Attitudinal segmentaion of drivers in Pakistan: The potential for effective road safety campaigns

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ABSTRACT

Deviant driving behaviors are considered as the main cause of Road Traffic Accidents in Pakistan. This research is founded on the premise that driving behaviors are mediated by attitudinal and motivational factors. It advocates that rather than simply aggregating drivers' responses or *a-priori* classification of them based on their personal characteristics, adoption of segmentation technique is more useful to look at multiple factors provoking aberrant driving behavior in combination and not just in isolation. For this, the study generated an Attitudinal Questionnaire, inspired by the Ajzen's Theory of Planned Behavior (TPB: Ajzen, 1991), and extended violation-scale of modified Driver Behavior Questionnaire (DBQ: Lawton et al., 1997). Attitudinal and behavioral items are first factor analyzed. Then, cluster analysis is performed on extracted attitudinal factors which classified sample driving population into four relatively homogenous and distinct groups of drivers. The results demonstrated the explanatory utility of the market segmentation approach to systematically relate the interaction between attitudes, behaviors and socio-demographic characteristics of drivers. It is concluded that the approach is successful in distinguishing safe drivers from unsafe driver and therefore, can legitimately form the basis of road safety interventions. Finally, the findings are used to recommend targeted information-based road safety solutions with a focus on the diverse characteristics of each of the identified segments.

1. Introduction

Road Traffic Accidents (RTAs) are attributed to many factors including road, vehicle and human factors. These contributory factors combine in a way that leads to a road user failing to cope in a particular situation (Casbard and Accidents, 2003, p. 2). The literature generally agrees that human factors are one of the most dominant factors in understanding the chain of events leading to an accident (e.g. Christ et al., 2004) and contributes to as much as 75% of all roadway crashes (Salmon et al., 2005, p. 1). More recently, taking 'man as the measure of all things' and a starting point, in a balanced combination of the elements 'road', 'vehicle', and 'man' is strongly advocated in programs such as the Sustainable Safety Vision of the Netherlands (Wegman et al., 2008, p. 12). It is frequently argued that changes in aberrant behavior of drivers offer the largest opportunities for harm reduction (Evan, 1991). However, in order to improve these behaviors, attitudinal and motivational components attached to them must first be understood (Glendon, 2007; Parker, 2004). Attitudes have long been recognized as having an important influence on driver performance, making this an important road safety issue. The construct continues to be a major focus of theory and research in the social and behavioral sciences (e.g. Ajzen, 2001; Delaney et al., 2004; OECD, 1994). There is a consensus that attitudes towards traffic safety affect risky driving behavior (Ulleberg and Rundmo, 2003) and efforts can be made to change the attitudes that motivate certain drivers to commit relatively high rate of violations (Parker et al., 1995).

Theory of Planned Behavior (TPB) is one of the most established psychological theories to understand attitude-behavior relations. According to the theory, volitional behavior is based on Intention and intentions are results of cognitive components including Attitudes, Subjective Norms (SN) and Perceived Behavioral Control (PBC). However, many studies challenge the assumption that the predictors in the TPB are sufficient to account for intentions and behavior. This is done by including measures of additional variables in the prediction equation and showing significant improvement in the prediction of intentions or behavior (see Conner and Armitage, 1998 for a review). However, Ajzen (1991) states that evidences support the TPB and that adding further variables to the model would not significantly enhance its predictive power (Eby and Molnar, 1998, p. 65). In later years, he has further claimed that, even when improvements are found, for the

most part the improvements in prediction of intentions or behavior are relatively minor, and their generalizability to other behavioral domains has yet to be demonstrated (Ajzen, 2001; p. 46). As the significance and empirical values of the basic constructs of the TPB have already been established in a number of studies (e.g. see Ajzen, 1985, 1991; Chorlton, 2007), this research takes primary guidelines from these constructs to look into risky behavior of drivers. The theory is not applied rigidly. However, for the sake of brevity and because of the notable importance of attitudes, the term 'attitudes' or 'attitudes toward road safety' is used to take into account other internal cognitive components including SN and PBC. This is to illustrate the overall underlying socio-psychological mechanism involved to perform behavior.

1.1. Potential of attitudinal segmentation for effective road safety campaigns

There has been little research on the effectiveness of road safety campaigns and driver training to bring about a general improvement in driver behavior and accident savings particularly in case of developing countries. However, meta-analysis of the effect of road safety campaigns on accidents by Phillips, Ulleberg and Vaa (2011) suggest positive associations between accident reduction and the use of personal communication or roadside media as part of a campaign delivery strategy. To add, the commonly used statistical methods in socio-psychological investigations like this include Principal Components Analysis (PCA), Factor Analysis (FA), and Regression Analysis (RA). However, it is criticized that although these techniques are a major tool for data analysis, most of multivariate techniques share common limitations. For instance, each technique can only investigate one relationship at one time (Limpanitgul, 2009). Also, these are data reduction techniques and produce groups of highly interrelated variables known as component/factor/dependent variable or composite variable (Hair et al., 2006). Whilst the review of literature suggests that driving behavior is a function of complex interaction between driver's social-cognitive factors, socio-demographic characteristics and many other external factors.

Another limitation of these techniques is linked with failure of intervention studies based on the assumption that attitudes influence behavior to show any consistently significant effects. One of the reasons suggested is that they tend to cover too large and varied groups of drivers (Iversen and Rundmo, 2004). It is argued that different groups of people need to be served in different ways to optimize the likelihood of affecting behavior change (Anable, 2005).

There is also a criticism on conventional practices of a-priori classification of drivers based on their socio-demographic characteristics (e.g. male driver vs. female driver; higher-income driver vs. lower-income driver). For comparative purposes, attitudinal (or behavioral) results are averaged out for people of each group under investigation. This generalization by attributing a set of characteristics to a group of people can lead to stereotyping and can also result in manipulation of findings by researchers (e.g. see Anable, 2002; Carey, 2011).

To address these limitations, this research seeks to move beyond these techniques. It proposes that adoption of segmentation techniques such as Cluster Ananlysis (CA) can bring more in-depth and realistic understanding to a phenomenon of driving behavior. More recently, the technique has started receiving attention in transport studies research (e.g. Collins et al., 2008; Higgs and Abbas, 2015). Fernandes et al. (2006, p. 27) specifically support the use of such unconventional tecnhiques in road safety research. They say given the range of factors implicated in the prediction of risky driving, it is necessary to examine such factors together, in order to tease apart the roles of different factors, and identify which factors best predict which *individual* risky driving behavior. Clearly, identifying the causal factors associated with road crashes must remain the optimal goal – however, the investigation of predictive factors worthy of experimental manipulation for specific risky driving behaviors is an important first step to realizing this goal.

The technique allows exploring the combined effect of different variables (i.e. attitudes towards road safety) on phenomenon under investigation (i.e. driving behavior). The method does not make prior assumptions about important differences in the population. It reduces the number of entities being dealt with into a manageable number of groups (of drivers) that are mutually exclusive and share well defined characteristics (Anable, 2002). It also provides socio-demographic profiling of extracted groups. This collective information facilitates comprehensive and pragmatic understanding of combination of underlying factors provoking deviant driving practices. Thus, for this research work the technique is adopted in the hope that effective road safety campaigns can be designed following person-based approach for Pakistan. Considering the limitation of resources in the country, it is considered favorable to focus more on person-based cost effective solutions, as these can be incorporated readily into existing decision-making structures. Also it is difficult to entirely rebuild a different transport system to meet the desired standards of road safety. Davies et al. (1997) say that the understanding of different demands and decision making process of the segments can be used to design different messages for different groups to be channeled through different media at different times as part of a coordinated and systematic campaign (p. 316). Thus, the aim of this research is to assess the human side of accidents in Pakistan while focusing on attitudes and behavior of drivers in the context of Road Traffic Violations (RTVs). Simply, the principal approach adopted to assess the pre-crash phenomenon is statistical segmentation. It is postulated that the technique provides an underlying explanation of multiple dimensions related to aberrant driving behaviors while classifying sample population into relatively homogenous and distinct groups. Consequently, it also aids in development of targeted road safety intervention by understanding the differences between safe and un-safe drivers.

2. Methodology

2.1. Questionnaire

In total, 438 drivers agreed to take part in the study who are approached randomly at different locations of Lahore city. They are asked to complete self-reported questionnaires measuring their attitudes towards road safety and aberrant driving behaviors, along with socio-demographic characteristics and driving-related variables. The sample is predominantly composed of the young age group drivers (< 19: 12%; 19–34: 64%; 35–55: 17%; 55+: 3%). Male drivers constituted 86% of the sample. Participants also informed about their employment status. Nearly 31% were students and the same percentage was full-time employed (29.2%), closely followed by self-employed drivers (24.1%). Drivers working part-time (3%), unemployed/retired (3.7%), or looking after family (2.8%) were in lesser percentages. The mean near misses and accidents for the study's driver in last six months are 2.72 and 1.98 respectively. On average, participants held a driving license for 8.43 years and have a weekly mileage 363.47 km.

Although, the theory is not applied rigidly, a 58-item questionnaire is developed inspired by attitudes, SN and PBC constructs of the TPB. Preliminary guideline to develop an Attitudinal Questionnaire (AQ) has been borrowed from the Driver Attitude Questionnaire (DAQ: Parker, et al., 1996). The questionnaire tapped drivers' opinion towards issues such as speeding (e.g. if you are safe driver, it is acceptable to exceed the speed limit), use of seatbelt/helmet (e.g. for me to wear seatbelt/helmet each day while driving on road is unpleasant), unsafe lane change (e.g. I know exactly when I can change lane safely across a continuous while line), red light running (e.g. even running a red light when there is no traffic makes you less safe as a driver), drink and drugs driving (e.g. I would never ride with someone I knew has been taking drugs), one-way driving (e.g. I think it is okay to drive the wrong way on a one-way road), close-following (e.g. close following is not really a serious problem) and overtaking (e.g. it is quite acceptable to take