CAUSAL MODEL OF MOTORCYCLIST HELMET USE BEHAVIOR IN IRAN: PLS- SEM APPROACH

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Abstract- Despite the cumulating evidence regarding the effectiveness of helmet use by motorcyclists in reducing fatalities and severe injuries, helmet usage remains low among Iranian motor riders. In fact, Iran has the fifth highest road traffic fatality rate across the world. However, identifying the factors affecting the use of helmets by motorcycle riders is of great interest, due to the increasing number of 2-wheel motorized vehicle fatalities worldwide. This study examines the factors affecting motorcyclist helmet usage, such as age, social norms, tendency for violation, difficulty in helmet use, and the number of fines issued for failed helmet use. For this purpose, a comprehensive questionnaire was developed with three questions about helmet usage (i.e., just carrying a helmet, just wearing a helmet without closing the helmet strap, and correct use of a helmet). Using a face-to-face interview method, 220 questionnaires were completed by motorcyclists. The data were analyzed with the partial least squares structural equation model (PLS-SEM) approach. The result of the total effect of age variable showed positive effects of 0.12 on the complete use of helmet with increasing the age. The social norms latent variable (being reflective of public views toward helmet usage, as well as encouragement by family and friends) had a great reducing effect on both the tendency for violations and the difficulty of helmet usage, with total effect of 0.33 on the correct use of a helmet. Furthermore, the effect of the number of fines was positive on both ―just carrying a helmet‖ and ―wearing a helmet without closing the strap,‖ while it had a negative effect on ―correct use of a helmet.‖

Keywords- Helmet use, Motorcyclist behavior, Safety, PLS-SEM

I. INTRODUCTION

Iran, with 34.1 fatalities per 100,000 populations in 2010, is the fifth highest country in the rate of road deaths. According to Iran's death registry system, nearly 6,000 motorcyclists die annually due to traffic injuries, which accounts for 23% of traffic fatalities in Iran (RTIRN, 2010). Injuries that are more severe tend to occur on rural roads, with 60% of deaths, as compared to urban roads. 80% of injured riders are men, and 20% are passengers of which only 5% are females. Risky drivers aged 18-35 account for 60% of deaths, while many drivers have no education and about 9% of them are underage to have a driver's license. Two-thirds of injuries are due to head injuries (RTIRN, 2010).

Motorcyclists are more vulnerable to injury in traffic crashes than other drivers, and the head is one of the areas most subjected to fatal injuries. Head injuries occurred in 66.7% of the cases in the COST database (COST, 2001) and the majority of these injuries were severe (Fernandes and Alves, 2013). Safety helmets reduce the severity of motorcyclists' accidents and result in a roughly 40% decreased death risk (Keng, 2005, Savolainen & Mannering, 2007). Since the 70s, various projects and legislation have begun to promote the use of helmets in different countries (Kraus et al., 1995). In Iran, since 2001, it is forbidden to ride a motorcycle without a helmet. However, available statistics still indicate a low rate of helmet use (30% among drivers and 10% among passengers in 2010), (WHO, 2010), (Zamani-Alavijeh et al., 2011; Mehri et al., 2011). Due to the limiting effects of helmet use on audiovisual ability (Hung et al., 2008; Li et al., 2008; Aghamolaeai et al., 2011; Ranney et al., 2010; Orsi et al., 2012), heaviness (Li et al., 2008), and feelings of warmth, (Orsi et al., 2012) Motorcyclists refuse to use helmets. Social norms (Ranney et al., 2010) and beliefs regarding the helmet-use of their friends and relatives (Fuentes et al., 2010) may also be a major obstacle to helmet use by motorcyclists. Several studies have shown that risky behaviors of motorcyclists are a definite factor in the avoidance of helmet use (Ranney et al., 2010; Hung et al., 2008). The impact of travel characteristics like trip length (Hung et al., 2008; Ambak et al., 2010), trip rout (Hung et al., 2008; Li et al., 2008), and urban and rural environment (Ambak et al., 2010; Skalkidou et al., 1999; Yannis et al.,2012) have been studied in many previous reports; however, these studies have not yielded the same results. Motorcyclists during winter (Zamani-Alavijeh et al., 2011; Gkritza, 2009), weekdays (Skalkidou et al., 1999; Li et al., 2008), and early morning hours (Conrod et al., 1996; Gkritza, 2009) are more likely to use helmets. Much research has shown that people who are older in age, have higher educational degrees, have more riding experience (Aghamolaeai et al., 2011; Arosanyin et al., 2012; Ranney et al., 2010; Ambak et al., 2010), and

who got injured while riding (Hung et al., 2008; Ranney et al., 2010; Aghamolaeai et al., 2011; Orsi et al., 2012; Kulanthayan et al., 2000) are more likely to use helmets. Additional research on important factors such as the level of police presence, penalties, and the perception of law enforcement is needed (Aghamolaeai et al., 2011; Zamani-Alavijeh et al., 2009; Hung et al., 2008; Li et al., 2008). Also analyze the impacts of motorcycle-exclusive lanes on motorcyclist psychology and risky driving behaviors shows that neglecting to wear a helmet was most common on paved shoulders (Sukor and Fuji, 2011). A summary of factors considered by previous studies as a barrier and facilitators in wearing helmet by motorcyclists is reported in Table 1. Structural equation models (SEM) also shows that at least part of the reason why helmet laws do not appear beneficial is that they disproportionately discourage the safest cyclist (fyhri, Bjørnskau and Backer-Grøndahl, 2012). Another study shows that gender, years of education, consumption of high concentrated alcohol, and time of day when riding occurred, were significant predictors of the frequency of self-reported helmet use. It also concludes that continuous education programs and intensification of law enforcement, particularly at night hours, may be effective in increasing helmet use (Papadakaki et al., 2013). Previous research shows the effectiveness of helmet use in reducing fatalities and the severity of injury in road traffic accidents by motorcyclists, but the helmet usage rate is still low for some developing countries. Hence understanding the mechanism of motorcyclist's behavior regarding to helmet use is a great interest which can saves more life in high rate accident fatality countries like Iran. However, according to our research, there is little effort in literature to determine the causal factors influencing the use of helmets among motorcyclists. The aim of this study is to determine factors affecting motorcyclist helmet use, with the use of partial least squares structural equation modeling (PLS-SEM).

Table 1- A summary of important barrier and facilitators in significant previous studies toward wearing Helmet

Researchers	Barriers						Facilitators						
	Audiovisual ability	Heaviness	Feeling Warmth	Social norms	Beliefs	Risky behavior	Age	Education	More Riding	Got Injured	Weekday	Early Morning	Winter
Orsi et al., (2012)	✓		✓							✓			
Aghamolaeai et al., (2011)	✓						✓	✓	✓	✓			
Ranney et al., (2010)	✓			✓		✓	✓	✓	✓	✓			
Hung et al., (2008)	✓					✓				✓			
Li et al., (2008)	✓	✓			✓						✓		
Fuentes et al., 2010					✓								
Skalkidou et al., (1999)					✓						✓		
Zamani-Alavijeh et al., (2011)													✓
Gkritza, (2009)												✓	✓
Conrod et al., (1996)												✓	
Arosanyin et al., (2012)							✓	✓	✓				
Ambak et al., (2010)							✓	✓	✓				

II. MATERIAL AND METHODS

2.1. Data Collection

This study examines factors that might be significant in helmet use. The questionnaire is designed in accordance with social norms of Iran and was supposed to be used for the face-to-face interview of motorcycle drivers. The targeted population was motorcyclists over 18 years old in the city of Mashhad in northeast Iran. Motorcycle repair shops were chosen as interview sites in this study and the best effort was made to ensure that a random sample was selected by surveying a wide variety of repair shops and different age groups. A total of 222 motorcyclists were interviewed in February 2013 in which two of them eliminated due to refuse of respondents during survey. The questions consist of socio-economic characteristics of motorcycles as well as their attitudes toward wearing helmet. The summary of attitude questions toward wearing helmet used is reported in Table 2.

Table 2. Summary of Questions in Questionnaire

Main Subject	Questions (Number)	Scoring
Difficulty in helmet use (DHU)	Visual and hearing abilities (1)	1=completely disagree 3=completely agree
	Helmet in hot weather in summer (2)	1=completely disagree 3=completely agree
	Holding and keeping helmet (3)	1=completely disagree 3=completely agree
Social norms (SN) (Attitude toward helmet use)	Attitude of persons in your living area (4)	1=abnormal 3=perfectly normal
	Attitude of your family members (5)	1=abnormal 3= perfectly normal
	Attitude of your friends (6)	1=abnormal 3= perfectly normal
Tendency for violation (TV)	Moving in opposite direction in one-way street (7)	1=never 3=usually
	Speaking on cell phone while driving (8)	1=never 3=usually
Number of fines	Number of fines because of no helmet use? (9)	Times within year
Just carry helmet (JCH)	How many times do you carry your helmet, out of 10 trips with your motorcycle? (10)	0=never 10=always
Wearing helmet without closing strap (WHWCS)	How many times do you wear your helmet without closing the strap, out of 10 trips with your motorcycle? (11)	0=never 10=always
Correct use of helmet (CUH)	How many times do you wear your helmet with a closed strap, out of 10 trips with your motorcycle? (12)	0=never 10=always

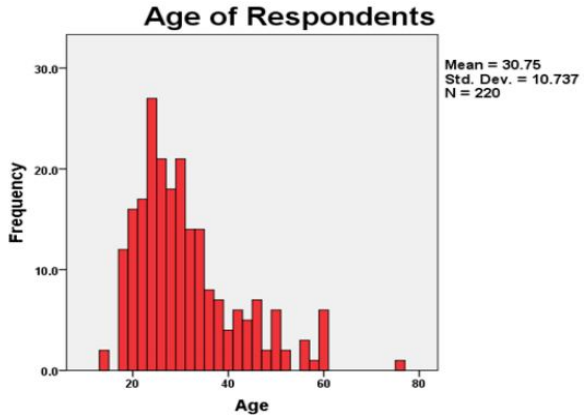
*: The symbol is represented for descriptive analysis of each questions represented in Table 2.

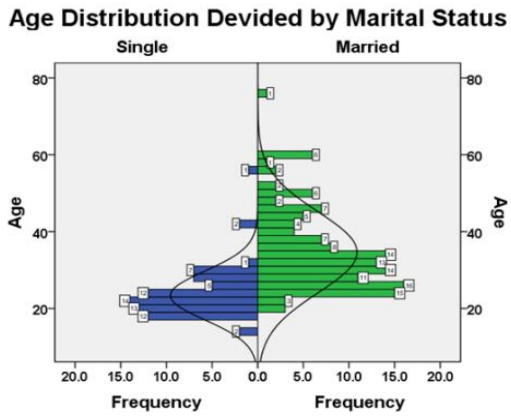
Some important socio-economic characteristics of respondents were (see figure 1):

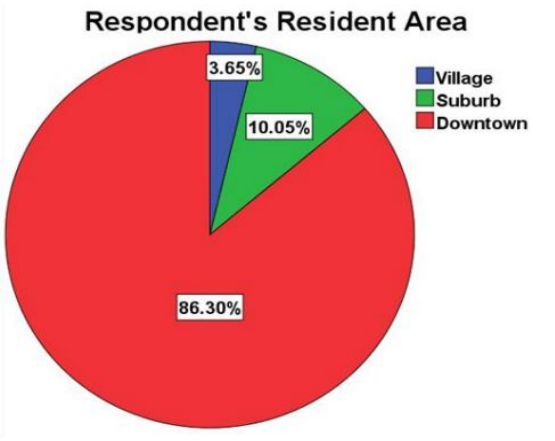
- 65.45 % of motorcyclists were married (all respondents were male)
- 47.73 % of the motorcyclists had only guidance school degree and just 6.82% of them had bachelors and higher educations
- 86.30% of respondents were living in downtown
- 87.56 % of motorcyclists were self-employed and 83.64% of them using motorcycle for work related business
- The average income was 542,800 Tomans

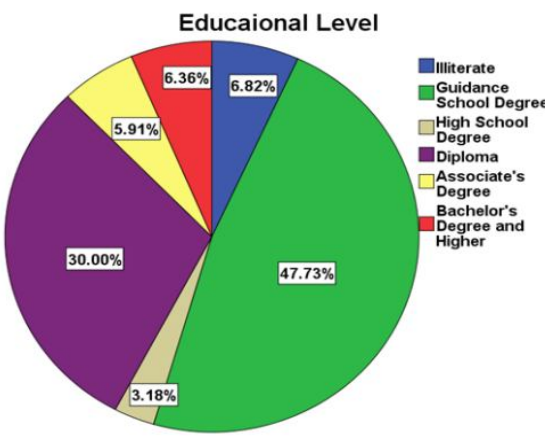
Respondents were asked about their perceptions toward wearing helmet and their behavior in riding motorcycle (see figure 2). The results shows that 36.53 % of motorcyclists are completely agree that safety helmet cause a difficulty in visual and hearing abilities of them. 23.04 % reported that using helmet is completely difficult in hot summer days and 39.27 % believed in difficulty of holding and keeping helmet.

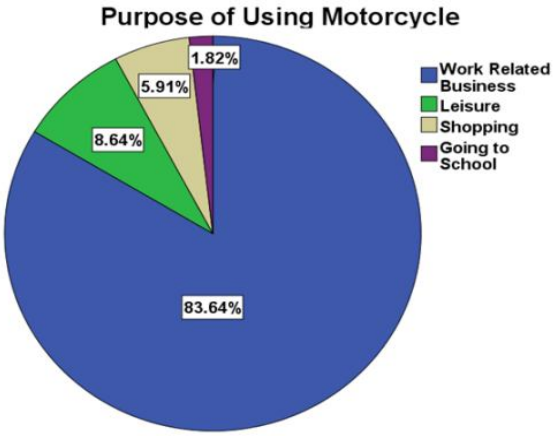
16.97 % of respondent's friends had abnormal attitude regarding wearing helmet while it was 13.64 % and 2.28 % among respondent's living area persons and family members respectively. The results also shows that 30.91 % of motorcyclists usually moving in opposite direction in one way street while 23.18 % of them usually speak on cell phone while driving.

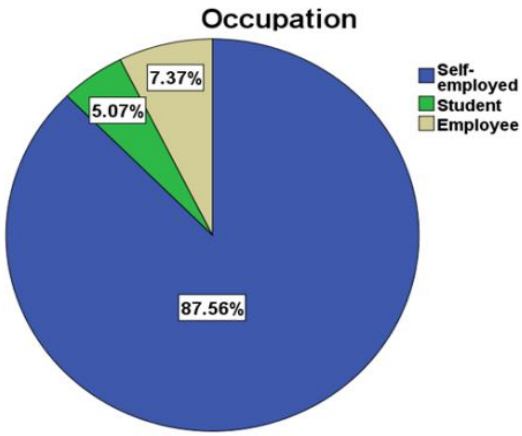












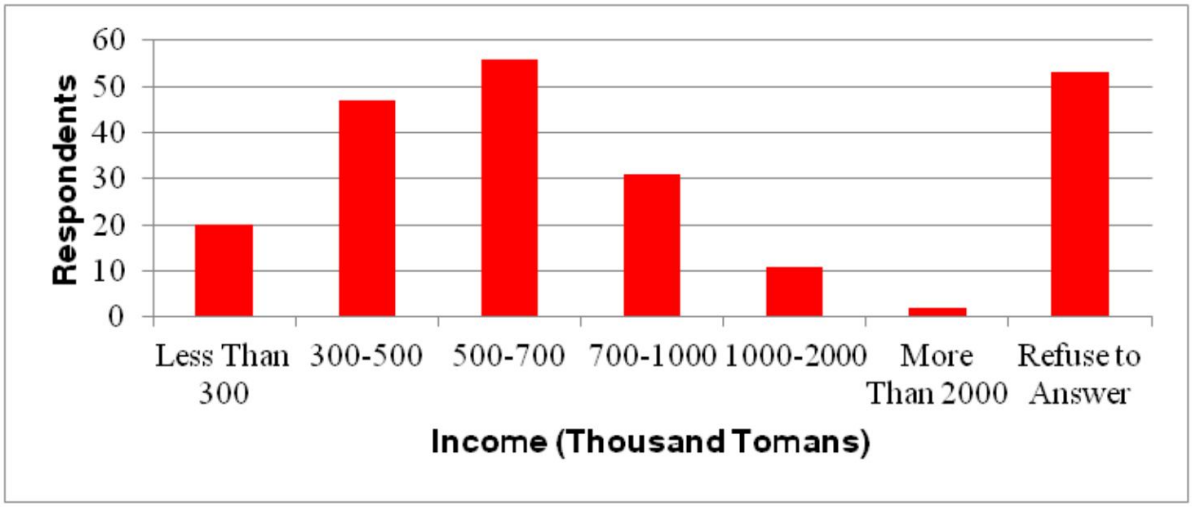
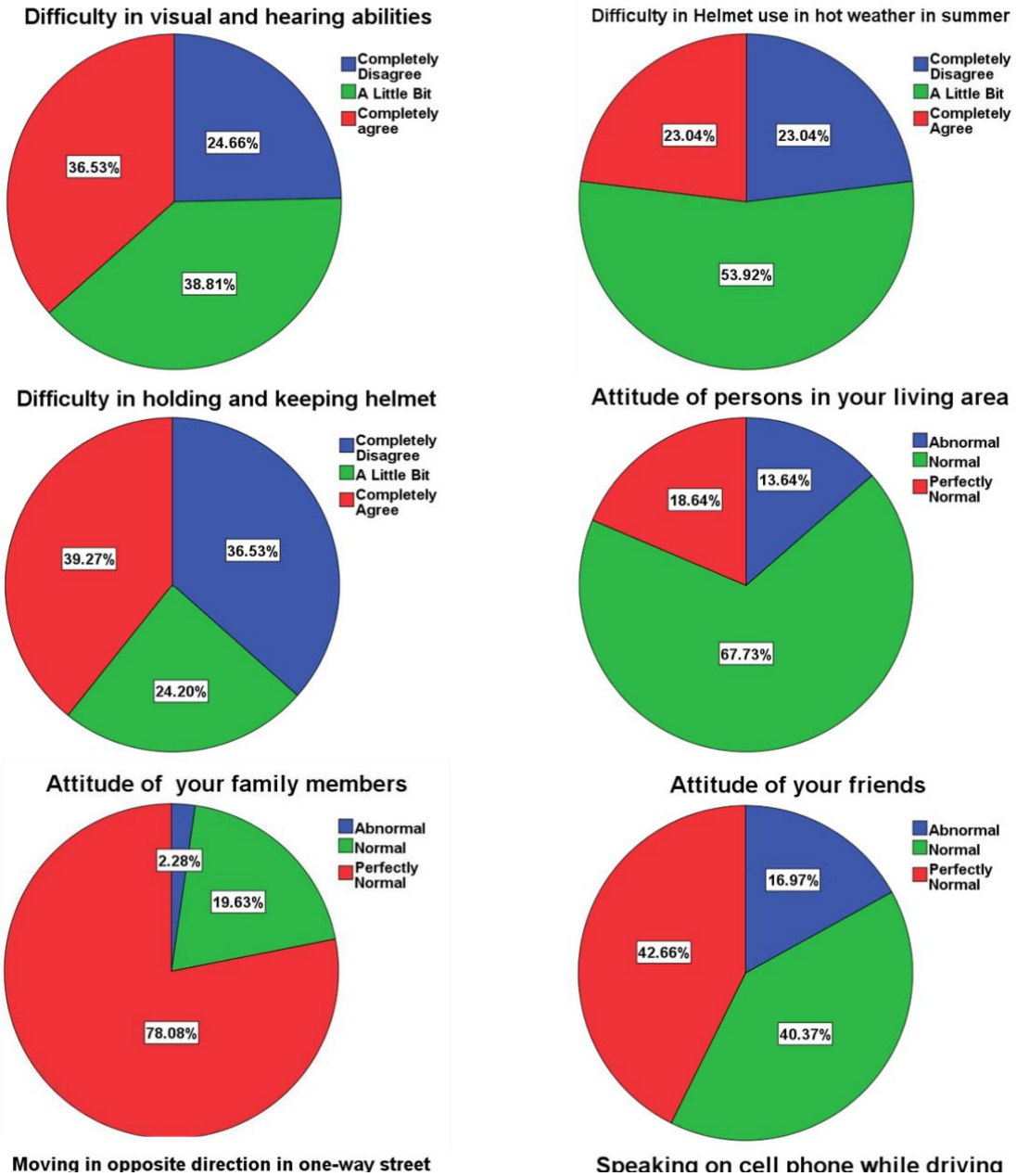


Fig. 1. Some important socio-economic characteristics of respondents



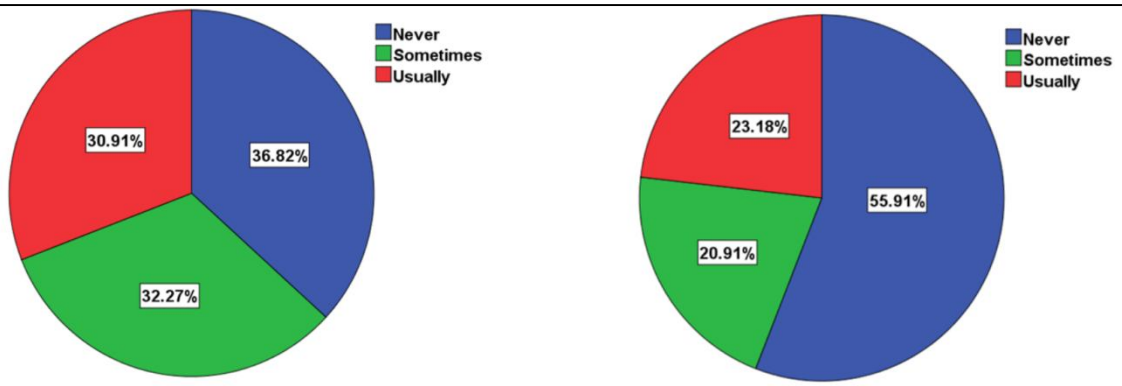


Fig. 2. Perceptions about wearing helmet

Some descriptive statistics of the sample is presented in Table 3, in which the number of valid cases list-wise is 195 cases. The skewness of each observed variable is also reported, which shows that the distribution of some variables is skewed.

Table 3. Descriptive statistics of the sample size

Questions Number	Valid Number	Minimum	Maximum	Mean		Variance	Skewness	
	Statistic	Statistic	Statistic	Statistic	Deviation	Statistic	Statistic	Deviation
1	219	1	3	2.12	0.052	0.601	-.209	0.164
2	217	1	3	2.00	0.046	0.463	0.000	0.165
3	219	1	3	2.03	0.059	0.761	-0.053	0.164
4	220	1	3	2.05	0.038	0.322	0.010	0.164
5	219	1	3	2.76	0.032	0.230	-1.823	0.164
6	218	1	3	2.26	0.049	0.533	-0.440	0.165
7	220	1	3	1.94	0.055	0.677	0.110	0.164
8	220	1	3	1.67	0.056	0.687	0.675	0.164
9	200	0	900	26.14	6.169	7610.419	6.642	0.172
10	220	0	10	5.39	0.292	18.695	-0.110	0.164
11	220	0	10	4.74	0.282	17.483	0.147	0.164
12	220	0	10	4.60	0.323	22.990	0.159	0.164
Age	220	14	75	30.75	0.724	115.291	1.219	0.164

2.2. Methodology

This paper modeled motorcyclist's helmet use behavior with PLS-SEM approach. Conceptually and practically, PLS-SEM is similar to using multiple regression analysis. SEM has two components. The first component is the structural model, typically referred to as the inner model in the PLS-SEM context, which shows the relationships (paths) between latent constructs. PLS-SEM only permits recursive relationships in the structural model (i.e., no causal loops). Therefore, the structural paths between the latent constructs can only head in a single direction. In the structural model, we distinguish between exogenous and endogenous constructs. The term exogenous is used to describe latent constructs that do not have any structural path relationships pointing at them. Thus, the term endogenous describes latent target constructs in the structural model that are explained by other constructs via structural model relationships (Hair et al. 2011). The second component of SEM is the measurement models, also referred to as outer models in the PLS-SEM context. The measurement models include the unidirectional predictive relationships between each latent construct and its associated observed indicators, as shown in Figure 3. Multiple relations are not permitted; therefore, indicator variables are associated with only a single latent construct. PLS-SEM can handle both formative and reflective measurement models. Reflective indicators are seen as functions of the latent

construct, and changes in the latent construct are reflected via changes in indicator (manifest) variables. Reflective indicators are represented as single-headed arrows, pointing from the latent construct outward to the indicator variables; the associated coefficients for these relationships are called outer loadings in PLS-SEM. In contrast, formative indicators are assumed to cause a latent construct, and changes in these indicators determine changes in the value of the latent construct. Formative indicators are also represented by single-headed arrows, but pointing toward the latent construct inward from the indicator variables; the associated coefficients for these formative relationships are called outer weights in PLS-SEM (Hair et al. 2011).

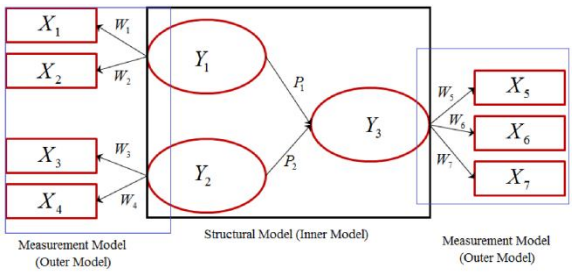


Fig. 3. Simple path model example

It is important to mention that the inner model is like the simultaneous equation modeling method, while the outer model is the same as factor analysis. These characteristics allow PLS-SEM to handle indirect and multiple relationships and to study reverse relationships. Because of these characteristics, PLS-SEM is particularly adequate for modeling the complex relationships between motorcyclist behavior and helmet wearing use. The method is especially useful in identifying the direct impact of one variable on another, as well as the variable's possible impact through a mediator (latent variable). In behavioral analysis, PLS-SEM is becoming popular as a modeling method because of its ability to simultaneously estimate several endogenous variables and to include latent variables without any assumptions on sample data. In this way, PLS-SEM is particularly suited to model indirect and non-recursive relationships (Hair et al. 2011). The equation of SEM models can be written as follows:

$$x = \Lambda_x \xi + \delta \qquad (1)$$

$$y = \Lambda_y \eta + \varepsilon \qquad (2)$$

$$\eta = \beta\eta + \Gamma\xi + \zeta \qquad (3)$$

The first set (equation 1) relates the indicators of the exogenous variables () to their associated measurement error (), and the latent exogenous variables (ξ). $\Lambda$are vector of loadings of indicators of exogenous variables. The second set (equation 2) describes the relationship between the indicators of the endogenous variables (), their associated measurement error (ε), and the latent endogenous variables (η). Λ are vector of loadings of indicators of endogenous variables. The last set (equation 3) deals with the relationship between the latent endogenous (η) and exogenous (ξ) variables. ζ is a random disturbance term (Haenlein, & Kaplan, 2004).

2.3. Sample Size

A rule of thumb for robust PLS path modeling estimations suggests that the sample size be equal to the larger of the following (Barclay et al., 1995): (1) ten times the number of indicators of the scale with the largest number of formative indicators, or (2) ten times the largest number of structural paths directed at a particular construct in the inner path model.

Chin and Newsted (1999) present a Monte Carlo simulation study on PLS with small samples. They find that the PLS path modeling approach can provide information about the appropriateness of indicators at sample size as low as 20 (Henseler, 2009).

It was recommended that a data set that has at least 100 or desirably 200 cases would be appropriate (Hoyle, 1995; Loehlin, 2004). In this Study, 220 completed questionnaires were collected that meets the general above recommendation.

III. RESULTS

This study develops structural equation models to test 16 hypotheses, as shown in Figure 4. The PLS-SEM approach is a weighting technique to simultaneously estimate a series of interrelated dependence relationships. The proposed model would examine the effect of variables such as Age, Social norms, Tendency for violation, Difficulty in helmet use, and Number of fines for helmet usage. Path Coefficients with related T statistics are shown through Figures 5 and 6.

The effect of age on the tendency for violation is negative, while the path coefficient on social norms is positive. Despite the positive effect of social norms on three helmet wearing and carrying variables (just carrying a helmet, just wearing a helmet without closing the strap, and correct use of a helmet), the difficulty in helmet use and the tendency for violation variables have negative effects on helmet usage.

The number of fines has a positive effect on just carrying a helmet and just wearing a helmet without closing the strap, but has a negative effect in the complete use of a helmet.

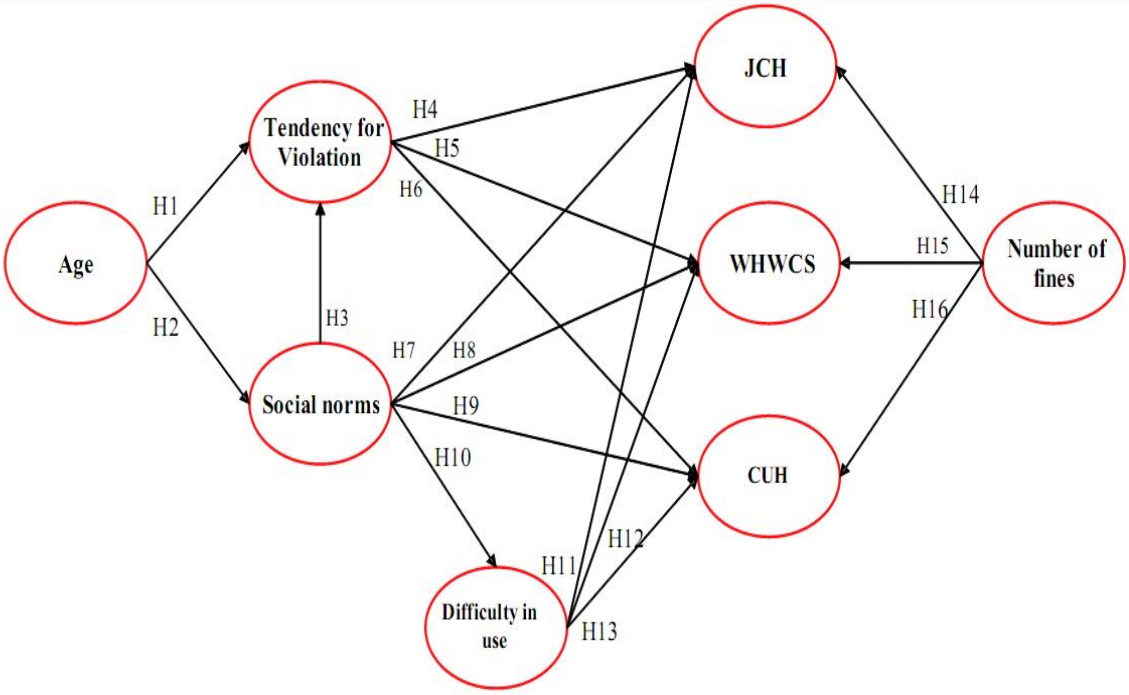


Fig. 4. Proposed structural model examining influential factors on motorcyclist behavior of helmet wearing (JHC: Just carry helmet, WHWCS: Wearing helmet without closing strap, CUH: Correct use of helmet)

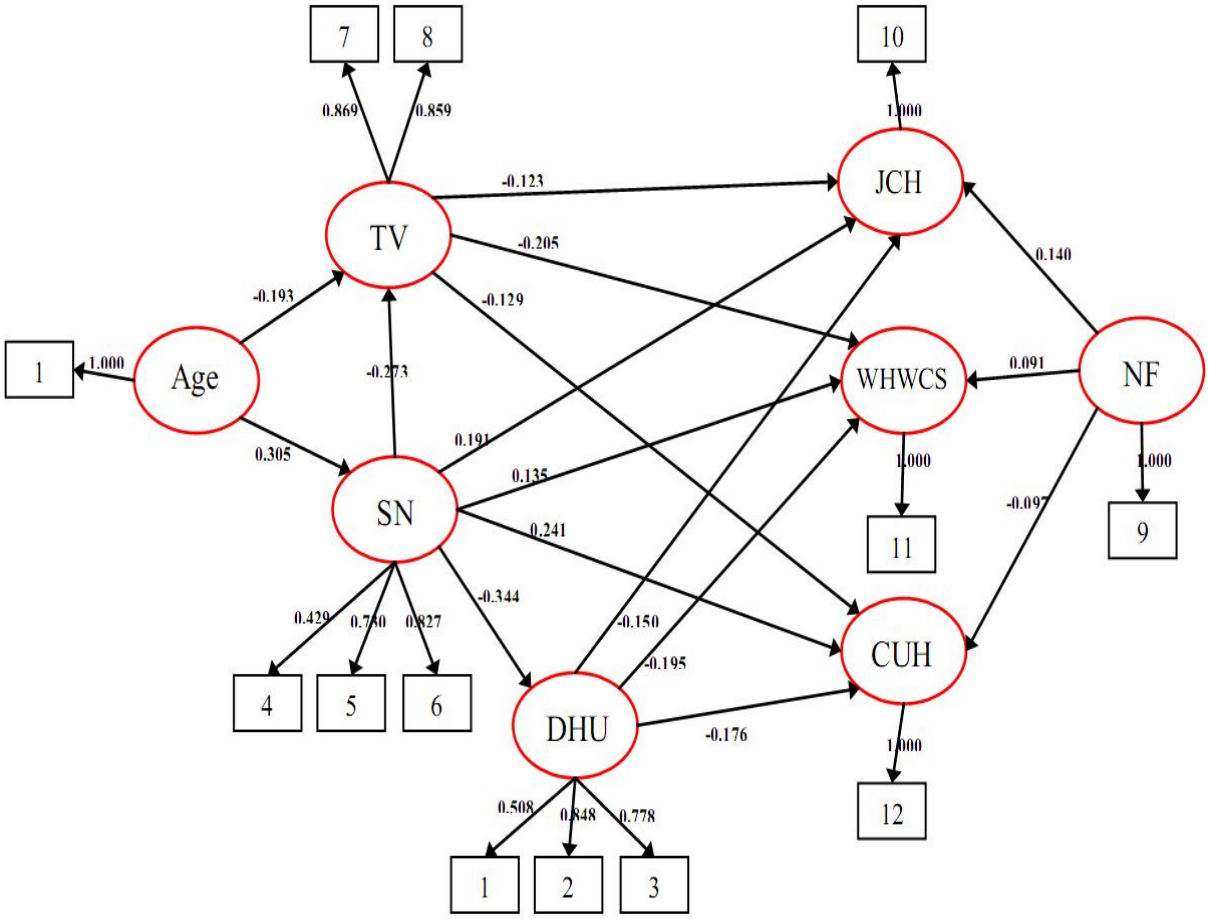


Fig. 5. Path coefficient and outer loading for helmet use explained by PLS-SEM model.

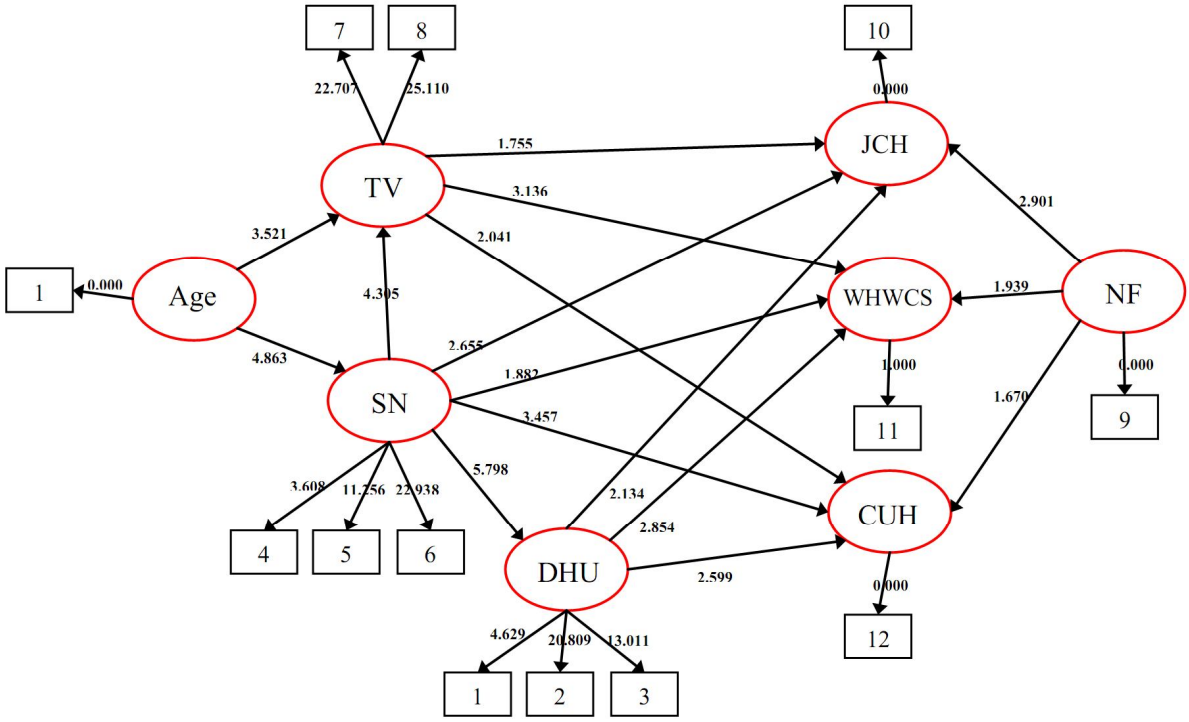


Fig. 6. T statistics for helmet use explained by PLS-SEM model

The total effect of exogenous variables with their path directions and T statistics are presented in Table 4. As age is increased, its total effect is positive on Social norms, Just carrying a helmet, Wearing a helmet without closing the strap, and Correct use of a helmet, while it has a negative effect on Difficulty of use and Tendency for violation. It has the greatest positive effect on Social norms and the greatest negative effect on Tendency for violation. It can thus be concluded that as age increases in motorcyclists, the use of a helmet in all three formats (JCH, WHWCS and CUH) increases, with slightly more effect on the correct use of a helmet (0.127). Social norms have the greatest positive total effects on the correct use of a helmet (0.336) and have the greatest negative effect on Difficulty in use (-0.344). The effect of Social norms is similar to the Age variable, which both has positive effects on helmet usage, while the total effect of Social norms are more than Age. Finally, improving social norms has a negative effect on Tendency for violation (-0.273). Difficulties in the use of a helmet and Tendency for violation have negative effects on helmet usage by motorcyclists. The number of fines issued for failing helmet use has a positive effect on incorrect use of helmet (Just carrying a helmet and Wearing a helmet without closing the strap), while it has a negative effect on the correct use of a helmet. It could be concluded that fear of being fined (or more frequently fined) by police may increase the improper usage of a helmet, but not correct use of it.

Table 4. Total effect of exogenous variables and related T statistics

Path Direction	Original Sample (O)	Standard Error (STERR)	T Statistics (|O/STERR|)
Age → Social norms	0.305	0.062	4.862
Age → Difficulty in use	-0.105	0.030	3.472
Age → Tendency for violation	-0.276	0.053	5.149
Age → Just carry helmet	0.108	0.030	3.550
Age → Wearing helmet without closing strap	0.118	0.029	3.969
Age → Correct use of helmet	0.127	0.030	4.219
Social norms → Difficulty in use	-0.344	0.059	5.797
Social norms → Tendency for violation	-0.273	0.063	4.304
Social norms → Just carry helmet	0.276	0.062	4.426
Social norms → Wearing helmet without closing strap	0.258	0.064	4.011
Social norms → Correct use of helmet	0.336	0.060	5.604
Difficulty in use → Just carry helmet	-0.150	0.070	2.134
Difficulty in use → Wearing helmet without closing strap	-0.195	0.068	2.854
Difficulty in use → Correct use of helmet	-0.176	0.067	2.598
Number of fines → Just carry helmet	0.140	0.048	2.900
Number of fines → Wearing helmet without closing strap	0.091	0.046	1.939
Number of fines → Correct use of helmet	-0.097	0.058	1.670
Tendency for violation → Just carry helmet	-0.123	0.070	1.754
Tendency for violation → Wearing helmet without closing strap	-0.204	0.065	3.136
Tendency for violation → Correct use of helmet	-0.129	0.063	2.041

Table 5 shows the fit indices and quality criteria of the model. As a rule of thumb, the average variance explained (AVE), which is examined for convergent validity, should be higher than 0.5 for each latent variable. The composite reliability criteria, which accounts for internal consistency reliability, should be higher than 0.7. Cronbachs alpha measures whether latent variables are homogenous or not. Communality, redundancy, and R squared are the other criteria which are reported in this table.

Table 5. Goodness of fit criteria

	AVE	Composite Reliability	R Square	Cronbachs Alpha	Communality	Redundancy
Age	1	1	--	1	1	--
Social norms	0.467	0.711	0.093	0.415	0.467	0.043
Difficulty in use	0.527	0.762	0.118	0.532	0.527	0.062
Number of fines	1	1	--	1	1	--
Wearing helmet without closing strap	1	1	0.161	1	1	0.055
Tendency for violation	0.746	0.855	0.143	0.661	0.746	0.051
Correct use of helmet	1	1	0.168	1	1	0.106
just carry helmet	1	1	0.141	1	1	0.073

Cross loadings for evaluating the discriminant validity of the model are reported in Table 6. In this test, it would be expected that the loading for each latent variable is more than cross loadings for other latent variables. For example, the load for friend encouragement by the social norms latent variable is 0.827, while for other latent variables it is 0.34, -.272, -.025, 0.187, -.330, 0.266, 0.196; the discriminant validity is thereby accepted.

Table 6. Cross loadings

	Age	Social norms	Difficulty in use	Number of fines	Just carry helmet	Tendency for violation	Correct use of helmet	just carry helmet
Age	1	0.305	-0.177	0.117	0.200	-0.276	0.125	0.196
Cell phone usage	-0.275	-0.275	0.139	-0.105	-0.239	0.859	-0.202	-0.169
Correct use of helmet	0.125	0.341	-0.279	-0.075	0.535	-0.228	1	0.473
Family encouragement	0.089	0.730	-0.258	0.068	0.253	-0.191	0.300	0.275
Number of fines	0.117	0.024	-0.013	1	0.119	-0.108	-0.075	0.160
Friend encouragement	0.340	0.827	-0.272	-0.025	0.187	-0.330	0.266	0.196
Holding problem	-0.127	-0.204	0.508	0.001	-0.147	0.096	-0.074	-0.165
Just carry helmet	0.196	0.287	-0.238	0.160	0.869	-0.227	0.473	1
Just carry helmet	0.200	0.272	-0.277	0.119	1	-0.292	0.535	0.869
Opposite direction riding	-0.203	-0.298	0.148	-0.082	-0.264	0.869	-0.192	-0.222
Public view	0.185	0.428	-0.159	0.017	0.098	-0.117	0.089	0.092
Summer use problem	-0.135	-0.240	0.777	-0.062	-0.208	0.152	-0.202	-0.207
Visual effect	-0.129	-0.297	0.848	0.028	-0.236	0.115	-0.289	-0.156

IV. DISCUSSION

The aim of this study is to investigate factors effecting motorcyclists helmet use and understand why previous observations show that although with mandatory law for wearing helmet, the helmet usage is rare among Iranian motorcyclists. Analysis of socio-economic characteristics show that most of motorcyclists have low educational level (87.73 % are diploma or less), most of them (87.56%) are self-employed, 83.64 % use motorcycle as a work related business, low average income (near 550,000 Tomans) with average of 30 years old. Therefore this group of people may need more attention to understand their behavior. In general, the results of this study show that improving social norms as a facilitator and attitude toward difficulty of using helmet as a barrier can effect helmet usage among motor riders. Consistent with (Aghamolaeai et al., 2011; Arosanyin et al., 2012; Ranney et al., 2010; Ambak et al., 2010), older persons have more tendency for using helmet (specially correct use of helmet), therefore much attention must be made on younger riders who maybe more vulnerable due to lack of experience or risk seeking (Cestac et al, 2011). Social norms, as mentioned by (Ranney et al., 2010) may also be a major obstacle (or facilitator) to helmet use by motorcyclists in which this study shows the greatest positive total effect of 0.336 on complete use of helmet. The result of perception toward difficulty use of helmet show negative effect on helmet use which consistent with many studies (Hung et al., 2008; Li et al., 2008; Aghamolaeai et al., 2011; Ranney et al., 2010; Orsi et al., 2012 Li et al., 2008; Orsi et al., 2012) indicate difficulty in wearing and holding helmet cause Motorcyclists refuse to use helmets. Result of tendency for violations latent variable indicate with increasing with these tendencies, the more occurrence in avoidance of helmet use (Ranney et al., 2010; Hung et al., 2008). In contrast to usefulness of intensification

of law enforcement in helmet use (Papadakaki et al., 2013), this study show that perceptions about more intensive law enforcement can maybe increase the improper use of helmet and may has negative effect on proper use. Therefore much attention must be made toward making policy for encouraging proper use of helmet specially by enhancing social norms through education and proper informing the motorcyclists.

The small number of indicators per latent variables which also measured by only 3 scores Likert scale may limits the conclusions that can be drawn from the study. Although the self-reported data are subject to an unknown amount of measurement error that can result in underestimation or overestimation of behavior.

While the previous studies illustrating that helmet usage among motorcyclists' passengers (pillions) are more severe (only 10 % of passengers wear helmet compared to 30 % helmet use by motor riders), it is highly recommended to investigate pillions and their interactions with motor riders behaviors in future studies. Also it may be exists some heterogeneity in behavior of motor riders due to their trip purpose that is recommended to investigate.

CONCLUSIONS

In this study, the behavior of helmet use by motorcyclists was modeled with the partial least squares structural equation model (PLS-SEM). This structural model contains 16 hypotheses to derivate the effects of exogenous (e.g., age and number of fines) and latent variables (e.g., social norms and tendency for violation) on helmet usage in a country with a high rate of road traffic fatalities. Resultantly, the age variable shows positive total effects of 0.12 on the complete use of a helmet as age increases. The social norms latent variable (reflective of public views toward helmet use and family and friend encouragement) has great effect on both reducing tendency for violations and difficulty in helmet usage, with a total positive effect of 0.33 on correct use of a helmet. Another finding is that the effect of number of fines is positive on both just carrying a helmet and wearing a helmet without closing the strap, while it has negative effect on correct use of a helmet. The results of this study confirm that for encouraging motorcyclists to use a helmet, the most efficient way is to invest in family social norms. This finding can be used by policy makers for increasing helmet use by motorcyclists and pillions, hence saving more lives during crashes.

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