# Analysis of Young Driver Behaviour related to Road Safety Issues in Pakistan and Hungary

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**Abstract -** *Young Driver behaviour plays a key role in road safety as it is important in traffic accident prevention. Young drivers mostly involve in behaviours that cause risks to both themselves and to other road users also. This study designed to develop an initial set of measures to observe young driver behaviour related to road traffic safety issues in different countries. Driver Behaviour Questionnaire (DBQ) was designed to elicit useful information related to road safety from university students having driving licence. The main consideration taken on driver's attitudes towards traffic safety issues were failing to comply with traffic light signal, failing to wear the seat belt, disregard the speed limits, failing to use personal intelligent driver assistant, failing to yield pedestrian, driving too closely, frequently changing lanes, risk due to encroachments, failing to apply brakes, problems of mixed traffic and sounds horn in annoyance. Several differences in driving attitudes between Pakistan and Hungary young drivers were identified. The utilization of observed measures provided richer information about deviant young driver behaviour in both regions. The statistical analysis of the young drivers' perception on road traffic safety issues quantify significant factors associated with them. From comparative studies of questionnaire data, it was noticed that Budapest drivers appear more disciplined than Islamabad drivers. But still there are some important young driver attitudes in both regions which need improvements for safe movements on the road.*

*Keywords*: Young Driver Behaviour, Road Safety Issues, Driver Behaviour Questionnaire (DBQ), Comparative Study, Statistical Analysis.

## 1. Introduction

In this paper, driver behaviour questionnaire (DBQ) study was designed on young driver behaviour related to road traffic safety issues. A survey was designed and conducted in two different contexts: the city of Budapest, located in centre of Hungary, and the city of Islamabad, located in the northeast of Pakistan. The questionnaire consists of 11 items to investigate the young driver responses towards driving safety subjects. Also, the information about age, gender and driving experience was included in questionnaire. The students of universities who drive cars were asked for their opinions on certain characteristics of driving attitudes related to road safety while driving. The statistical results showed significant differences in driver attitudes towards road traffic safety issues along with some similarities in the regions. The ANOVA analysis was applied on the data collected from the surveys to characterize the road users' driving behaviour, to evaluate significance level of items and factors that most affect the young driver's perception of traffic safety issues. The significance level was set 0.05. Based on analysis results it was observed that Budapest young drivers respect the driving rules highly as compared to Islamabad drivers. The results in the study could be useful in terms of consideration that which driver attitudes are the most important one's which need improvements for safe movements on the road.

## 2. Related Work

Many research studies focused solely on identifying the fundamental factors that cause road crashes. From these studies, it was noticed that human factors have the most significant impact on accident risk. The basic factors influence on road safety directly

related to the driver are i.e., driving behaviour, driver's perception of traffic risks and driving experience [1]. Drivers involve frequently in attitudes that cause road safety issues. Many of these attitudes are dynamic, conscious rule violations, while others are the result of errors due to less driving experience, momentary mistakes, inattention or failure to perform function, the latter often related to age. These behaviours often contribute to traffic collisions [2] [3]. Besides of risky driver behaviour the bad driving practices and poor knowledge along with disrespect for road and safety regulations are the obvious problems [4].

The study estimated that novice and younger drivers use the road-ways in large numbers as compared to older drivers. The young drivers driving difficulties are distinct and can be evaluated [5]. The novice young drivers suffer more risk due to over-representation in road injuries. To deal this problem effectively, a better understanding of the driving behaviour of novice young drivers and of its factors is needed [6]. The traffic safety related factors of young drivers causing accidents were noticed such as inattention, distraction and aggressive behaviour [7] [8]. The consistency and conversely, the differences in young driver behaviour, and the factors causing crash risk, may differ due to situation based specific factors [9]. The young driver characteristic of normlessness is common for individuals during adolescence, thus leading them to have more anti-social attitudes and behaviours [10].

Driving behaviour Identification has been considered central requirement for traffic studies which provides useful information generally in three main fields such as road safety analysis, microscopic traffic simulation and intelligent transportation systems (ITS) [11]. Among the many tools developed to identify problematic driver behaviours, the Driver Behaviour Questionnaire (DBQ) stands out for its longevity and dominant use. There has been substantial effort made to detect and remediate behaviours that decrease driving safety [12] [13]. The Questionnaire survey study measured self-reported frequency of drivers involving in a range of driving behaviours toward perceived risk. The main questionnaire was formed by considering twelve behaviours related to road safety issues such as human errors, traffic rules violations and some others [14]. A questionnaire survey was carried out among novel licensed drivers (18–24 years old) in Central Florida in Fall 2010. The significant factors affecting young drivers' crash risk were in-vehicle distractions, attitudes toward speeding and demographic characteristics [15].

The study determined that driver behaviour and the rate of traffic accidents vary in different countries. The differences in driver behaviour with respect to countrywide reveal variations in traffic risk perception [16]. It is well known that there are significant differences between countries in driving practice [17]. The cultural differences were studied in risk perception and approaches towards traffic safety and risk-taking behaviour in Ghana and Norway. It was found that adolescent drivers were intense to take risks in traffic as compared to older adults in both countries [18]. Another study was carried to find the differences in perceived risks of traffic accidents in different countries where perceived risk of traffic accidents was compared in Japanese and a North American sample. The results indicated that participants in the Japanese sample projected higher risk of traffic accidents than participants in the North American sample [19].

The driving task experience has a statistically major effect on overall driving performance. The study investigated that the task of driving can be easy or difficult depending on the momentary task demand of driving and the driver's skill to control his/her vehicle correctly [20] [21]. Descriptive statistics (mean and standard deviation values) were calculated for young driver's risk-taking behaviour by country. For majority of items the significant differences were observed between countries [22]. The analysis of variance (ANOVA) was also applied in study on DBQ item and scale scores to study whether there were significant differences between countries after controlling the effect of sex, age, and annual miles travelled within the sample. To examine the relationship between driving behaviour and the number of traffic accidents in each country, regression analyses was performed by using forward stepwise procedure. The level of $p < 0.05$ was set as the cut-off value for significance. The results of ANOVA measured significant differences between countries on DBQ item and scale scores [23]. Another similar analysis approach such as the one-way ANOVA analysis was used to measure significance level of drivers on risk-taking behaviour of each of the nine questions related to their psychosocial function. Results showed that the level of risk-taking behaviour was significantly related to psychosocial function of driving, leisure time activities including driving related interaction with friends and educational attainment [24].

# 3. Methodology
## 3. 1. Sample Characteristics

A total of (N=70) students of universities who have at least one-year driving experience were sampled from each region for this study. The demographic characteristics of respondents related to age, gender and driving experience were tabulated in table 1. The mean and standard deviation values were measured for these characteristics in both regions. The results showed that mostly young drivers who participated in the study were male as compared to females in both regions. Also, young drivers who participated in study have less driving experience in both regions. The 95% confidence interval was also applied to measure lower and upper bound limits of young driver's demographic data.

Table 1. Sample characteristics.

| Variables | Budapest | Islamabad |
|---|---|---|
| N | 70 | 70 |
| Age | | |
| Mean | 22.52 | 20.98 |
| SD | 2.25 | 2.54 |
| 95% confidence interval: | | |
| Lower bound | 21.99 | 20.37 |
| Upper bound | 23.06 | 21.59 |
| Gender (1=male,0=female) | | |
| Mean | 0.76 | 0.84 |
| SD | 0.43 | 0.36 |
| 95%confidence interval: | | |
| Lower bound | 0.65 | 0.75 |
| Upper bound | 0.86 | 0.93 |
| Driving Experience | | |
| Mean | 2.35 | 1.67 |
| SD | 1.03 | 0.92 |
| 95% confidence interval: | | |
| Lower bound | 2.11 | 1.45 |
| Upper bound | 2.60 | 1.89 |

## 3. 2. Driver Behaviour Questionnaire Survey

Driver Behaviour Questionnaire (DBQ) was utilized to measure young driver behaviour towards road safety issues. To assess deviant driving behaviour, the Driver Behaviour Questionnaire (DBQ) was first developed as a tool in the related studies 1990s [25] [26]. DBQ, such an instrument has the potential to provide useful information relevant to driver evaluation and training. Indeed, there is a significant relation between self-reported collisions and behaviours such as violations [27]. Questionnaire survey method is a predefined series of questions used to collect information from individuals. Questionnaire design in this study included closed ended questions in which respondents were given a list of predetermined responses from which to choose their answers. Questionnaire survey sampling made it possible to accurately estimate the characteristics of a young driver's attitudes related to road safety. The DBQ questionnaire included 11 items of risky driving attitudes consists of closed questions, that is, multiple choices on three-point scale (1=often, 2=sometimes, 3=never) for the convenience of statistical analysis. Participants were asked to indicate how often they have involved the risky attitudes related to road safety while driving in recent one year.

The questionnaire was designed in English originally, and this version was used in Islamabad. And it was translated into a Hungarian language and this version was used in Budapest. Survey data was collected by face to face method which enhanced its reliability. DBQ questionnaire data was collected from university students of Islamabad with the help of research assistant. While, Hungarian language version of the same questionnaire was distributed among university students in Budapest. For this purpose, individuals were approached and interviewed using the questionnaire. The eleven-examined driver behaviour questionnaire (DBQ) items with assigned symbols were listed here.

Q1: Failing to comply with traffic light signal, Q2: Failing to wear seat belt, Q3: Disregard speed limit, Q4: Failing to use personal intelligent assistant, Q5: Failing to yield pedestrian, Q6: Driving too closely, Q7: Frequently changing lanes, Q8: Risk due to encroachments, Q9: Failing to apply brakes, Q10: Problems of mixed traffic, Q11: Sounds horn in annoyance.

# 4. Data Analysis and Results

The results of the study revealed the reported attitudes of young drivers towards traffic risks related to road safety. Table 1 & 2 showed the information of driver behaviour questionnaire items with responses and the frequency levels related to road safety subjects in Budapest and Islamabad. Mostly young drivers in Budapest stated that they 'never' involve in the driving safety issues with a high frequency but for some items

in driver behaviour questionnaire (DBQ), the drivers selected only 'sometimes' with high percentage such as disregard speed limits Q3 (62.9%), failing to use of personal intelligent system Q4 (54.3%), driving too closely Q6 (57.2%) and frequently changing lines Q7 (62.9%). While, comparatively higher percentage of Islamabad young drivers stated that they 'often' involved in the driving safety issues on DBQ. The highest percentage traffic safety issue in Islamabad young drivers was observed as failing to use of personal intelligent system Q4 (68.6%). In other items of driver behaviour questionnaire (DBQ) they also selected only 'sometimes' with high percentage such as failing to wear seat belt Q2 (50%), disregard speed limit Q3 (45.7%) and problems of mixed traffic Q10 (48.6%). Some road safety subjects were respected in both sample of respondents in which they selected 'never' such as failing to yield pedestrian rules (Q5) (approximately 72.9% of Budapest drivers and 64.3% of Islamabad drivers) and failing to apply brakes rules (Q9) (approximately 64.3% of Budapest drivers and 54.3% of Islamabad drivers).

Descriptive statistics was also applied to investigate the means and standard deviations of 11 items on the DBQ questionnaire for both groups as shown in table 1 & 2. The most frequently reported traffic issues reported by Budapest respondents were the failing to use personal intelligent assistant (Q4) and frequently changing lanes (Q7) which had the lowest mean of 1.94 whilst risk due to encroachments (Q8) was the least reported issue by respondents which had mean of 2.78. While, the most frequently reported traffic issue reported by Islamabad respondents was the failing to use personal intelligent system (Q4) which had the mean of 1.47 whereas failing to yield pedestrian (Q5) was the least reported issue by respondents which had mean of 2.47. These results can also help to evaluate the traffic safety issues from one to eleven based on risk level.

Table 2. Driver behaviour questionnaire (DBQ) results.

| Questionnaire | | Budapest | | | |
|---|---|---|---|---|---|
| Items | Options | Frequency | % | M | SD |
| Q1 | 1)Often<br>2)Sometime<br>3)Never | 03<br>12<br>55 | 4.3<br>17.1<br>78.6 | 2.74 | 0.52 |
| Q2 | 1)Often<br>2)Sometime<br>3)Never | 04<br>14<br>52 | 5.7<br>20<br>74.3 | 2.68 | 0.57 |
| Q3 | 1)Often<br>2)Sometime<br>3)Never | 14<br>44<br>12 | 20<br>62.9<br>17.1 | 1.97 | 0.60 |
| Q4 | 1)Often<br>2)Sometime<br>3)Never | 18<br>38<br>14 | 25.7<br>54.3<br>20 | 1.94 | 0.67 |
| Q5 | 1)Often<br>2)Sometime<br>3)Never | 05<br>14<br>51 | 7.1<br>20<br>72.9 | 2.66 | 0.61 |
| Q6 | 1)Often<br>2)Sometime<br>3)Never | 05<br>40<br>25 | 7.1<br>57.2<br>35.7 | 2.28 | 0.58 |
| Q7 | 1)Often<br>2)Sometime<br>3)Never | 15<br>44<br>11 | 21.4<br>62.9<br>15.7 | 1.94 | 0.60 |
| Q8 | 1)Often<br>2)Sometime<br>3)Never | 0<br>15<br>55 | 0<br>21.4<br>78.6 | 2.78 | 0.41 |
| Q9 | 1)Often<br>2)Sometime<br>3)Never | 0<br>25<br>45 | 0<br>35.7<br>64.3 | 2.64 | 0.48 |
| Q10 | 1)Often<br>2)Sometime<br>3)Never | 07<br>29<br>34 | 10<br>41.4<br>48.6 | 2.38 | 0.66 |
| Q11 | 1)Often<br>2)Sometime<br>3)Never | 07<br>23<br>40 | 10<br>32.9<br>57.1 | 2.47 | 0.67 |

Table 3. Driver behaviour questionnaire (DBQ) results.

| Questionnaire | Islamabad | | | | |
| --- | --- | --- | --- | --- | --- |
| Items | Options | Frequency | % | M | SD |
| Q1 | 1)Often | 23 | 32.9 | 1.97 | 0.79 |
| | 2)Sometime | 26 | 37.1 | | |
| | 3)Never | 21 | 30 | | |
| Q2 | 1)Often | 23 | 32.9 | 1.84 | 0.69 |
| | 2)Sometime | 35 | 50 | | |
| | 3)Never | 12 | 17.1 | | |
| Q3 | 1)Often | 25 | 35.7 | 1.83 | 0.72 |
| | 2)Sometime | 32 | 45.7 | | |
| | 3)Never | 13 | 18.6 | | |
| Q4 | 1)Often | 48 | 68.6 | 1.47 | 0.75 |
| | 2)Sometime | 11 | 15.7 | | |
| | 3)Never | 11 | 15.7 | | |
| Q5 | 1)Often | 12 | 17.1 | 2.47 | 0.77 |
| | 2)Sometime | 13 | 18.6 | | |
| | 3)Never | 45 | 64.3 | | |
| Q6 | 1)Often | 19 | 27.1 | 2.04 | 0.76 |
| | 2)Sometime | 29 | 41.5 | | |
| | 3)Never | 22 | 31.4 | | |
| Q7 | 1)Often | 32 | 45.7 | 1.74 | 0.77 |
| | 2)Sometime | 24 | 34.3 | | |
| | 3)Never | 14 | 20 | | |
| Q8 | 1)Often | 05 | 7.1 | 2.41 | 0.62 |
| | 2)Sometime | 31 | 44.3 | | |
| | 3)Never | 34 | 48.6 | | |
| Q9 | 1)Often | 08 | 11.4 | 2.43 | 0.69 |
| | 2)Sometime | 24 | 34.3 | | |
| | 3)Never | 38 | 54.3 | | |
| Q10 | 1)Often | 20 | 28.6 | 1.94 | 0.71 |
| | 2)Sometime | 34 | 48.6 | | |
| | 3)Never | 16 | 22.8 | | |
| Q11 | 1)Often | 33 | 47.1 | 1.73 | 0.77 |
| | 2)Sometime | 23 | 32.9 | | |
| | 3)Never | 14 | 20 | | |

## 4. 1. ANOVA Analysis

Analysis of variance (ANOVA) is a collection of statistical models and their associated procedures used to analyse the differences between two or more means of independent variables. ANOVA test is generally suitable for comparing means in controlled studies, but the limitation of test is when the samples are not independent a repeated measures test must be used. In this study one-way ANOVA was applied to measure significance differences of young driver behaviour factors between two groups after controlling the effect of age, gender and experience. The measured parameters were described here; Firstly, total degrees of freedom (DF) show how much information that data uses. DF is calculated by total number of values in an independent variable source minus one, e.g. in this study, there are total two groups of drivers in sample, so its degrees of freedom (DF) is calculated by two minus one, i.e. one as shown in second column of table 4. Mean squares describes that how much a term or model displays variation, if all other terms are in the model, irrespective of the order they were entered. Mean square is calculated by dividing the sum of square values by degree of freedom. In this case values of sum of square and mean square are same because value of degree of freedom was measured one for all items in sample. The values of mean squares are shown in column 3 of table 4. F-value is the statistical test used to determine whether the term is related with the response variable or not. F-value is used to calculate the significance value on risk taking behaviour in the sample. F-values have been computed for all the questionnaire items in sample as shown in column 4 of table 4. The p-value is a probability that measures the evidence against the null hypothesis. The measured p values were shown in column 5 of table 4. There are two parameters to check the significance of items in sample which are; the F-values should be greater than F-critical, and p-value should be less than α-value. In this study, all the significance level (alpha value) is in default of 0.05. If the p value is less than or equal to the significance level, it implies all the means are equal. If the p value is greater than the significance level, there is insufficient evidence to claim that some of the means may be different from each other. So, if F-value is greater from F-critical and p-value is lower from 0.05 then the effect for that term is statistically significant. If the p-value is larger than the selected significance level (α), the effect is not statistically significant. The results showed that mostly terms in sample are statistically significant because their F-values are greater than F-critical and p-value less than 0.05. Only three terms are not statistically significant such as disregard speed limit (Q3), failing to yield pedestrian (Q5) and frequently changing lanes (Q7) which have F value less then F critical and p-value greater than 0.05. The ANOVA analysis results have been shown in table 4.

Table 4. ANOVA analysis results after controlling the effect of age, gender and driving experience.

| Items | DF | MS | F | P-value | F-critical |
|-------|----|-----|-----|---------|------------|
| Q1 | 1 | 20.828 | 45.3980 | 0.000 | 3.909 |
| Q2 | 1 | 24.864 | 60.8844 | 0.000 | 3.909 |
| Q3 | 1 | 0.7142 | 1.59279 | 0.209 | 3.909 |
| Q4 | 1 | 7.7785 | 15.0734 | 0.000 | 3.909 |
| Q5 | 1 | 1.2071 | 2.47842 | 0.117 | 3.909 |
| Q6 | 1 | 2.0642 | 4.37206 | 0.038 | 3.909 |
| Q7 | 1 | 1.4 | 2.87744 | 0.092 | 3.909 |
| Q8 | 1 | 4.8285 | 17.1864 | 0.000 | 3.909 |
| Q9 | 1 | 1.6071 | 4.50653 | 0.035 | 3.909 |
| Q10 | 1 | 6.8642 | 14.2753 | 0.000 | 3.909 |
| Q11 | 1 | 19.314 | 36.3695 | 0.000 | 3.909 |

## 4. 2. Comparison Plots

Figure 1 showed comparison column charts between two groups (Budapest and Islamabad) for percentage of drivers who responded the option 'often' on DBQ items. It was noticed that the percentage values "often" were observed higher for Islamabad young drivers as compared to Budapest drivers. The highest percentage value for option "often" was observed for failing to use personal intelligent assistance for Islamabad drivers about 68.6%. It depicted that driver assistance systems were not used by most of young drivers in Islamabad. The highest percentage value for option 'often' in Budapest was also failing to use personal intelligent assistance about 25.7%. It was also noticed that there was zero percentage "often" for two road safety issues in Budapest such as risk due to encroachment and failing to apply brakes. Additionally, the percentage of difference for 'often' between two groups was observed higher (>25%) in some items such as Q1 (28.6%), Q2 (27.2%), Q4 (42.9%) and Q11 (37.1%). While, other cases the percentage of difference was observed lower (<25%) between two groups.
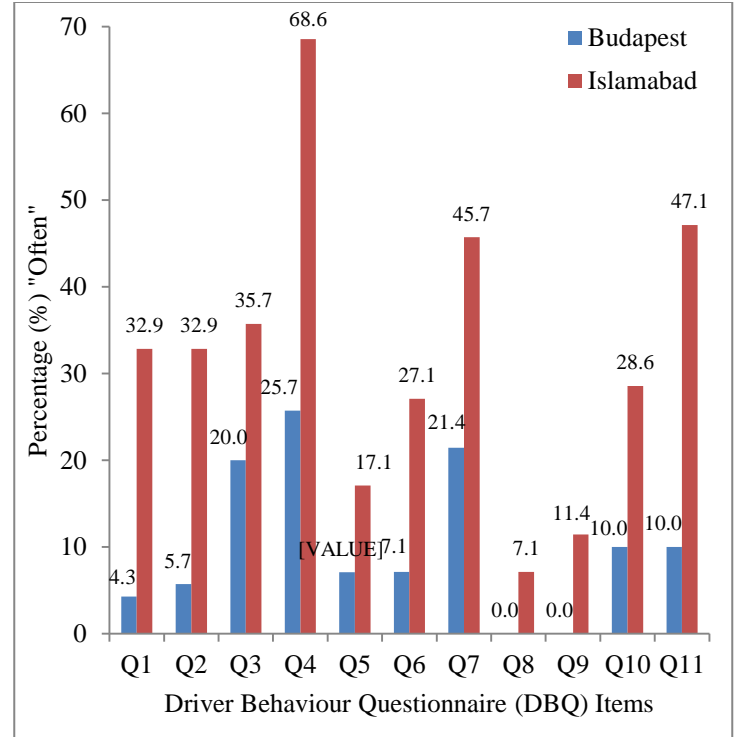


Figure 1. Comparison charts for driver's response "Often".

Figure 2 showed comparison column charts between two groups (Budapest and Islamabad) for percentage of drivers who responded the option 'never' from 11 items of questionnaire. It was noticed that the percentage values for "never" were observed higher for Budapest drivers as compared to Islamabad drivers. But for two items such as disregarding speed limits (Q3) and frequently changing lanes (Q7) the percentage value for "never" was observed higher for Islamabad drivers as compared to Budapest drivers. These two risky driver behaviour factors should be fixed in Budapest. Mostly, Islamabad drivers selected less percentage for "never" which means they did not respect these driver behaviour factors related to road safety. There is need to take solid steps to solve these young driver's road safety issues in Islamabad. Additionally, the percentage of difference for 'never' was observed higher (>25%) between two groups in some items such as Q1 (48.57%), Q2 (57.14), Q8 (30%), Q10 (25.72) and Q11 (37.14). While, other cases the percentage of difference was observed lower (<25%) between two groups.
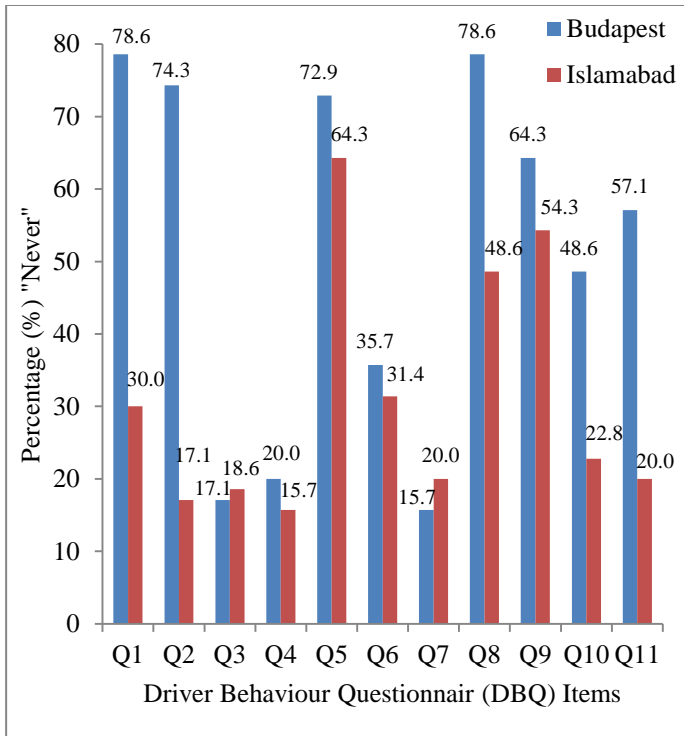
Figure 2. Comparison charts for driver's response "Never".

## 5. Conclusion

This paper investigated young driver behaviour with the help of self-assessment driver behaviour questionnaire (DBQ) as tool to identify the factors that most affect driver perception towards road traffic safety issues. Questionnaire survey included 11 items of driver behaviours on multiple choice of three-point scale (1=often, 2=sometimes, 3=never) for the convenience of statistical analysis. The demographic data of drivers was also collected on DBQ. For this purpose, the individuals (N= 70) of university students having driving license were approached and interviewed in Budapest on Hungarian language version of questionnaire. Also, the Islamabad university students having driving license responded on English language version of questionnaire with the help of research assistants. From the statistical analysis of results of DBQ items, many significant differences were measured in many young driver attitudes such as failing to comply with traffic light signal, failing to wear seat belt, failing to use personal intelligent system, problems of mixed traffic and sounds horn in annoyance between two regions. However, the results obtained from the samples also showed some similarities in some young driver attitudes such as failing to yield pedestrian and failing to apply brakes in both regions. These two

factors were not observed high in both regions. The factor analysis indicated that some important young driver behaviours such as disregarding the speed limits, driving too closely and frequently changing lanes which need improvements in both countries. The ANOVA analysis results suggested the significance of items in sample. The significance level was set 0.05 In general, the comparisons suggested that the driving behaviour of the young drivers in Budapest is more compliant with the driving safety approaches than that of young driving behaviour in Islamabad. The major issue with young drivers' particularly young male drivers is that most of them do not regard driving to be a dangerous activity and over rate their driving skills. The traffic regulation authorities in Pakistan should take solid steps to mitigate pointed traffic safety issues of young drivers. There is the need to develop effective and strong measures that will be capable of countering the optimism of young drivers regarding their driving skills. These results can play an important role in planning road safety campaigns in universities for young drivers in both regions. Concerning future research needs, it is recommended to examine young drivers' behaviour using driving simulators or other advance naturalistic tools to compare the actual behaviour with the self-reported behaviour presented in the current study.

## References

[1] D. O. Juan, D. O. Rocio, L. Eboli, C. Forciniti and G. Mazzulla, "How to identify the key factors that affect driver perception of accident risk, A comparison between Italian and Spanish driver behaviour," *Accident Analysis and Prevention*, vol. 73, pp. 225-235, 2014.

[2] N. A. Stanton and P. M. Salmon, "Human error taxonomies applied to driving: generic driver error taxonomy and its implications for intelligent transport systems," *Safety Science*, vol. 47, pp. 227-237, 2009.

[3] W. W. Wierwille, R. J. Hanowski, J. M. Hankey, C. A. Kieliszewski, S. E. Lee, A. Medina, A. S. Keisler and T. A. Dingus, "Identification and evaluation of driver errors: overview and recommendations," U.S Department of Transportation, Federal Highway Administration, Report No. FHWA-RD-02-003, 2002.

[4] A. Lindgren, F. Chen, P.W. Jordan and H. Zhang, "Requirements for the design of advanced driver assistance systems – the differences between

Swedish and Chinese drivers," *International Journal of Design*, vol. 2, no. 2, pp. 41-54, 2008.

[5] W. Boot and C. Scialfa, "The aging road user and technology to promote safe mobility for life," In: Kwon, S. (Ed.), Gerontechnology, Springer, New York (in press), 2016.

[6] C. G. Prato, T. Toledo, T. Lotan and O. Taubman-Ben-Ari, "Modeling the behaviour of novice young drivers during the first year after licensure," *Accident Analysis & Prevention*, vol. 42, no. 2, pp. 480-486, 2010.

[7] M. A. Regan, J. D. Lee and T. W. Victor, "Driver Distraction and Inattention," *Advances in Research and Countermeasures*, vol. 1, Ashgate, Farnham, UK, 2013.

[8] H. Stanislaw, "Personality and demographic predictors of aggressive and distracted driving," In: M. Sullman, L. Dorn, (Eds.), Advances in Traffic Psychology, Surrey, UK, pp. 63-75, 2012.

[9] B. Scott-Parker and C. Proffitt, "Validation of the behaviour of young novice drivers scale (BYNDS) in a New Zealand young driver population," *Accident Analysis and Prevention,* vol. 77, pp. 62-71, 2015.

[10] M. A. Machin and K. S. Sankey, "Relationships between young drivers' personality characteristics, risk perceptions, and driving behaviour," *Accident Analysis and Prevention,* vol. 40, pp. 541-547, 2008.

[11] G. N. Bifulco, F. Galante, L. Pariota, M. R. Spena and P. D. Gais, "Data Collection for Traffic and Drivers' Behaviour Studies: a large-scale survey," *Procedia - Social and Behavioral Sciences*, vol. 111, pp. 721-730, 2014.

[12] A. af Wåhlberg, L. Dorn and T. Kline, "The Manchester driver behaviour questionnaire as a predictor of road traffic accidents," *Theory, Issues Ergonomics, Science*, vol. 12, pp. 66-86, 2011.

[13] J. C. F. de Winter and D. Dodou, "The Driver Behaviour Questionnaire as a predictor of accidents: A meta-analysis," *Journal of Safety Research*, vol. 41, no. 6, pp. 463-470, 2010.

[14] N. Rhodesa and K. Pivikc, "Age and gender differences in risky driving: The roles of positive affect and risk perception," *Accident Analysis and Prevention*, vol. 43, pp. 923-931, 2011.

[15] M. Hany Hassan, A. Mohamed Abdel-Atya, "Exploring the safety implications of young drivers' behavior, attitudes and perceptions," *Accident Analysis and Prevention*, vol. 50, pp. 361-370, 2013.

[16] T. Lajunen, A. Corry, H. Summala and L. Hartley, "Cross-cultural differences in drivers' self-assessments of their perceptual-motor and safety skills: Australians and Finns," *Personality and Individual Differences*, vol. 24, pp. 539-550, 1998.

[17] T. Ozkan, T. Lajunen and H. Summala, "Driver Behaviour Questionnaire: a follow-up study," *Accident Analysis and Prevention*, vol. 38, no. 2, pp. 386-95, 2006.

[18] I. O. Lund and T. Rundmo, "Cross-cultural comparisons of traffic safety, risk perception, attitudes and behaviour," *Safety Science*, vol. 47, no. 4, pp. 547-553, 2009.

[19] H. Hayakawa, P. S. Fischbeck and B. Fischhoff, "Automobile risk perceptions and insurance-purchasing Decisions in Japan and the United States," *Journal of Risk Research*, vol. 3, pp. 51-67, 2000.

[20] F. P. Da Silva, J. A. Santos and A. Meireles, "Road accident: Driver behavior, learning and driving task," *Procedia – Social and Behavioral Sciences*, vol. 162, pp. 300-309, 2014.

[21] R. Fuller, "Towards a general theory of driver behavior," *Accident Analysis & Prevention*, vol. 37, no. 3, pp. 461-472, 2005.

[22] B. Scott-Parker, O. Oviedo-Trespalacios, "Young driver risky behaviour and predictors of crash risk in Australia, New Zealand and Colombia: Same but different," *Accident Analysis and Prevention*, vol. 99, pp. 30-38, 2017.

[23] D. Lord, S. P. Washington and J. N. Ivan, "Poisson, Poisson-gamma and zero-inflated regression models of motor vehicle crashes: balancing statistical fit and theory," *Accident Analysis and Prevention*, vol. 37, pp. 35-46, 2005.

[24] M. Møller and N. P. Gregersen, "Psychosocial function of driving as predictor of risk-taking behaviour," *Accident Analysis and Prevention*, vol. 40, no. 209-215, 2008.

[25] J. T. Reason, A. S. R. Manstead, S. Stradling, J. Baxter and K. Campbell, "Errors and violations on the roads," *Ergonomics*, vol. 33, pp. 1315-1332, 1990.

[26] D. Parker, J. T. Reason, A. S. R. Manstead and S. G. Stradling, "Driving errors, driving violations and accident involvement," *Ergonomics*, vol. 38, pp. 1036-1048, 1995.

[27] T. D. Sheila Cordazzo, T. Charles Scialfa, Katherine Bubric, Rachel Jones Ross, "The Driver Behaviour Questionnaire: A North American analysis," *Journal of Safety Research*, vol. 50, pp. 99-107, 2014.