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RISKY DRIVING ATTITUDES AND SELF-REPORTED TRAFFIC VIOLATIONS AMONG TURKISH DRIVERS: THE CASE OF ESKİŞEHİR

TÜRK SÜRÜCÜLERİNİN KENDİ BİLDİRİMLERİNE DAYANAN TRAFİK İHLALLERİ VE RİSKLİ SÜRÜŞ TUTUMLARI: ESKİŞEHİR ÖRNEĞİ

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ABSTRACT: Risky driving attitude terminology is used to explain behaviors, which directly increase accident risk, such as over speeding or violation to traffic rules while driving and attitudes related to traffic safety. This study is focused on driver factors in traffic accidents and was carried out in order to show risky drivers' attitudes tendency, especially. In this study, in order to develop a risky driver attitude model, factors explaining obedience to speed rules, caring about traffic accidents, risk taking tendency in traffic and violations of basic traffic rules were studied. For this reason with the assistance of structural equation models LISREL 8.54 was used to try to develop a model, and fitness of the model has been discussed considering various fitness criteria. On the other hand, analysis of variance was performed for factors measuring sex, education level, age and driving experience, in order to portrait risky drivers.

Keywords: Risky driver attitudes; Driving behaviour; Traffic; Structural equation modelling

ÖZET:*Riskli sürücü tutumu terminolojide, trafik güvenliğiyle ilgili sürüş, tutumlar, trafik kural ihlalleri veya hızlı sürüş gibi kaza riskini doğrudan arttıran davranışları açıklamak için kullanılmaktadır. Bu çalışma trafik kazalarındaki sürücüden kaynaklanan faktörleri ve özellikle riskli sürücü tutum eğilimini açıklamaya odaklanmıştır. Çalışmada hız kurallarına uyma, trafik kazalarına karşı ilgi, trafikte risk alma eğilimi ve temel trafik kural ihlalleri faktörleriyle açıklanan "Riskli Sürücü Tutum Modeli" geliştirilmeye çalışılmıştır. Bu amaçla LISREL 8.54 kullanılarak Yapısal Eşitlik Modelleri yardımıyla bir model geliştirilmeye çalışılmış ve geliştirilen model çeşitli uyum kriterleri dikkate alınarak uygunluğu tartışılmıştır. Diğer yandan riskli sürücüleri betimlemek için cinsiyet, eğitim durumu, yaş ve sürüş deneyimi faktörleri yardımıyla varyans analizi yapılmıştır.*

***Anahtar Kelimler**: Riskli sürücü tutumları, Sürüş davranışı, Trafik, Yapısal eşitlik modellemesi*

1. Introduction

Road-traffic accidents are a leading cause of death in Turkey. According to Road Traffic Accident Statistics 2002 data (Data does not cover the number of road traffic accidents in the area of gendarmerie-police soldier responsibility), a total of 407103

traffic accidents occurred in Turkey, and reports indicated that 5000 people died while 100000 were injured and the cost of road crashes in 1999 was about US$ 3 billion to the Turkish economy in these accidents. Involvement rates in these traffic accidents are 65% for cars, 19.3% for trucks (van-long driver), 4.8% for buses and 1.7% for bicycles or motorcycles. The distribution rates of the killed drivers in these accidents are 53.6%, 18.6%, 2.67% and 15.57%, respectively. This is a major threat to public health. The data given above are recorded data. Actually, the real quantity is approximately more than twice of the recorded data. These results are fairly high even in the world where so much loss is not recorded in wars and natural disasters. Traffic accident death rates steadily decreased in the industrially developed countries in the last thirty years. Death rate for 100 million vehicles per mile in England in 1970 was 6.09, in 1985 were 2.68 and in 2001 is 1.21. These rates in Sweden are respectively given as 5.67, 2.37 and 1.34; they are 5.67, 2.37 and 1.34 in the USA. In Turkey the 2001 rate is 11.74 (Road Traffic Accident Statistics, 2002). This quantity implies the importance of the problem and requires a prompt response to solve the problem.

It is commonly acknowledged that human factors may contribute to accident involvement in traffic. Based on a study of 2041 traffic accidents, Sabey and Taylor (1980) concluded that human factors were contributing elements in 95% of the accidents. In particular, driving behaviors was identified as the most central of these factors. In a study based on driver, vehicle and environment factors in traffic accidents, Jashua and Garber (1992) has detected that the most common accident type resulted from drivers' faults. In addition, researches demonstrated that some demographic characteristics are related to the tendency to have accidents (Iversen, 2004; Turner and McClure, 2004; Rundmo and Iversen, 2004). Different researchers examining drivers' attitudes have classified risky drivers' attitudes into different groups. However, drivers' attitudes are composed of two groups basically. These are errors and violations of rules. As it is thought that their psychological sources are different, prevention of them are also different. Errors are expressible as planned actions that do not reached to the intended result, and violations are intentional deviations from rules believed necessary to provide safety in a potentially dangerous system (Reason et al., 1990). An investigation result performed by a group of researchers with different sampling revealed that violation is a factor related to involvement in accidents; but errors are not related to involvement in accidents (Parker et al., 1995). There are several studies that examined risky driving attitudes containing errors, violations and personality in the literature (Bell et al., 2000; Begg and Langley, 2004; Iversen, 2004; Iversen and Rundmo, 2002; Lajunen and Parker, 2001; Peck, 1993; Rajalin, 1994; Rundmo and Iversen, 2004; Turner and McClure, 2004; Summala, 1996; Sümer, 2003; Ulleberg and Rundmo, 2003; Reason et al., 1990). Parker et al. (1995) examined the relationship among errors, violations and forgetfulness and their rate of involvement in a traffic accident. Three factors, explaining 33% of the total variance, were determined by using factor analysis from the data collected among 520 drivers. This study revealed that being young and male anticipates violations and these violation factors make them susceptible to accidents. Blocke and Hartley (1995) carried out a renewal study on drivers living in west Australia. In this study three factors were determined which are general errors, dangerous errors and dangerous violations. Lawton et al. (1992) researched driving

violations by asking 16 questions (8 violations + 8 errors) of 830 drivers. In Turkey, Yiğit-Işık and Yasak (1997) researched Turkish drivers' behaviors such as their susceptibility to accidents, their driving behaviors, and their risk-taking tendency. The researchers studied a sample of 517 drivers. As a result of the study, they obtained five factors, which are violation, carelessness, exaggerated self-confidence, stress and driver existence image. In addition, according to the study, driving time, sex and age played an important role in involvement in an accident. Another study investigated in Turkey belongs to Sümer (2003). A contextual mediated model was proposed to distinguish the distal (i.e. personality factors) and proximal (i.e. aberrant driving behaviors) factors in predicting traffic accident involvement. Turkish professional drivers (N=295) answered a questionnaire including various measures of personality factors, driver behaviors, and accident history. He found that latent variables in the distal context predicted at least one of the proximal elements with relatively high path coefficients. Iversen and Rundmo (2002) examined relationships between personality, risky driving and involvement in accidents. Their questionnaire included measures of risky driving, accident involvement, recklessness, sensation seeking, locus of control and driver anger. They found that those who scored high on sensation seeking, recklessness and driver anger reported more frequent risky driving compared to those who scored low on these variables. They were more often involved in both speeding and ignorance of traffic rules. Iversen (2004) investigated whether toward traffic safety issues are predictors for future risk behavior traffic. Results of his research show a high correlation between the dimensions of attitudes and behaviors at the two data collection points. Iversen's model has 3 exogenous latent variables (1-attitude toward rule violations and speeding, 2- attitude toward the careless driving of others, 3- attitude toward drinking and driving) and an endogenous latent variable (risky driving behavior). Rundmo and Iversen (2004) focused on traffic accident risk perception. The aim of their paper is to present the result of the evaluation of the effect of the campaign and to examine the association between risk perception and traffic behavior. Their model includes speeding and rule violations.

In summary, a group of researchers, who maintain that human errors that cause traffic accidents are not standard, tried to classify risky driving attitudes. In these studies violations and errors found related to different driver characteristics. Also, according to these studies, some violations are speed alls related to accident involvement. For example, many investigations revealed that drivers who were involved in an accident were drunk. Many other researches showed that there is a strong correlation between speeding and accident involvement. Our study focused on the driver factor in traffic accidents and was carried out in order to show risky drivers' attitudes tendency, especially. Since our study aims to propose an initial model for Turkey, the basic factors containing only violations related to risky drivers' attitudes were investigated.

2. Method

2.1. Sample

The drivers were selected using a stratified sampling method. The research sampling was composed of 600 individuals driving different kinds of vehicles in Eskişehir-

Turkey. The questionnaire survey was carried out with the support of 4th class students of Osmangazi University Statistics Department on the basis of face-to-face interview with drivers. The questionnaire used in this study was composed of "the driver's behavior" questionnaire, improved by Reason at al. and "the recklessness attitudes towards traffic safety, and risk behavior" questionnaire, used by Ulleberg and Rudmo. A total of 548 respondents returned the questionnaires, yielding a response rate of 91%. For this reason, the analysis was performed based on the responses of the 548 drivers. Of these, 28% were women and 72% were men. Of these, 33.2% were 18-28 years old, 38.5% were 29-39, 19.3% were 40-50, 6.4% were 51-61 and 2.6% of them were 61 years old and above. Distribution of the respondents were as given; 73% were private car drivers, 11.3% were taxi drivers, 7.5% were small truck (van) drivers, 5.5% were bus drivers, 2% were bicycle or motorcycle drivers and 0.7% were truck (long vehicle) drivers. 11.5 % of the drivers had traffic experience of less than two year, 40 % were experienced for 3-10 years, 32.3 % were experienced for 11-20 years and 16.2 % were experienced for more than 20 years.

2.2. Measures

Through a review of the literature we selected five factors about risky driver attitudes in traffic or involvement in traffic accidents. These included: Risky driver attitudes, Obedience to speed rules, Caring about traffic accidents, Risk taking tendency in traffic and violations of basic traffic rules (see e.g. Cellar, Nelson and Yorke, 2000; Hilakivi et al., 1989; Jonah, 1997; Parker et al., 1992; Rutter,Quine and Chesham, 1995; Ulleberg and Rundmo, 2003; West and Hall, 1997). In this study, latent structure is composed of Risky driver attitudes and explanatory structures are composed of Obedience to speed rules, Caring about traffic accidents, Risk taking tendency in traffic and violations of basic traffic rules. The structure, composed of the relationship of four assumed independent latent variables (A, B, C and D) to one dependent latent variable (E) constitutes the model to be tested. The first factor was entitled Obedience to Speed Rules. Questions were related to whether it is acceptable to ignore speed rules to ensure traffic flow. The items of the second factor, Caring about Traffic Accidents, were phrased as follows: " I am afraid to injure a person with my car", "I can not carry on my life as if nothing had happened if I injure a person in traffic", "I wish no body injuries if I get involve in an accident". The second factor is related to drivers' opinion about traffic accidents. That third factor questioned drivers' attitudes toward speed and drink driving. Fourth factor is Violations of Basic Traffic Rule. The last factor was related Risky Driver Attitudes**.** These items are given in Table 1.

The questionnaire was given on a face-to-face basis. It is composed of 42 questions. 8 of the questions are related to demographic characteristics of drivers while 34 of them are about their behaviors in traffic. Since the explanatory powers of 16 questions were not strong enough, they were not incorporated into the analyses. The questionnaire used in this study was composed of "the driver's behavior" questionnaire, improved by Reason et al. and "The recklessness attitudes towards traffic safety, and risk behavior" questionnaire, developed by Ulleberg and Rudmo.

Table1. Factors for items measuring Risky driver attitudes

Factor A. Obedience Speed Rules
a1- It is acceptable to drive in 100 km/h on a straight road if there are no other vehicles within 1.5 km.
a2- Safe drivers can exceed speed limits.
a3- There is no problem to drive above the speed limits, if the conditions are proper.
a4- Driving 5 or 10 km above the speed limit is OK because everyone does it.

Factor B. Caring About Traffic Accidents
b1- I am afraid to injure a person with my car.
b2- I can not carry on my life as if nothing happened if I injure a person in traffic.
b3- I wish no body injuries if I get involved in an accident.

Factor C. Risk Taking Tendency in Traffic
c1- If you have good skills, speeding is OK.
c2- Drivers have a need for fun and excitement in traffic.
c3-It is not risky to drive after drinking alcohol as it is thought.

Factor D. Violations of Basic Traffic Rules
d1- Sometimes it is necessary to bend the rules to keep traffic going .
d2- Sometimes it is necessary to ignore violations of traffic rules.
d3- It is more important to keep up the traffic flow rather than always follow the traffic rules
d4- Sometimes it is necessary to bend the traffic rules to arrive in time.
d5- It is better to drive smooth than always follow the traffic rules.

Factor E. Risky Driver Attitudes
e1- Sometimes it is necessary to violate the traffic rules to keep traffic going.
e2- Sometimes it is necessary to take risks in traffic.
e3- A driver who takes risks and violates some traffic rules does not mean he is a less safe driver.

All items were answered on five-point Likert scales ranging from 1 ‘‘strongly agree’’ to 5 ‘‘strongly disagree’’.

2.3. Statistical analysis

Cronbach’s alpha coefficient was applied to evaluate the internal consistency of the attitude measures. The relationship between latent variables was estimated using structural equation modeling. Structural Equation Modeling (SEM) is a comprehensive statistical method used in testing hypotheses about causal relationships among observed and unobserved (latent) variables and has proved useful in solving the problems in formulating theoretical constructions (Reisinger and Turner, 1999). Its function was found to be better than other multivariate statistical techniques which include multiple regression, path analysis and factor analysis. Other statistical techniques can not take into consideration that which is due to the interaction effects among dependent and independent variables. Therefore, a method that can examine a series of dependence relationships simultaneously helps to address complicated managerial and behavioral issues. SEM also can expand the explanatory ability and statistical efficiency for model testing with a single comprehensive method (Pang, 1996).

Data was analyzed by means of the LISREL 8.54 Program. LISREL (LInear Structural RELationships), a statistical modeling technique, was chosen to generate a model that best fits the data. LISREL combines features of multiple regression, factor analysis, and path analysis to allow the examination of both observed and latent variables in complex relationships. LISREL provides a simultaneous estimation of the model, estimation of causal relationships among latent variables with multiple indicators, inclusion of both measurement and structural properties of theoretical models, measurement of direct and indirect effects, inclusion of measurement errors and correlation of residual, and estimation of non-recursive causation. LISREL requires the researcher to provide a base or starting point called the hypothesized model. Then, through a series of iterative modification indices, LISREL provides information that guides the researcher toward an ameliorator's empirical model. Once the model's structure or explanatory power has been maximized, the researcher has a final model (Byrne, 1998; Cudeck, Toit and Sörbom, 2000; Hayduk, 1987; Jöreskog and Sörbom; 2001; Pang, 1996; Steenkamp and Baumgartner, 2000).

Hypotheses developed to test the relationship among the latent constructs are given below:

H1; There is a significant relationship between Risky driver attitudes and Obedience to speed rules. The more to obedience speed rules, the less risky are the driver attitudes.

H2; There is a significant relationship between Risky driver attitudes and Caring about traffic accidents.

H3; There is a significant relationship between Risky driver attitudes and Risk taking tendency in traffic.

H4; There is a significant relationship between Risky driver attitudes and Violations of basic traffic rules.

The overall model is assessed using goodness-of-fit criteria (see Table 2). Table 2 provides an overview over some rule of thumb criteria for goodness-of-fit indices. This included the goodness-of-fit index (GFI), the adjusted goodness-of-fit index (AGFI) and the root mean square error of approximation (RMSEA). Traditionally, a GFI and AGFI of 0.90 or above and a RMSEA of 0.05 or less have been considered to indicate a good fit between the model and the data (Schermelleh-Engel and Moosbrugger, 2003).

Table 2. Recommendations for Model Evaluation: Some Rules of Thumb Fit Measure Good Fit Acceptable Fit. (Schermelleh-Engel & Moosbrugger, 2003).

Fit measures	Good fit	Acceptable fit	Proposal model
RMSEA	0<RMSEA<0.05	0,05 ≤ RMSEA ≤0,10	0.077
SRMR	0 ≤ SRMR ≤ 0,05	0,05<SRMR ≤ 0,10	0.087
NFI	0,95 ≤ NFI ≤ 1	0,90 ≤ NFI ≤ 0,95	0.95
NNFI	0,97 ≤ NNFI ≤ 1	0,95 ≤ NFI ≤ 0,97	0.95
CFI	0,97 ≤ CFI ≤ 1	0,95 ≤ CFI ≤ 0,97	0.96
GFI	0,95 ≤ GFI ≤ 1	0,90 ≤ GFI ≤ 0,95	0.90
AGFI	0,90 ≤ AGFI ≤ 1	0,85 ≤ AGFI ≤ 0,90	0.87

Note. *AGFI* = Adjusted Goodness-of-Fit-Index, *CFI* = Comparative Fit Index, *GFI* = Goodness-of-Fit Index, *NFI* = Normed Fit Index, *NNFI* = Nonnormed Fit Index, *RMSEA* = Root Mean Square Error of Approximation, *SRMR* = Standardized Root Mean Square Residual. *NFI* may not reach 1.0 even if the specified model is correct, especially in smaller samples. As *NNFI* is not normed, values can sometimes be outside the 0-1 range. *NNFI* and *CFI* values of .97 seem to be more realistic than the often reported cut off criterion of .95 for a good model fit.

3. Results

When the proposed model and fitness criteria given in Table 2 were compared, the fit measures indicated that the proposed model fitted the data acceptable: GFI=0.90, AGFI=0.87, CFI=0.96, RMSEA=0.077. According to results of the factor analysis, the path model explained 82% of the total variation in risky driver attitudes. Individual relationships were examined for statistical significance as well. The effects of the exogenous variables on the endogenous variable were determined using t-Statistics. Each path forms its own hypothesis. Table 3 presents the effect of exogenous latent variables on the endogenous latent variable for the model. Maximum Likelihood estimates, standardized solutions, Cronbach alpha values, R^2 and t-statistics are shown for each of the effects. All causal relationships are significant at the 0.05 level. H1, H2, H3 and H4 assumptions for the proposed model have been approved. There are significant negative causal relationships between obedience to speed rules and risky driver attitudes (γ_{11} = - 0.30). This value means "the more obedience to speed rules, the fewer risky driver attitudes." There are significant positive causal relationships between caring about traffic accidents positive attitudes towards traffic rules and risky driver attitudes (γ_{21} = 0.27). In this case, contrary to the expectation of less risky attitudes when caring about traffic, this value is found to be positive. This result may be interpretable in that increased sensitivity towards traffic accidents does not have any significant effect on decreasing risky attitude and behavior. A similar significant relationship was determined between risk taking in traffic and risky driver attitudes (γ_{31} = 0.41). This means that if the risk-taking tendency rises, then the risky attitudes will rise, too. Violation of traffic rules was the strongest predictor for behavior (γ_{41} =0.87). Increase in violations of basic traffic rules will result in an important increase in risky drivers' attitudes. The four predictors explained 82% of the total variation in risky driving attitude. This value shows that the explanation rate of the proposed model with the latent variables taken is fairly high. These results show that the proposed model is a proper model for explaining risky driver attitudes in Turkey. The path diagram for the proposed model is given in Figure 1. It shows the tested model, with standardized path coefficients.

Table 3. Maximum Likelihood Estimation of the Effects the Exogenous on the Endogenous Variables for the final LISREL model

Construct/indicator	Standardized Estimate (t-value)	Cronbach Alpha	R^2
A		0.85	
	A→E -0.30 (-2.75)		
a1	0.63 (15.49)		0.39
a2	0.78 (20.92)		0.61
a3	0.85 (23.71)		0.73
a4	0.78 (20.95)		0.62
B		0.78	
	B→E 0.27 (2.78)		
b1	0.84 (21.69)		0.70
b2	0.70 (17.27)		0.49
b3	0.78 (09.74)		0.60
C		0.69	
	C→E 0.41 (3.05)		
c1	0.64 (14.99)		0.41
c2	0.57 (12.93)		0.32
c3	0.72 (17.18)		0.52
D		0.83	
	D→E 0.87 (10.05)		
d1	0.69 (17.76)		0.48
d2	0.69 (17.76)		0.48
d3	0.67 (16.84)		0.44
d4	0.79 (21.40)		0.63
d5	0.80 (21.79)		0.64
E		0.67	
e1	0.71		0.50
e2	0.59 (11.91)		0.35
e3	0.59 (11.81)		0.35

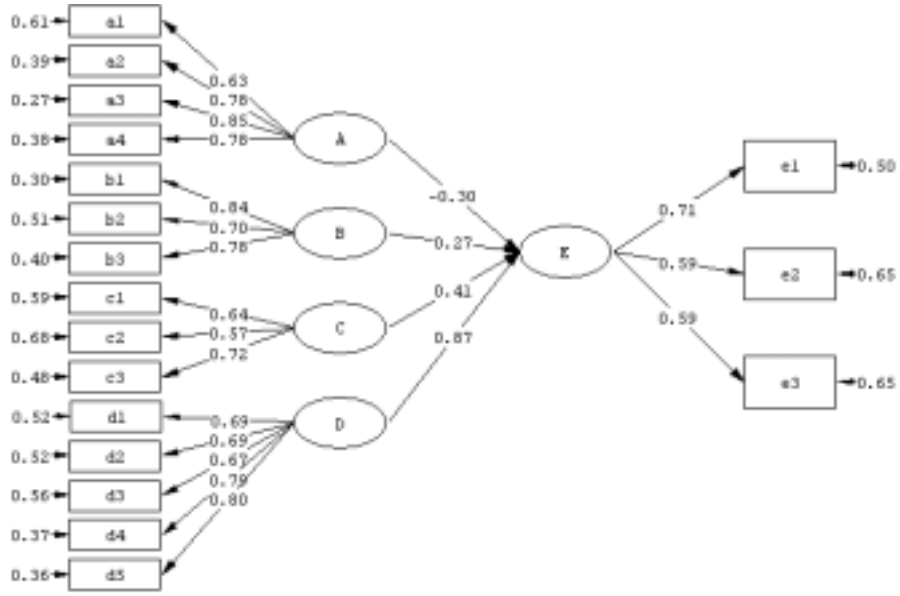

Figure 1. Proposed model

4. Discussion

The human factor is evaluated on a wide range from driving frequency to drivers' demographic characteristics; from psychomotor abilities to their personalities, and all of these factors play a past in accidents at different rates. In this study in order to get assistance to explain risky drivers, ANOVA was performed for demographic factors such as sex, education level, age and driving experience. For sex and age, all F values were not significant on behaviors related to obeying speed rules. These results show that both men and women and all age groups demonstrated similar behaviors on obeying speed rules. For education level, contrary to sex, completely opposite results were obtained. $F_{a1}(4;543)=10.99^{***}$, $F_{a2}(4;543)=8.18^{***}$, $F_{a3}(4;543)=7.93^{***}$ for a1, a2 and a3, respectively *(***p<0.001).* The significant difference resulted from primary education-university, secondary school-university. When the driving experience was taken into consideration, values computed were $F_{a1}(3;544)=2.32$, $P=0.074$, $F_{a2}(3;544)=7.12^{***}$, $F_{a3}(3;544)=3.8$, $P=0.01$, respectively. When the averages are taken into consideration, it can be seen that drivers having experience of less then 2 years demonstrate a positive attitude towards obedience to speed rules relative to these experienced over 2 years. According to this result, as drivers get more experienced their self-confidence increases and they bend the traffic rules. For sex, about recklessness attitudes towards traffic accidents, values are computed as $F_{b1}(1;546)=22.23^{***}$ for b1; $F_{b2}(1;546)=0.00$, $P=0.992$ for b2; $F_{b3}(1;546)=48.54^{***}$ for b3. When the results obtained and the average values are investigated it is seen that women care about traffic accidents more than men. Since it is known that male drivers in Turkey are involved in fatal accidents more than females as is the case in the whole world, this result is not surprising, when number vehicles and kilometers are taken into consideration. For education level and experience, while recklessness towards accidents showed various significant results, age did not indicated significant differences. About risk taking tendency, only c3 were found significant.

$F_{c3}(1;546)=23.07$***, $F_{c3}(4;543)=7.29$***. From this result, it becomes clear that women, relative to men, evaluate drunk driving as risky and on the other hand, 19-39 age groups do not think that drunk driving is risky relative to other age groups. For education level and experience, risk taking was not found to be significant. For sex, related to violations of basic traffic rules, d1 and d2 were found significant. From these results, it appears that men are more eager to bend basic traffic rules than women For education, d1 and d4; for driving experience, d1, d3 and d4; for age, d1, d2, d3 and d4 were found to be significant. While 19-29 age group takes the highest average value on violation to traffic rules, the lowest average value is for the 61 and older age group.

This study, tried to measure drivers' attitudes through their own responses. In the light of their responses, we tried to describe risky driving attitudes of Turkish drivers. In the proposed model four exogenous latent variables were included; however, the model can be developed by incorporating new factors thought to effect risky drivers' attitudes. The study reveals that drivers are not able to read the road and to take precautions relating to it and most of the respondents saw traffic accidents as a result of fate. According to 2002 data, individuals' having a driving license is about 15 millions and number of vehicles is about one million in Turkey. In addition, in 2002, 500000 people received driver licenses from driver training centers. One of the most important results reflected as a result of this study is that if the drivers' obey the speed rules, risky driving tendency decreases. In view of these results, we suggest making drivers' more conscious of high speed and its results, especially, at the drivers' training centers, in addition to the lessons containing more qualified traffic information, other teaching and training lessons such as speed in traffic and results, and risky driver attitude in traffic and results should be added.

References

BEGG, D.J., ANGEY, J.D. (2004). Identifying predictors of persistent non-alcohol or drug-related risky driving behaviours among a cohort of young adults. *Accident Analysis and Prevention,36(6),*1067-1071.

BELL, N.S., AMOROSO, P.J., YORE, M.M., SMITH, G.S., JONES, B.H. (2000). Self –reported risk- taking behaviours and hospitalisation for motor vehicle injury among active duty army personnel. *American Journal of Prevention Medicine, 18,* 85-95.

BLOCKE, P.N., HARTLEY, L.R. (1995). Aberrant driving behaviour: errors and violations. *Ergonomics, 38,* 1759-1771.

BYRNE, B.M. (1998). *Structural Equation Modelling with LISREL, PRELIS, and SIMPLIS: Basic concepts, Applications, and Programming*, New Jersey : Lawrence Erbaum Associates Publisher.

CELLAR, D.F., NELSON, Z.-C., YORKE, C.M. (2000). The five-factor model and driving behaviour. Personality and involvement in vehicular accidents. *Psychological Reports, 86,* 454–456.

CHENG, E.W.L.,(2001). SEM Being more Effective than Multiple Regression in Parsimonious Model Testing for Management Development Research. *Journal of Management Development, 20 (7),* 650-667.

CUDECK, R., TOIT, D.S., SÖRBOM, D. (2000). *Structural Equation Modelling: Present and Future*, Scientific Software International Inc., Chicago.

HAYDUK L.A. (1987). *Structural Equation Modeling with LISREL Essential and Advances*. The John Hopkins University Press.

HILAKIVI, I., VEILAHTI, J., ASPLUND, P., SINIVUO, J., LAITINEN, L., KOSKENVUO, K. (1989). A sixteen-factor personality test for predicting automobile driving accidents of young drivers. *Accident Analysis and Prevention, 21*, 413–418.

IVERSEN, H. (2004). Risk-taking attitudes and risky driving behaviour. *Transportation Research Part F*, 7(3), 135-150.

IVERSEN, H., RUNDMO, T. (2002). Personality, risky driving and accident involvement among Norwegian drivers. *Personality and Individual Differences, 33*, 1251-1263.

JASHUA, S.C. , GARBER, N.J. (1992). A Causal Analysis of Large Vehicle Accidents Through Faulth- Tree Analysis, Risk Analysis, 12, 173- 187.

JONAH, B.A. (1997). Sensation seeking and risky driving: a review and synthesis of the literature. *Accident Analysis and Prevention, 29*, 651–665.

JÖRESKOG, K., SÖRBOM, D. (2001). *LISREL 8: User's Reference Guide*, Scientific Software International Inc., Chicago.

LAJUNEN, T., PARKER, D. (2001). Are aggressive people aggressive drivers? A study of the relationship between self-reported general aggressiveness, driver anger and aggressive driving. *Accident Analysis and Prevention, 33*, 243-255.

LAWTON, M., KLEBAN, M.H., RAJAGOPAL, D., DEAN, J. (1992). Dimensions of effective experience in three age groups. *Psychology and Aging, 7*, 171-184.

PANG, N.S.K. (1996). School Values and Teachers' Feelings: a LISREL model. *Journal of Educational Administration, 34 (2)*, 64-83.

PARKER, D., MANSTEAD, A.S.R., STRADLING, S., REASON, J.T. (1992). Determinants of intention to commit driving violations. *Accident Analysis and Prevention, 24*, 117–131.

PARKER, D., WEST, R., STRADLING, S., MANSTEAD, A.S.R. (1995). Behavioural characteristics and involvement in different types of traffic accident. *Accident Analysis and Prevention, 27*, 571-581.

PECK, R.C. (1993). The identification of multiple accident correlates in high risk drivers with specific emphasis on the role of age, experience and prior traffic violation frequency. Paper presented at the Behavioural Factors that Determine Accident Rates Symposium, Santa Monica, CA, USA. *Alcohol, Drugs & Driving, 9*, 145-166.

RAJALIN, S. (1994). The connection between risky driving and involvement in fatal accidents. *Accident Analysis and Prevention, 26*, 555-562.

REASON, J., MANSTEAD, A., STRADLING, S., BAXTER, J., CAMPBELL, K. (1990). Errors and violations on roads. *Ergonomics, 33*, 1315-1332.

REISINGER, Y., TURNER, L.(1999). Structural Equation Modeling with LISREL: Application in Tourism., *Tourism Management, 20*, 71-88.

Road Traffic Accident Statistics, (2002). State Institute of Statistics Prime Ministry Republic of Turkey, publication number: 2741

RUNDMO, T., IVERSEN, H. (2004). Risk perception and driving behaviour among adolescents in two Norwegian counties before and after a traffic safety campaign. *Safety Science, 42*, 1-21.

RUTTER, D.R., QUINE, L., CHESHAM, D.J. (1995). Predicting safe riding behaviour and accidents: demography, beliefs, and behaviour in motorcycling safety. *Psychology and Health, 10*, 369–386.

SABEY, B.E., TAYLOR, H. **(**1980). *The known risks we run: the highway*. Department of Transport, TRRL SR567, Transport and Road Research Laboratory. Crowthorne, Berks.

SCHERMELLEH-ENGEL, K., MOOSBRUGGER, H. (2003). Evaluating The Fit of Structural Equation Models: Tests of Significance and Descriptive Goodness-of-Fit Measures. *Methods of Psychological Research Online, (8) 2,* 23-74

STEENKAMP, B.E.M., BAUMGARTNER, H. (2000). On the use of structural equation models for marketing modelling. *International Journal of Research in Marketing, 17,* 195-202.

SÜMER, N. (2003). Personality and behavioural predictors of traffic accidents: testing a contextual mediated model. *Accident Analysis and Prevention, 35*, 949- 964.

SUMMALA, H. (1996). Accident risk and driver behaviour. *Safety Science, 22,* 103-112.

TURNER, C., MCCLURE, R. (2004). Quantifying the role of risk-taking behaviour in causation of serious road crash-related injury. *Accident Analysis and Prevention, 36,* 383-389.

ULLEBERG, P., RUNDMO, T. (2003). Personality, attitudes and risk perception as predictors of risky driving behaviour among young drivers. *Safety Science, 41,* 427-443.

WEST, R. , HALL, J. (1997). The role of personality and attitudes in traffic accident risk. *Applied Psychology: An International Review, 46,* 253–264.

YIĞIT-IŞIK, İ., YASAK, Y. (1997). Driver behaviour profile in Turkey: relationship between driver behaviour and risk taking. *6th international workshop* "*driver improvement*" (DI 97), October 20-22, Berlin Germany.