different behaviours [7]. In 2006, Warner and Aberg [8] examined to what extent drivers' speeding behaviour can be predicted using the theory of planned behaviour. The results were surprising: norms and self-reported speed, but not perceived behavioural control, were significant predictors of actual speed. This result was also found in 1992 by Parker and his colleagues [9] who found that subjective norms are the best predictors of driving violation. The difference between Parker's and Warner's study is that perceived behavioural control remained a predictor of violations.

Other authors report different results. For example direct and indirect measures of the concepts belonging to the theory of planned behaviour were able to predict up to 70% of intention to speed in urban areas and up to 73% in rural areas. Perceived behavioural control was the best predictor in both areas (β=0.48 and β=0.51) followed closely by subjective norm (β=0.26 and β=0.30) [10]. Forward found that attitudes, subjective norms and perceived ease predicted 47% of the intention to speed, the attitudes being the best predictor [11].

As it can be observed, the results obtained by using the theory of planned behaviour are contradictory. There are results indicating that perceived behavioural control is the best predictor [10], others that attitudes make the largest contribution [11] or subjective norms do [8], [9]. In spite of these different findings, the theory remains among those that have proven their capacity to explain and predict a large proportion of variance in speeding behaviour.

One important application of the theory of planned behaviour is in the domain of behavioural change. Researches want to understand the behaviour in order to modify it. In 2009 Elliot proved that perceived behavioural control was the construct influenced by an intervention toward compliance with speed limits, and that the intervention had no effect on attitudes or subjective norms. These findings provided insight to the causal process that generates behavioural change in complying with speed limits (control beliefs – perceived behavioural control - behaviour) and suggested that perceived behavioural control is the construct that should be targeted in interventions [12]. Literand and Delhomme suggested that in targeting behaviours for interventions the researches should consider that, in a given situation, different possible and available behavioural evaluations will interact with each other in determining the adopted final behaviour. It was showed that the intention to exceed the speed limit was predicted by both attitudes and subjective norms.

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Also, perceived behavioural control predicted observing and exceeding speed. Literand emphasised that observing and exceeding speed are two different behaviours [13].

Young drivers' speeding behaviour is a particular area that is given much attention. It is a known fact that young drivers have the highest rate of car crashes [14] and the highest number of deaths among all drivers [15], so understanding their behaviour and the reason why they are involved in so many road incidents is particularly important. In Romania, this problem is extremely sensitive and needs to be addressed. In 2010 in the first 10 months there have been more than 700 severe crashes [16] and the reported fatality rate was 1/3 (one out of three accidents is fatal) compared to the 1/40 mean in EU [17]. In 2008, almost one million speeding tickets were given to Romanian drivers and the mortality rate per million of inhabitants was the highest in Europe (130 deaths/million inhabitants) [17]. In 2011, according to Romanian Road Management [18], 6749 car accidents took place killing 1459 persons and injuring 6399 others. The main cause identified by Romanian authorities was speeding (19% of all accidents).

Moreover, the drivers' behaviour is almost completely unknown, only few researches addressing this particular domain. For example, in 2010, the famous Drivers Behaviour Questionnaire [18] was adapted for the Romanian population [20]. The results indicated that young Romanian drivers' do not perceive speeding as being dangerous considering it as being relatively safe and a minor offence : they do not consider that they should be punished for over speeding nor they would punish other drivers for this offence [21]. Another recent research [22] shows that disobeying a traffic rule generally depends on the usual deviant behaviour of the driver, the irrationality of rule, general disrespect for the laws and low level of perceived risk. Speeding is considered to be risky (M=5.34) but not as risky as overtaking (M=5.78) or running the red lights (5.50) or illegal parking (5.40).

II. METHOD

This study aims to verify if and to what extent the theory of planned behaviour can be used to predict and to explain young Romanian self-reported driving speed. Four path analyses were conducted. Path analysis was chosen because it is a well-established model and many other authors used it before to the same purpose [23], [24].

Each of these analyses were based on the theory of planned behaviour model but differed in the type of self-reported speed employed as measure for actual behaviour. Therefore the first path analysis used self-reported speed in the city, the second one self-reported speed outside the city, the third one the self-reported speed during night time and the fourth one used a computed mean for all three self-reported speeds before.

Each figure presents the initial model tested in the first analysis and the subsequent modifications made in order to improve the goodness of fit indices of the model (if needed). The dashed lines represent paths or variables that were removed during the next analysis. The values represent path and regression coefficients from the first analysis.

If changes appeared in these values during the second analysis, the new values appear between parentheses. If it is not the case, the value remains the same.

A. Sample

The questionnaires were administered to a sample of 184 young drivers aged between 18 and 25 years (mean = 21.89, standard deviation = 2.16). Within the sample 91 subjects were men and 92 were women, 31.9% of them having high school diplomas while 61.9% having college degrees. One hundred and six subjects own cars that range from 45 horsepower to 235 (mean = 97.41, standard deviation = 35.55) and were built between 1990 and 2009 (mean = 2001.78, standard deviation = 4.72). It can be noticed that young Romanian drivers own cars that can be considered new and powerful.

B. Questionnaire

In order to collect the data two questionnaires were used. The first one was built based on Ajzen's recommendations [24]. The questionnaire obtains direct and indirect measures for attitudes, norms and perceived behavioural control. A pilot questionnaire was administered to a sample of 25 young drivers in order to obtain the items for indirect evaluation of attitudes, subjective norms and perceived behavioural control. The indirect measures were obtained through a pilot questionnaire administered to a sample of 25 young Romanian drivers.

The second questionnaire measures self and others reported speed and contains the section with socio-demographical data for the participants. Self-reported speed measures were taken for several situations: driving in the city, driving outside the city (Romania has only one highway, therefore self-assessed speed for this situation was considered to be little representative) and night time driving.

C. Measures

Attitude was computed from indirect and direct measures of attitudes according to Ajzen's recommendations [25]. For direct measures subjects had to evaluate the degree of usefulness, agreeableness, fun and safety for speeding on a Likert scale with four levels ranging from "not at all" to "extremely".

For the indirect measures subjects had to evaluate the behavioural outcomes of speeding and their importance to them on a Likert scale with four levels ranging from "unlikely" to "extremely likely"

Item example: How likely do you think that speeding can lead to saving time spent in traffic?

Subjective norms were computed from direct and indirect measures of norms. Direct measures of norms were obtained with a single item that evaluates general perception of others expectations on speeding (e.g. *Most people expect me to speed*). The indirect norm measures were obtained for two significant groups, parents and peers. The influence of each group was moderated by asking the subject to evaluate the importance of each group opinions on him or her as a person,

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and on him or her, as a driver. The answers were given on a Likert scale with four levels.

Item example: My peers would agree with me speeding.

Perceived behavioural control was computed from direct and indirect measures of control. Direct measures of control were obtained by asking the participants to assess if they could successfully speed. Indirect measures were obtained by assessing the importance of driving experience, the road quality, the weather and the car. The answers were given on a Likert scale with four levels.

Item example: Given your actual driving experience, how difficult do you think it would be for you to speed?

Intention was assessed through a single item asking participants to evaluate their intention to speed in the next week.

Behavioural measures of speed were obtained by self-reports. Subjects were asked to estimate their speed in the city, outside the city and during the night time. Using these three speeds we computed an average speed for each young driver.

III. RESULTS

A. Descriptive statistics

Using the median, car age and horsepower variables were divided into two levels. Median values for both variables were close to their means. Car age was divided into old cars and new cars, the old cars being considered those built before 2002 and the new ones those built after 2002. Concerning horsepower the cars having more than 100 horsepower were considered powerful cars and those below this value as being less powerful.

TABLE I
DESCRIPTIVE STATISTICS

	Mean	Standard deviation	Min	Max
Attitude Direct	2.48	0.51	1.00	4.00
Attitude Indirect	9.06	2.16	3.50	16.00
Attitude	5.77	1.13	3.25	9.25
Norm Direct	1.48	0.55	1.00	3.00
Norm Indirect	7.27	3.22	1.00	16.50
Norm	4.37	1.71	1.00	9.00
Control Direct	2.68	1.03	1.00	4.00
Control Indirect	19.56	6.10	8.50	36.00
Control	22.25	5.95	11.00	37.00
Intention	2.17	0.68	1.00	4.00
Self-Reported speed - City	55.84	11.28	30	90
Self-Reported speed- Outside	90.47	18.43	30	140
Self-Reported speed - Night	77.80	19.21	30	130
Self-Reported Speed	74.70	12.83	33.33	113.33

These variables, together with age, gender, driving experience, having or not having a car; were used to test if there are significant differences in the intention to speed, attitude, subjective norms and perceived behavioural control. The independent tests were insignificant indicating that there are no significant differences in the intention to speed, attitudes towards speeding, subjective norms related to speed

and perceived behavioural control for males or females, subjects aged between 19 and 21 years and 21 to 25 years, possessor's of a car or not, possessor's of powerful or new car or nor or novice or experienced drivers.

Table I presents the descriptive statistics. For most of the variables the means are close to the middle of response range, but not for attitudes. As concerns attitudes; the mean seems closer to the maximum response value possible. Self-reported speeds are in the range of Romanian legal speed limits, but social desirability might affect these data.

B. Path Analysis

The next section will present four path analyses computed in order to test the degree of fit of the theory of planned behaviour to our data. The software used to compute the analysis was AMOS 17 with Maximum likelihood estimation.

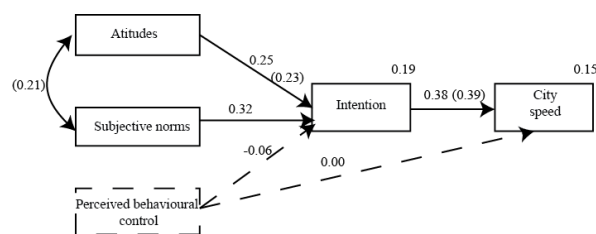Fig 1 represents the first tested model for self-reported speed in the city.

Fig. 1 City speed
- - - - variables or paths removed from the initial model

In table II it can be observed that the initial model for self-reported speed in the city, has obtained a relatively poor fit as indicated by RMSEA and NFI. The value of RMSEA exceeds the upper limit considered acceptable (0.08) and the NFI index is smaller than 0.95

TABLE II
GOODNESS OF FIT INDICES SELF-REPORTED CITY SPEED

	χ^2_{df}	p	NFI	CFI	AIC	RMSEA	χ^2 difference
Initial	19.98 (5)	0.00 1	0.79	0.83	48.89	0.12	
1	0.61 (2) 6	0.73	0.99	1.00	24.61	0.00	19.36 *** (2)

χ^2 - chi square NFI – normed fit index CFI – comparative fit index AI - Akaike information criterion and RMSEA – root mean square estimation .
*** significant at 0.0001

Besides, the negative loading of the perceived behavioural control onto intention and the 0 loading on city speed indicated that there are some misspecifications of the model. A quick review of the regression waits section in AMOS output revealed that perceived behavioural control was an insignificant predictor of intention (0.006, p = 0.400) and of city speed (0.005, p=0.969). In order to address this issue we eliminated the perceived behavioural control variable form the model since it was not significantly connected to any of the other concepts. In order to increase the fit of the model we added a covariance between attitude and subjective norms that was suggested in the modification indices section (modification index = 8.37).

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It can be noticed a significant improvement even if the chi square is no longer significant for the second model.

In the next model, the self-reported speed outside the city replaces self-reported speed inside the city as measure of actual behaviour.
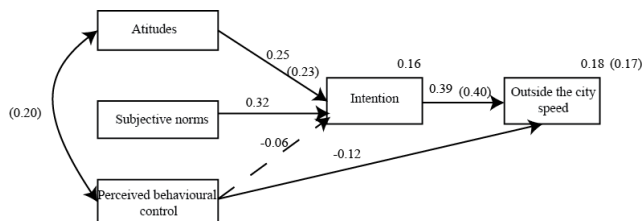

Fig. 2 Outside the city speed
- - - - variables or paths removed from the initial model

Table III presents goodness of fit indices and as it can be noticed the initial model for self-reported speed outside the city has a relatively poor fit as indicated by RMSEA that has a value greater than the 0.08 and the NFI value below 0.95.

TABLE III
GOODNESS OF FIT INDICES SELF-REPORTED SPEED OUTSIDE THE CITY

	χ^2 df	p	NFI	CFI	AIC	RMSEA	χ^2difference
Initial	19.29 (5)	0.002	0.73	0.82	39.29	0.12	
1	12.41 (5)	0.030	0.86	0.91	32.41	0.09	

χ^2 - chi square NFI – normed fit index CFI – comparative fit index AI - Akaike information criterion and RMSEA – root mean square estimation .
*** significant at 0.0001

In fig 2 it can be observed the changes that were made in order to improve the goodness of fit of the model.

The regression waits was examined and it revealed the same problem with perceived behavioural control. Perceived behavioural control was not a significant predictor of intention to speed (-0.80, p=0.400). Consequently the path between perceived behavioural control and intention was eliminated. The modification indices section further suggested a covariance between perceived behavioural control and attitude (modification index = 7.30).

A significant improvement of the modification fit indices can be observed; even if the values are slightly under those considered to be good.

The third path analysis used self-reported night speed as measure for the behaviour.
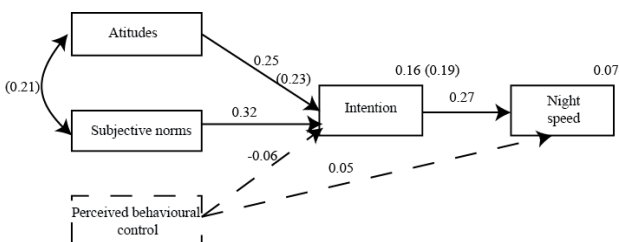

Fig. 3 Night speed
- - - - variables or paths removed from the initial model

Table IV presents the goodness of fit indices and the same poor fitting can be noticed. In order to increase the fit of the model perceived behavioural control was eliminated due to insignificant relations with intentions (-0.84, p=0.400) and with self-reported night speed (0.76 p=0.468). A covariance between attitude and subjective norms was added (modification index = 8.37).

TABLE IV
GOODNESS OF FIT INDICES SELF-REPORTED NIGHT SPEED

	χ^2 df	p	NFI	CFI	AIC	RMSEA	χ^2difference
Initial	23.66 (5)	0.000	0.69	0.71	43.66	0.14	
1	5.82(2)	0.54	0.91	0.93	21.82	0.10	17.84 ***

χ^2 - chi square NFI – normed fit index CFI – comparative fit index AI

As it can be observed in table IV, the goodness of fit indices increased significantly suggesting, as the chi square difference and AIC index, that the second model is more appropriate even if the RMSEA value is not very good.

Finally, the fourth model employs general speed as measure of the behaviour as it can be noticed in fig. 4.
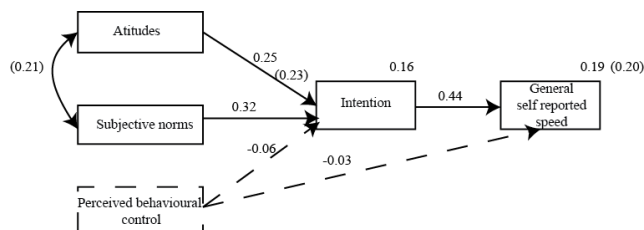

Fig. 4 General self-reported speed
- - - - variables or paths removed from the initial model

It can be observed in table 5 that the goodness of fit indices suggests a relatively poor fit of the model (RMSEA value is over the accepted threshold of 0.80 and CFI and NFI are below 0.95). In order to improve the fit of the model, we added a covariance between attitudes and subjective norms (modification index = 8.37) and we eliminated perceived behavioural control because it was an insignificant predictor of both intention (-0.84, p=0.40) and self-reported speed (=0.46, p=0.64).

A significant improvement of the goodness of fit indices can be observed (table V), and the chi square difference and AIC index highlight that the second model is a better one.

TABLE V
GOODNESS OF FIT INDICES SELF-REPORTED SPEED

	χ^2 df	p	NFI	CFI	AIC	RMSEA	χ^2difference
Initial	19.89(5)	0.001	0.79	0.83	49.89	0.12	
1	1.27 (2)	0.52	0.98	1.00	25.27	0.00	18.62***

χ^2 - chi square NFI – normed fit index CFI – comparative fit index AI - Akaike information criterion and RMSEA – root mean square estimation .
*** significant at 0.0001

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These results highlight that perceived behavioural control is not a good predictor of the intention (Fig 1, 2, 3, 4) or of self-reported speed (Fig 1, 3, 4) while subjective norms are the best predictor of intentions in all the models.

Perceived behavioural control correlates insignificantly with both intentions and self-reported speed in all the cases (city speed, night speed and general self-reported speed) except outside the city speed. The negative correlation between self-reported speed and perceived behavioural control suggests that young drivers with low perceived behavioural control report higher speeds.

Attitudes correlates significantly with subjective norms for self-reported city speed, night speed and general speed (r=0.21) but with perceived behavioural control for outside the city speed (r=0.20) and are the second predictor for intention to speed.

As expected, intention is a significant predictor of self-reported behaviour regardless of the type of speed, having the best value for general speed (β=0.44) and the lowest for night time speed (β=0.27).

The highest percentage explained by our models from the variance of self-reported speed is for the fourth model- general speed (20%) and the lowest for night speed (7%).

The goodness of fit indices is good but could be better for self-reported night speed (especially RMSEA index) and outside the city speed. The main problem is that it was necessary to improve the models by eliminating paths and variables for all the four tested models.

IV. Discussions

Prior studies have shown that perceived behavioural control does not predict intention or actual behaviour [8] and the results from the current study seem to concur to these findings. However, other studies reported perceived behavioural control as being one of the best predictors [10], [11]. There are several possible explanations for this result. This situation might be due to the characteristics of the sample. While many authors used as subjects drivers from the general population, without age limits, in this study only young divers (18 to 25 years) were used. Thirty per cent of the drivers have their driving licence for only one year and 20% for two years. Therefore the young drivers in this sample may not have yet acquired a high level of perceived behavioural control because they are still learning to control the vehicle and to deal with new situations in traffic. Previous research has already shown that young Romanian drivers do not perceive speed as being a dangerous behaviour and do not consider that it is worth to being punished by authorities [21].

One interesting finding was that perceived behavioural control does predict self-reported speed outside the city. Even more, the regression waits is negative meaning that the more the driver has a low perceived behavioural control the more he is going to increase the speed employed outside the city. These results suggest that young Romanian drivers do not have a clear understanding of the risks of speeding.

Another important finding was that subjective norms are the best predictors for the intention to speed. This result may be explained by the fact that young drivers are sensitive to peer pressure but it also might suggest that in Romania a "speed culture" can be identified. Taking into account that drivers perceive speeding as a normal and habitual behaviour, the pressure applied by the significant others to obey the general norm is sufficiently high to overpass individual variables as attitudes and perceived behavioural control.

Fig 4 shows that 16% of all variance in intention to speed is predicted by attitude and subjective norms and intention to speed predicts almost 20% of self-reported general speed. These results are consistent with those of other studies that found intention to be a good predictor of behaviour, even for self-reported behaviour [6].

These findings can have a high impact on the adaptation and implementation of safety campaigns. As stated in the first part of the article, Romania can be considered as being quite far from European countries where prevention campaigns and politics regarding the reduction of car accidents are well articulated and applied. An example of Romanian prevention campaign can be found on the site of Road Management division [26]. Most of the research and knowledge in traffic safety and traffic behaviour domains comes from western societies, where car usage is both larger and older than in post communist countries. In Romania for example, before 1989 there were few drivers, but immediately after the fall of communism the car market exploded. Unfortunately, the interest and the actions taken for traffic safety did not match the speed of this evolution. Moreover, the fact that Romania is still a developing country causes it to invest less money, time and research in traffic safety than other developed countries.

Romanian prevention campaigns would have better results if they would address specific target groups (like young drivers), specific risky behaviours (such as speeding) and would attempt to change attitudes toward speeding or to increase resistance to peer pressure.

This study has a series of limitations. First of all, the sample is quite small and the large proportion of novice drivers (almost 40% of drivers had their license for only 2 years or less) might affect the results. In addition to that, the goodness of fit indices is below those accepted and considered by the scientific community as indicating good fit. Another problem might arise due to self reported measures that were employed. It is a well-known fact that subjects have the tendency to dissimulate the reality especially when sensitive behaviours are targeted. Therefore these data must be interpreted with caution. It is obvious that more research on this topic needs to be undertaken before arriving to clear conclusions.

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