

# Predictors of speeding among drivers based on Prototype Willingness Model

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## Abstract

Speeding is a major contributor of road crashes among young driver and caused 40% of fatal crashes. The purpose of this study was determining predictor of speeding intention among drivers in Ghaemshahr based on Prototype Willingness Model (PWM). In this cross sectional studies 114 young drivers entered in this study with a clustered random sampling from population of urban health care of Ghaemshahr in 2012. Data were collected by using a self-reported questionnaire that contains demographic factors and prototype willingness model constructs. The validity and reliability of the scale were approved. The result showed that speeding intention was correlated to all variables except description of the typical other driving, and regression model explained 63.4% of the speeding intention variance. Determinants of the intention to speeding were mostly past behavior, subjective norms, perceived similarity of the prototype, description of the typical other driving, driving experience and attitude. Also intention, willingness and driving experience predicted the speeding behavior. Results highlight the importance of attitude, normative aspect and driving experience in the speeding intention and these factors used for designing educational program aimed to reduce speeding and road crashes.

**Keywords:** Automobile Driving, Dangerous Behavior, Health Education, Intention

## Introduction

Approximately 1.24 million people die every year on the world's roads, and another 20 to 50 million sustain nonfatal injuries as a result of road traffic crashes. In Iran 23249 people (79% male and 21% female) were killed in road traffic accident in 2010[1]. Road traffic injuries are estimated to be the eighth leading cause of death globally, with an impact similar to that caused by many communicable diseases, such as malaria. They are the leading cause of death for young people aged 15–29 years, and as a result take a heavy toll on those entering their most productive years [1].

Also, according to the national disease burden studies conducted by the Ministry of Health, road traffic crashes are introduced as the main cause of Disability Adjust Life Years

(DALY) [2]. Speeding is a major road safety problem in all countries. Faster driving speeds increase the likelihood of a crash occurring, and the severity of the crash consequences [1] Speeding caused 30% to 45% of fatal crashes in developed countries and 25% to 45% of death in Iran. In other research, road traffic death due to speeding is 40% in Australia, 30% in New Zealand, 30% in Britain and 33% in America [3]. One of the major causes of road accidents is the drivers' behavior on the road. A number of young drivers engage in driving behaviors that are risky either inadvertently or with the intention to take the risk, Perhaps because they tend to be inexperienced and lack of skills to deal with obstacles on road driving situation or have

positive attitude to taking risks [4]. Risky driving is one of the key points in road crashes and many studies have showed an association between several risky driving behaviors especially in young drivers [4]. Speeding, drunk-driving, driving while fatigue, not wearing seat belt are four risky driving behaviors. It is estimated that all fatal crashes occurred in road, 40% involved speeding, 25% involved alcohol use, 16% involved not wearing seat belt, and 18% for drive fatigue [4].

Driving experience is a predictor of speeding in young drivers [5]. The drivers' perceived ability to controlling driving task in terms of the perceived difficulty increases with driving experience and changes according to the driver's transitory states (related or not to driving or not like being in hurry, aggressiveness of other road user, fatigue, mood, etc...). In developed countries, the drivers are aware of the risks associated with speeding like risks of a crashes and fine [6]. They achieved through training education, mass media. Still many drivers continue violating the speed limits because driving fast save time and give them a sense of satisfaction, freedom, internal reward and increased self-confidence [7]. Finally, speeding is the means to compete with others and express own superiority and powerfulness while driving [8]. Low negative feedbacks such as crashes, near-missed crashes, and penalty in drivers may think have a better chance than others to avoid crashes. This phenomenon is called comparative optimism, which has been extensively studied in literature on risk taking [4,8]. It is noteworthy that comparative judgment of the risk is not always optimistic [9].

Sociologists, psychologists and anthropologists have suggested a range of theories and models to explain the factors influencing behaviors.

The Prototype/Willingness model (PWM model) relies on a dual-processing approach and was developed to examine cognitive factors that mediate the effects of environment (social, familial, etc.) on adolescent risk behavior [10,11]. It does this by incorporating two pathways to risk behavior: a social reaction path, consisting of

prototype favorability predicting behavioral willingness (BW); and a reasoned path in which attitudes and subjective norms are antecedents of behavioral intention (BI), as outlined in the Theory of Reasoned Action [12]. In the PWM, normative influence on behavior has been developed, and it is assumed that risky behaviors occur spontaneously in response to a situation that leads to risk. Behavior willingness is the "recognition that one would be willing to engage in the behavior under some circumstances" [13]. Previous studies significantly support the role of constructs PWM model in predicting intention and behavioral willingness in risky behaviors in adolescents. Other studies utilized this model to predict smoking in adolescent, alcohol use in female student, Behavioral willingness in young and older male driver while intoxicated, and speeding in driving. In this studied behavioral willingness and social image can predict speeding in drivers while intoxicated [13,15]. Given that speeding is a one of the main causes of fatal crashes in young people, thus is important to identifying predictors of speeding and find suitable solutions. The review demonstrate a lack of research to predicting speeding in young drivers in Iran, so this present study aimed to examine the predictors of speeding intention among young drivers (19- to 25-years old) in GhaemShahr based PWM.

## Method

In this cross-sectional study, 114 young drivers between 19-25 years were selected by random cluster sampling from 10 districts in GhaemShahr city (based on health center distribution), so twelve people from each district were included. Sample size calculation was based on Tabachnick & Fidell ( $N > 50 + 8m$ ) formula using in multiple regressions, where  $N$  is the number of samples and  $M$  is the number of independent variables [16]. Sample size was estimated 90 people, but finally 120 people entered in the study through cluster sampling. Six participants were excluded because they did not complete the questionnaire, and then 114 participants voluntarily entered in the study (five independent variables in PWM model

included Attitudes, Subjective norms, Perceived Behavioral Control, Intention and Willingness).

They were required to have driven more than 100 k/h in the last year, using a vehicle capable to drove faster than 110 k/h. questionnaire consisted of three parts: The first part was demographic questions including age, education level, occupation, driving experience (including three groups: Those with less than 1 year, those with more than 1 year and less than 3 years and those with more than 3 years of driving experience), and the number of time tickets in the last year. The second part participant had to read speeding scenario based on prototype willingness model, and the third part measured comparative judgment of speeding risk. Content validity of this questionnaire was determined by utilizing seven expert opinions (epidemiologist, health education).

Cronbach's alpha was calculated to determine internal consistency of questionnaire in 20 drivers, The Cronbach's alpha ranged between 0.82-0.65 for different constructs. The questionnaires were completed by the participants in a self-report way. Questionnaires were designed based on the related studies and correspond to their authors, translating, implementing the expert opinion, and then completed by 20 drivers. The second part, participants had to read a scenario on speeding and answer questions based on PWM while imagine themselves in the scenario. The scenario is as follow: You're driving on a straight road with a speed limit of 90 kilometers per hour and traffic is flowing.

Behavioral intention construct was assessed using four questions and participants were asked to report, based on the conditions stated in the scenario, how likely it was for them to "perform the behavior and to "perform the behavior often" and the highest speed at which they intended to drive during the next 12 months when driving in the situation described above. Answers were based on a 5-point Likert scale. Each item could score between 1 and 5, so the whole scale scored 4-20.

To assess the behavioral willingness, participants were answered to questions based on the conditions stated in the scenario, how likely wanted to drive at the speed of 80-90,

90-100, 100-110, 110-120 and more than 120. Likert scale used were ranged from 1 to 5 (not at all to very much). Past Behavior was measure by two questions: According to the conditions described above "how often have you driven at the speed of 110km/h and the highest speed at which they to drive during the last 12 months. Answers to the first question were Likert scale ranging from not at all to very much, and the second question was opened question. Attitude was measured using three questions in which the participants considered driving at 110 km/h in this situation as pleasant, safe and beneficial, Likert scale used were ranged from 1 to 5, so the whole scale score 2-10. Subjective norms were measured by using 6 questions: What extent people around you think you should drive at 110 km/h in this situation and to what extent those people whose opinions are important to you confirm you're driving at the speed of 110 km/h? If the father, mother, brother and friends are in such a condition, how much are they likely to drive more than 110 km/h? The scores of this section ranged 6-30. To assess the Perceived Behavioral Control 3 questions were used among which the first two questions assess self-efficacy and the third one questioned assessed level of control: How easy is it for you to drive at the speed of 110 km/h in the mentioned situations? To what extent are you capable of controlling your driving at speeds higher than 110 km/h? The scores for this section ranged 4-20.

Prototype of the typical deviant in speeding is assessed by three measures: 1- the description of the typical other who adopt deviant behavior, description of the typical driver based on scenario situation while driving at 110 km/h), in this section, participants were describe drivers with character such as shoe off, reckless, irresponsible, dangerous, brave, adorable and artistic. To code the responses, positive perceptions were given high score and negative perceptions were scored in reverse order. Scores of this section ranged 7-35.

2-self description: The second measures included the individual's description of his own driving (self-description) which was assessed with three questions: To what degree do you believe that your driving is in the mode of dramatic, dangerous, and incautious. The score ranges 3-15.

3- The third measures is degree of perceived similarity to the prototype was assessed using one question where participants were asked to express the extent to which they tend to be similar to the assumed driver in the scenario. The answer to all of this section respectively are based on 5-point Likert scale (from not at all to very much). The score ranges from 1 to 5. Thus, total score of this section equals 11-55.

The third part of the questionnaire included comparative judgment of speeding risk. To assess this construct, one item was used that asked to compared themselves to drivers to get a speeding ticket than other same age drivers, likert scale were used ranging 1(higher than others) to 5(lower than others). The collected data were entered into SPSS statistical software version 13, and to analyze the data were used ANOVA, Pearson correlation and linear regression.

## Results

The result showed participant with a (mean age=22.6, SD=1.88), 37.4% of participants held high school diploma and 28.7% had university degrees. Furthermore, 37.4 of them were self-employed, 37.4% were students while 10.4% were drivers. The participants in the study were divided into three groups according to driving experience: 15.7% had driven for less than a year, 28.7 % between 1 and three years and 55.7% three years or more. Also, 64.3% of the

participants had not been any tickets for violations over the past year, 16.5% had been one ticket, 2.6% had been seven times while 16.6 percent between 2 and 6 tickets for violations. In order to assess the correlation between the constructs of PWM regarding speeding, the Pearson statistical correlation test was used. Table 1 showed the correlation, mean, standard deviation variables of PWM.

There was a strong, meaningful correlation between the intention, past behavior and attitude to speeding. However, one should note that the intention to drive faster than the speed limit had a meaningful correlation with all variables except self-description of driving

The statistical test of univariate variance analysis between the number of tickets and the constructs of speeding intention ( $P<0.008$ ), attitude ( $P<0.008$ ), subjective norms ( $P<0.01$ ), perceived similarity with typical deviant driver ( $P<0.005$ ) and comparative judgment of risk ( $P<0.004$ ) showed a meaningful statistical relation. Meanwhile, the driving experience showed a meaningful statistical relation only with the past behavior ( $P<0.004$ ) (Table 2). As shown in Table 3, the multivariate forward regression analysis showed that the total intention to drive faster than the speed limit by using the constructs of Prototype Willingness Model is 63.4%. In the meantime, the role of past behavior was  $\beta=0.67$  more than other variables.

**Table1** Correlation, mean, standard deviation for the PWM measures

Construct	M	SD	1	2	3	4	5	6	7	8	9	10
Willingness	11.48	±2.79	-									
Intention	10.94	±3.9	0.613	-								
Attitude	7.33	±2.87	**	**	-							
Subjective norms	14.96	±4.08	0.625	0.613	-							
Perceived behavioral control	9.66	±3	**	0.495*	0.542*	-						
Description typical driver	25.7	±4.65	0.410	*	*	*	-					
Self-description	5.55	±2.31	0.327*	0.298*	0.362*	0.369*	-0.31	-				
Perceived similarity to typical driver	1.68	±0.99	0.04	0.134	0.69	-0.96	-0.12	-0.15	-			
Comparative judgment of speeding risk	1.86	±0.99	0.143	0.234*	0.15	0.108	-0.12	-0.15	-			
Past behavior	6.27	±2.23	0.278*	0.452*	0.42**	0.288*	0.266*	0.29	0.134	-		
Sensation seeking	11.99	±4.44	*	*	*	*	*	*	*	*	*	*

\*\* $P<0.01$  \* $P<0.05$

**Table2** Mean, standard deviation in PWM by number of time ticket

Construct	Number of time ticket				F	P
	0-1	2-3	3-4	≥5		
	M <sub>±</sub> SD	M <sub>±</sub> SD	M <sub>±</sub> SD	M <sub>±</sub> SD		
Intention	10.34±3.7	13.28±3.6	14	13.85±4.01	4.09	0.008
Willingness	11.21±2.79	12.57±2.87	14	12.157±2.22	1.64	0.184
Attitude	6.9±2.78	8.71±2.97	10	9.85±1.46	4.192	0.008
Subjective norms	14.41±3.89	16.35±4.12	17	19.14±4.18	3.90	0.011
Perceived behavioral control	9.48±3.06	10.21±2.91	10	11±2.30	0.729	0.537
Typical driver description	25.22±4.63	25.14±4.72	25	24.57±5.8	0.420	0.988
Self-description	5.31±2.18	6.42±2.20	5	7.14±3.53	2.192	0.093
Perceived similarity to typical driver	1.53±0.87	2.14±1.35	3	2.57±1.13	0.495	0.005
Comparative judgment of speeding	1.72±0.83	2.57±1.22	1	2.42±1.27	4.690	0.004
Past behavior	16.04±2.25	7.5±1.87	7	6.85±2.11	1.980	0.121
Sensation seeking	11.60±4.48	14.35±3.75	11	12.57±4.43	1.646	0.183

Thus, the past behavior entered the model in the first stage and explains 44.9% of the variance of intention to speeding. Then subjective norms explain 8.1% more variance in the second stage, perceived similarity with typical deviant driver explain 4.8% more variance in the third stage, description of typical deviant driver explain 2.4% more variance in the fourth stage, The fifth step of the regression revealed a significant contribution of driving experience with a 1.8% increase in this stage. Finally the sixth step of regression added 1.5% variance played

key roles in determining the variance of intention to drive faster than the speed limit. As shown in Table 4, in this model past behavior explained 60.8% of the total variance in speeding. The most effective construct is intention to speeding that equals  $\beta=0.68$  and accounts for 44.9% of variance. Then, willingness for speeding with a 10.6% more variance in the third stage and driving experience explain 5.3% more variance, which all played important roles in predicting past behavior in speeding.

**Table3** Regression analysis predicting intention speeding

Predictor	$R^2$	$R^2\Delta$	$\beta$	P	F
1- Past behavior	44.9	44.9	0.67	<0.0001	91.14
2- Past behavior -subjective norms	53.4	8.1	0.572	<0.0001	62.56
3- Past behavior-subjective norms			0.301	<0.0001	
-perceived similarity to typical driver	57.8	4.8	0.523		
			0.25	<0.0001	41.21
			-0.234		
4- Past behavior-subjective norms			0.520	<0.0001	
-perceived similarity to typical driver			0.267	<0.0001	
-typical deviant driver description	60	2.4	0.225	<0.0001	41.21
			0.156	0.012	
5- Past behavior-subjective norms			0.556	<0.0001	
-perceived similarity to typical driver			0.265	<0.0001	
-typical deviant driver description			0.210	<0.001	
-driving experience	62	1.8	0.138	0.024	35.18
			-0.138	0.027	
6- Past behavior-subjective norms			0.488	<0.0001	
-perceived similarity to typical driver			0.207	0.004	
-typical deviant driver description			0.174	0.009	
-driving experience	63.4	1.5	0.145	0.017	30.93
-attitude			-0.138	0.026	
			0.171	0.04	

**Table4** Regression analysis predicting past behavior to speeding

Predictor	$R^2$	$R^2\Delta$	$\beta$	P	F
1- Intention	44.9	44.9	0.67	<0.0001	19.14
2- Intention willingness	55.5	10.6	0.415 0.414	<0.0001 <0.0001	69.22
3- Intention willingness driving experience	60.8	5.3	0.430 0.40 0.23	<0.0001 <0.0001 <0.0001	56.78

## Discussion

The present study aimed to determine the predictors of speeding among young drivers (aged 19-25) in the northern city of Ghaemshahr based on PWM. The study findings showed that the majority of the constructs of PWM had a significant correlation with intention to speeding. From the constructs, past behavior ( $r= 0.673$ ) and attitude to speeding ( $r= 0.613$ ) had a more significant correlation compared to others, which is consistent with the results of other studies. [17,18] This highlights the significance of past behavior in driver's and attitude to speeding. The study found that the number of ticket time had a significant correlation with speeding intention, attitude, subjective norms, perceived similarity with typical deviant driver in scenario and comparative judgment of risk. This was indicative of the negative feedback had on speeding, which is called pessimistic comparison in Gabany's study [8]. The regression analysis in this study predicted intention to speeding explained 63.4% more variance in each stage, which is almost similar to Cestac study. [17] Among the constructs of the theory of planned behavior, attitude and subjective norms had an impact on intention to speeding. In other studies, this constructs of the theory of planned behavior had an effect on the intention speeding [19,21]. Perceived behavioral control had no effect on intention to speeding. These finding were not consistent with the prior research in speeding [22,23]. The contradiction may be due to the fact that nearly half of the participants had less than three years of driving experience and that there is a correlation between driving experience and perceived behavioral control in speeding. In the present study past behavior explained 44.9 % of the variance of the intention to speeding. It has been higher than other variables. This is somewhat higher than usual (by Cestac and Armitage reported

20 % and 7 % of the variance. [17,24]. In other studies past behavior had an effect on speeding intention, which proves that speeding behavior is fixed among young drivers. [20,25]. After past behavior, subjective norms had the strongest impact on speeding intention, which shows better understanding of social pressure on the young drivers' intention to speeding. One should remember that social pressures from peers, friends and family members had positive impact on speeding intention. Howarth's study has also shown the effect of another individual on the speeding intention. [18] We suggest designing plan and programs that focusing on the young drivers' norms on speeding that is consistent with the results of other studies on speeding based on PWM. [15,17,18], After the subjective norm, perceived similarity to typical deviant driver, description of typical deviant driver and attitude had the highest effect on speeding intention, which explain 8.7 % more variance of speeding intention. The description of typical deviant driver and perceived similarity with the typical driver (accordance on the scenario) based on PWM. The model assumes that intention was determined by reasoned component (attitude) and spontaneous element (social reaction) components. This is related to social comparison phenomenon which cannot be assessed in the theory of planned behavior [17,26]. The results of the present study accord with Cestac's research. However, in Cestac's study, self-description, perceived similarity and comparative judgment of risk, which are the constructs of the PWM, had an effect on the speeding intention [17]. The reason behind this may be the role of gender in Cestac's study in which self-description had an effect on women's speeding intention. In the same line subjective norms effected on men intention to drive faster than the speed limit. This shows that fewer

women consider themselves in driving to be reckless and careless when it comes to driving. Many studies have shown that attitude to speeding plays a predictive role with regard to the speeding intention [14,15,21,27]. In other words, positive attitude to speeding will strengthen speeding intention. According to the findings of the study, a positive attitude toward the typical driver (based on the scenario) will increase the speeding intention in young driver. This is consistent with the findings of Cestac's study. [17]. indeed this construct is related to the normative aspect of speeding intention, which completes the concept of social influence in the theory of planned behavior. Social comparison that results from the description of the typical driver has a deep effect on speeding intention among those who have a positive attitude toward the typical driver.

The study found a significant relationship between the mean scores of speeding intention and attitude, perceived similarity with typical driver, comparative judgment of risk and the number of time tickets. Meanwhile, the number of time ticket is higher in drivers who intended to typical deviant driver (according in scenario). A rise in the mean score of speeding intention, attitude and subjective norms will lead to an increase in violation. This judgment is not optimistic and it is compatible with Delhomm's study, which stipulates that if drivers receive few negative feedbacks after committing offenses, they will develop an optimistic view of their driving and feel that they are luckier in terms of having an accident than other people [9]. Todd In a study showed that self-description of alcohol by drinkers had no impact on the intention to use alcohol in girl student mean while self-description in men had a high impact on the intention to drink alcohol [14]. This may stem from the fact that those activities which focus on normative effect have a deeper impact on risky behavior in men compared to women. The present study found that Willingness in speeding is not independent variables that predict the speeding intention on the other hand speeding intention is a planned behavior. While speeding willingness take place spontaneously or without any plan. However, in Ravis study, willingness is predictors of healthy behavioral protective in

adolescent [15]. The reason for the difference is the participants in this study was 19 to 25 years old, and in lower ages, people mainly use social reactions.

Finally in this study driving experience increased speeding intention and past behavior. This is compatible within young drivers. It is also explained by both the real and perceived ability driving skill, which improves over the initial years of driving and lack of negative feedback (crashes, penalty) due to violations. Both of these factors can change one's perception of risky behaviors [22]. Also, driving experience increased with higher level of past behavior that improved driving skills and ability to control risky driving situations thus it will lead to increase in speeding intention [28]. The results of this study is consistent with Cestac's research that in Cestac study, analyzing speeding intention with driving experience and showed sensation seeking was strong effect among novice (drive less than one year), normative aspect (perceived similarity typically deviant driver, self-description) impact beginner (drive between 1-3 years) and perceived behavioral control impact among more experienced driver (drive more than 3 years) [17].

The findings of the analysis of regression explained 60.8 % total variance on predicting past behavior and increases significantly at each stage. This result is slightly higher than Eliotte's study (51%). In Eliotte's study, the TPB was used for predicting speeding behavior [22]. In this study, intention is the strongest predictor of past behavior that explain 44.9% of the variance of past behavior which consistent to Eliot's study [22]. After intention, willingness is the strongest predictor of past behavior that explains 10.6% of the variance of past behavior. Willingness is one of the perceptual determinants of behavior and considered regardless of intention. That is compatible with Hukkelberg's study on predicting smoking behavior among adolescent [27]. Although people make plans for engagement in a particular behavior but may be ready to take risks under some circumstances. In this case, willingness will lead to behavioral risky intention. Those who take risks have a favorably images of risky behavior and their cognitive factor

(perceptions) will lead to behavioral willingness and risky behavior [28]. Some limitations of the current study are the relatively small sample size (drivers between 19-25 years) and inadequate cooperation with the researcher. We recommended that study be conducted in a larger community with more samples.

### Conclusion

The findings of the present study showed that the PWM Model is appropriate framework in understanding and predicting speeding intention and behavior among young drivers. Given the fact, population of drivers between 19 - 25 years old accounts a high proportion of the people who are killed in road crashes; they are ready to take more risks than do older drivers. For this reason, young drivers are a top priority for preventing road crashes with the aim of changing driving behavior. Therefore, in order to maximize the impact those programs, we need to understand the processes lead to risk taking on roads. Coercive measures like using speed cameras or issuing tentative driving licenses (one year of validity), which currently exist, are not sufficient to prevent speeding in young drivers. We need to also identify motivational processes to keep to moderate speeds that are basic principles of speeding among drivers. Speeding intention and willingness as well as driving experience are capable of predicting driving behavior. It should be noted that intention and willingness with regard to driving are influenced by some situations because driving is both planned (intention) and without any plan (willingness). Considering the effect of driving experience on speeding behavior, intention has more impact on speeding behavior among experienced drivers and willingness has more effect among novice driving behaviors. Hence, we should put emphasis on normative aspect of this model that effect on willingness (involuntary). It is worthy that educational programs put in adolescent and teenagers to reduce consequence of speeding behavior. To achieve the best results, emphasize on road safety campaigns, driver training based on motivational processes that affect speeding.

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### Contributions

Study design: MC, MM

Data collection and analysis: MM

Manuscript preparation: MC, MM, SA

### Conflict of interest

"The authors declare that they have no competing interest."

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