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Master's thesis

Personality Factors as a Predictor of Driving Behavior and Driving Outcomes Among Taxi Drivers in Addis Ababa: Testing the Contextual Mediated Model

Esmael Seid Yimer

Thesis presented in fulfillment of the requirements for the degree of Master of Transportation Sciences, specialization Traffic Safety

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2018
2019



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ABSTRACT

Taxi drivers constitute a disproportionate percentage of risky driving behaviors and crash involvement in Addis Ababa, Ethiopia. Despite its importance, little is known about the psychological underlying causes of aberrant driving behaviors among this population. It is clear that the more we know about the determinants of a given behavior, the better we are to reinforce or change that behavior. Using the contextual mediated model, the current study attempted to examine whether factors in the distal context such as personality traits (sensation seeking, aggression, altruism and normlessness), drivers' demographic factors and attitude towards traffic safety would predict crash involvement both directly and indirectly, through the effects of the so-called proximal factors such as aberrant driving behaviors (driving violations and errors) among this population. A cross sectional study design was followed on convenience sample of taxi drivers (n = 232; mean (SD) age = 33 (4.8) years, completed a pre-tested self-reported questionnaire that was measuring demographic factors, personality traits, attitude towards traffic safety, risky driving behaviors and crash involvements. The result of the casual modeling path analysis showed that certain personality traits and negative attitude towards traffic safety predicted drivers crash involvement indirectly via the mediating effect of aberrant driving behaviors (violations and errors). Overall, the study replicates and extends previous findings confirming the contextual mediated model among Ethiopian drivers. Beside the theoretical implications, practical implications for the development of traffic safety campaigns and drivers' education are discussed.

Keywords: *Risky driving, Taxi drivers, Personality, Attitude, Violations, Errors, Road traffic injuries, Addis Ababa*

Key findings

- There was no significant association in drivers' demographic factors and the different aberrant driving measures and driving outcome.
- Normlessness trait was associated with a variety of risky driving behaviors directly and indirectly with the number of self-reported crashes through the mediating effect of driving behaviors.
- Negative attitude towards traffic safety predicted drivers' likelihood of committing driving errors.
- DBQ errors accounted the highest percentage of variance in self-reported crash involvement of drivers followed by DBQ-Violations.
- Absence of significant direct effects of the personality and the attitudinal factors on the number of self-reported crashes.
- A relatively higher variance of the self-reported crash involvement of drivers were predicted through the indirect effect of the distal factors.

1. INTRODUCTION

Road traffic injuries continued to be a serious concern worldwide. This burden, however, greatly varies among regions, where low and middle-income countries are disproportionately affected. With a fatality rate of 27 deaths per 100,000 populations, citizens living in African countries, are three times in risk than in high-income countries despite having only 1% of total vehicle ownership share in this region (WHO, 2018). Apart from the direct human loss, the estimated economic cost borne by this burden exceeds 1% of the total GDP in this region (Sharma, 2008).

The case in Ethiopia is not different from the above fact, where despite the low level of motorization and vehicle ownership, the country stands out as the worst in terms of safety performance; a fatality rate of 170 per 10,000 people (United Nations Economic Commission for Africa, 2009). The situation is expected to escalate as the exposure to the risk increases with rapid motorization, rapid population growth, an increase in the road network coupled with poor attitudes and safety culture of road users. Specific to the capital Addis Ababa, despite various strategies and initiatives made by the city government (sobriety checks at different corridors, mandatory seatbelt, speed camera installations) road traffic deaths are increasing from 395 in 2007 to 463 and 477 in 2016 and 2017 respectively (Bloomberg Philanthropic Initiative for Global Road Safety, 2018). As far as the causes of crashes are concerned, the report by Federal Police Commission of Ethiopia uncovered (as cited on Newnam, Mamo, and Tulu (2014) drivers related causes accounted for an overwhelming share (86%). Failure to give way for pedestrians, over speeding, improper overtaking failure to give way for priority vehicles, improper overtaking and drink driving have been listed as the most driver related factors causing crashes in the country (United Nations Economic Commission for Africa, 2009).

Looking the crashes characteristics in terms of vehicle type, for over six years from 2005- 2011, minibus taxis accounted for the majority of (34.5%) road fatalities (Tulu, Washington, & King, 2013). Similar report was also emerged in the year 2017, where taxi drivers appeared on 24% of the vehicle crashes followed by private car 22% and heavy trucks 14% (Bloomberg Philanthropic Initiative for Global Road Safety, 2018).

As far as crashes by road user concerned, like that of many cities in the developing world, Addis Ababa is notorious by high rate of pedestrians' fatality. Such a heavy burden on pedestrians is mainly emanated from the extremely aberrant driving behaviors notwithstanding the poor road using culture of pedestrians exhibited in the city. In the year 2015 alone, random breath tests on more than 2003 drivers at major Addis Ababa roads found that 16% of taxi drivers had a blood-alcohol concentration exceeding the legal limit (Molla, 2017). Moreover, an observational study on more than 23,458 drivers during the time between January 2017-February 2017 on major corridors of the city uncovered 52 % of drivers were driving above the posted speed limit. Unhappily, professional drivers such as bus, taxi drivers shared an overwhelming majority of the share.

Conflicting findings are there concerning the effect of demographic factors of such as age and driving tenure on risky driving and accident involvement in Addis Ababa city. Indeed, some studies (Bloomberg Philanthropic Initiative for Global Road Safety, 2018; Tulu et al., 2013) have found that being a young driver, particularly below the age of 34 and with less than five years' experience of driving tenure were highly involved in a road traffic accident compared to other age groups. In contrast older and more educated drivers reported more unsafe driving behaviors, than younger and less educated ones (Newnam et al., 2014).

1.1 Personality, behavioral and attitudinal factors influencing traffic safety

Risky driving and traffic crash involvement undoubtedly have many reasons. Nonetheless, since human behavior accounted for 95% contribution to road traffic accidents, it is imperative that understanding the psychological mechanisms underlying driver behavior is an essential task in order to develop an evidence-based and effective intervention to change that unwanted behavior (Fishbein & Cappella, 2006). In the international research arena, the traffic psychology literature has witnessed two broad research traditions that aimed to explain individual differences in risky driving behavior and traffic accident involvement (Ulleberg & Rundmo, 2003). These approaches are the personality trait approach and the social cognition approach.

Personality can be defined as the consistent pattern of feeling, thinking and behaving that differentiate individuals (McCrae & Costa, 2003). The personality traits approach focused on attempts to identify stable traits that define risky drivers. In fact, the relationship between the personality trait approach toward traffic safety traced back to the earlier theory of “accident proneness” which speculates that the role of accident-prone personality among drivers in explaining accident involvement (Sümer, 2003). Even though the accident proneness theory was regarded as an outdated one, the causal factors that are internal to the driver in accident involvement have started to re-emerge as plenty of studies either by implementing the impact of single personality facets or a combination of different personality dimensions have found that personality traits are weakly, but consistently associated with accident involvement in traffic (Elander, West, & French, 1993; Lajunen, 2000; Sümer, 2003). On the other hand, the social cognition model highlighted among others, the role of attention, information processing capabilities, attitudes, perceived risk, social norms and perceived behavioral control as a central determinant of risk-taking behavior and traffic crash involvement using various prominent theories such as the theory of reasoned action/planned behavior and the health belief model (Ulleberg & Rundmo, 2003). Unfortunately, despite the advantage in integrating and assessing the relative importance of both the trait and the social cognition variables, a minimal amount of studies has tried integrate these two approaches in a single study (Ulleberg & Rundmo, 2003).

Previous research has shown the relation of certain trait dimensions that are frequently linked with traffic involvement. Sensation seeking can be defined as “the seeking of varied, novel, complex, and intense sensations and experiences and the willingness to take physical, social, legal, and financial risks for the sake of such experiences” (Zuckerman, 1994 p.27). It is among the most commonly appeared personality traits in association with a variety of risky driving behaviors and negative safety outcomes in a bunch of past studies not only in western countries but also in a sample of drivers from various middle income countries such as Brazil, Taiwan, China, Iran Turkey, etc. (Chen, 2009; Ge et al., 2014; Monteiro, Coelho, Hanel, Pimentel, & Gouveia, 2018; Sümer, 2003; Tao, Zhang, & Qu, 2017). For instance, using the contextual mediated model in a study by Monteiro et al. (2018) sensation seeking trait alone explain 13% of the variance in terms of dangerous driving behaviors operationalized as aggressive driving, risky driving, and negative emotions. Sensation seeking also had a multifaceted role in relation to predicting aberrant driving behaviors, alcohol use and over speeding (Sümer, 2003). The recent meta-analytic review on the association of sensation seeking and a multitude of driving outcomes on more than 44 past studies (Zhang, Qua, Tsoa, & Xue, 2019) also reinforced the above findings. The review has found sensation seeking positively correlated with a number of negative driving outcomes such as risky driving, aggressive driving, errors, accidents, and number of traffic tickets received. Anger can be defined as a “greater propensity to be angered and frustrated” (Ulleberg & Rundmo, 2003). It is also another prominent trait frequently appearing in relation to risky driving and other maladaptive

driving behaviors (Sümer, 2003; Ulleberg & Rundmo, 2003). Drivers with a high level of self-reported aggressiveness tendencies not only have a negative attitude towards traffic safety but also, they exhibited maladaptive and risky driving behaviors such as speeding and rule violations. Consistent with the previous assertion, higher scores on anger and aggressiveness tendencies of drivers were correlated with a more direct effect on risky driving behavior and hostilities towards other road users such as pedestrians (Monteiro et al., 2018). Considered as one among the distal factors, in an attempt to develop the contextual mediated model, (Sümer, 2003) has found that, aggression tendencies driver were shown to have an influence on proximal factors such as aberrant driving behaviors (operationalized as violations and errors) and dysfunctional drinking. In contrast to sensation seeking and anger, a trait frequently mentioned with positive traffic related behavior is altruism. Altruism which can be defined as having an active concern for others (Ulleberg & Rundmo, 2003) were associated with lower risk-taking attitudes and risky driving behaviors. The last but not the least, normlessness which is “the belief that socially unapproved behaviors are required to achieve certain goals(Ulleberg & Rundmo, 2003) also appeared to have a strong correlation in terms of predicting negative attitude towards traffic safety and driving behaviors. Taken together as a criterion variable with other personality traits in a study by Chen (2009) higher score on normlessness score contributed the largest influence on attitude toward unsafe driving. On a meta-analytic review of 48 studies, normlessness together with other personality traits such as impulsivity and narcissism exerted a strong influence on driving anger than the Big five personality factors (Demir, Demir, & Özkan, 2016).

1.2 The contextual mediated model

Despite all the above findings in relation to personality traits and driving behaviors, still, the literature concerning the link between personality traits and actual accident involvement failed to provide unequivocal results (Sümer, 2003). The central debate in this regard was whether the measured trait directly influences crash risk; or through some other, more proximal variables. In this regard, an extensive review on the behavioral correlates of accident involvement by Elander et al. (1993) asserted that the possible causes of weak variance in crash involvement using trait approaches might be emanated from various methodological and theoretical differences in the studies. Firstly, whether or not the studies employed a measure of driving style (i.e. behavior) or skills (i.e. performance) greatly determine the link between personality and accident. It is suggested that driver performance is all the skill related performances such as reaction time and information processing which can be improved by practice. Whereas, driving behaviors are simply choices of the individual that reflect his personality and attitudes among others. Moreover, they pointed that that driving style is rather a more proximal factor to accident causation and linked with certain personality characteristics, such as Type A behavior and antisocial attitudes, and it is influenced by driving-related attitudes and beliefs as well as general needs and values. Secondly, the review also mentioned the presence of unexamined mediator variables contribute to the observed weak relationships and mixed findings in predicting road crashes in previous research. Considering this call, evidence for the predictive value of unexamined mediators or variables such as attitude have emerged in various studies. Particularly, the attitude construct which is considered to be a significant construct within the social cognitive approach frequently appeared in relation with aggressive and fast driving, and self-reported accident involvement (Iversen, 2004; Ulleberg & Rundmo, 2003). Attitude was defined as “tendencies to evaluate an entity with some degree of favor or disfavor, ordinarily expressed in cognitive, affective and behavioral responses” (Eagly & Chaiken, 1993 as cited on Iversen (2004). In relation to traffic-related behaviors, attitude towards safety have been found to be a significant predictor of speeding violations (Parker, Reason,

Manstead, & Stradling, 1995), self-reported tendencies of aggressive driving (D. Parker, Lajunen, T. ,Stradling, S. , 1998) and a range of risky driving behaviors such as reckless driving, drink driving and low seatbelt uses (Iversen, 2004). In a study among young Saudi Arabian drivers, attitude toward traffic safety was also found to have an influence not only speeding and aggressing driving behavior but also including accident involvement (Mohamed & Bromfield, 2017).

The contextual mediated model which was proposed by Sümer (2003) aimed at creating a unified and better understanding of the relative contributions of personality factors and driving behaviors in accident involvement considering the methodological recommendations from a previous review done by (Elander et al., 1993). This model distinguished a proximal and distal factors, labeling personality, attitudes, demographic factors and other variables such as hazard perception as a distal factors influencing accident risks indirectly, through driving behavior (e.g. speed choice, tendency for traffic code violations and driving errors drunk driving), which are widely considered a proximal factor, directly related to accident risk. Ever since the publication of this model, various studies (Constantinou, Panayiotou, Konstantinou, Loutsiou-Ladd, & Kapardis, 2011; Mallia, Lazuras, Violani, & Lucidi, 2015; Monteiro et al., 2018; Tao et al., 2017) have replicated the indirect role of personality traits as a source of variation in drivers' crash involvement.

1.3 The Driver Behavior Questionnaire as a predictor of crashes

A wide variety of behavioral measures were developed by scholars in driving literature. Among these, the DBQ was the work of Reason, Manstead, Stradling, Baxter, and Campbell (1990) which aimed to traffic violations and risk-taking behavior of drivers. Accordingly, errors were conceptualized as a skill related deficiencies manifested in perceptual and information processing ability of the drivers. On the other hand, violations(Parker et al., 1995) accounted for choices and styles accustomed by drivers as a habit (Reason et al., 1990). Despite the difficulty in having a black and white distinction, most important delineation of errors a violation lays on their deliberateness and intentionality, where, errors arise as a result of information processing problems while violations have a clear motivational component (Reason et al., 1990). So far, the DBQ tool has been popular and widely used in relation to predicting driving behavior and driving outcomes in various studies employing different group of respondents; young drivers, professional driver, motorcyclist, probationary drivers (Af Wahlberg, Barraclough, & Freeman, 2015; J. C. de Winter & Dodou, 2010). There exist a mixed result concerning the predicting ability of the three dimensions of the DBQ (violations, errors, and lapses) as far as crash involvement of drivers is concerned. In their attempt to validate the original DBQ, Parker et al. (1995) found that accident liability was predicted by self-reported tendency to commit violations than errors and lapses. The recent meta-analytic review by J. C. F. de Winter et al. (2018) also reinforced the above finding where DBQ violations to have a small to moderate correlation with actual crashes involvements and near crashes. In contrast, DBQ errors were also found to be a significant predictor of accidents than violation (DeLucia, Kathryn Bleckley, Meyer, & Bush, 2003).

1.4 The research project

In most cities in Ethiopia, including the capital Addis Ababa, apart from police reports and observations, little is known not only about the knowledge, attitude, behavior of road users, but also on how road safety promotion and decision-making takes place (United Nations Economic Commission for Africa, 2009). This is partly the result of limited research in the area. Notwithstanding with their benefit, all the scant studies conducted so far (Newnam et al., 2014; Tibebe Beshah & Hill, 2010; Tulu et al., 2013) focused only in investigating the mere prevalence and characteristics of accidents with little attention in exploring the psychological mechanisms

which motivate car drivers underlying individuals' decisions to perform (or not perform) behaviors. Apart from the above noticeable gap, the fact that so little work in this area other setting is also another motivator for the current study. As it can be inferred from the above discussions, knowledge concerning the influence of personality traits and other motivational factors on traffic issues have been widely asserted among studies conducted in Western and European countries with relatively good traffic safety performance. However, personality as a culture-specific psychological construct (Heine & Buchtel, 2009), it clearly worth validation and replication in assessing its role in determining risky driving behaviors and accident involvement in different cultures across countries. Hence, the purpose of this study was test and explore the contextual mediated model which assert that distal factors such as personality traits (sensation seeking, aggression, altruism, and normlessness) appeared to influence what is known as proximal factors (driving behaviors) in predicting driving outcomes, including injury involvement among minibus taxi drivers in Addis Ababa, Ethiopia. Moreover, considering the recommendation of the original developer of the contextual mediated, the role of drivers' attitude towards traffic was included. The last but not the least, the role demographics factors such as age and driving tenure were also assessed to aid a greater understanding of the many dynamics that have an impact on risky driving and accident involvement.

1.5 The proposed contextual mediated model

A review of the literature revealed that the distal factors dimensions were linked with variety of risky driving behaviors and driving outcomes, although there are conflicting findings in terms how personality traits will predict driving outcomes. In light of this evidence, we began with the assumption that all of the distal factors are linked with driving outcomes measured in terms of self-reported number of injuries, either directly or indirectly through driving behaviors. However, considering the contextual mediated model, we hypothesized that the direct influence of the distal factors such as personality traits, attitudes traffic safety and demographic factors on the dependent variable would be minimal. Figure 1 below depicted the proposed contextual mediated model.

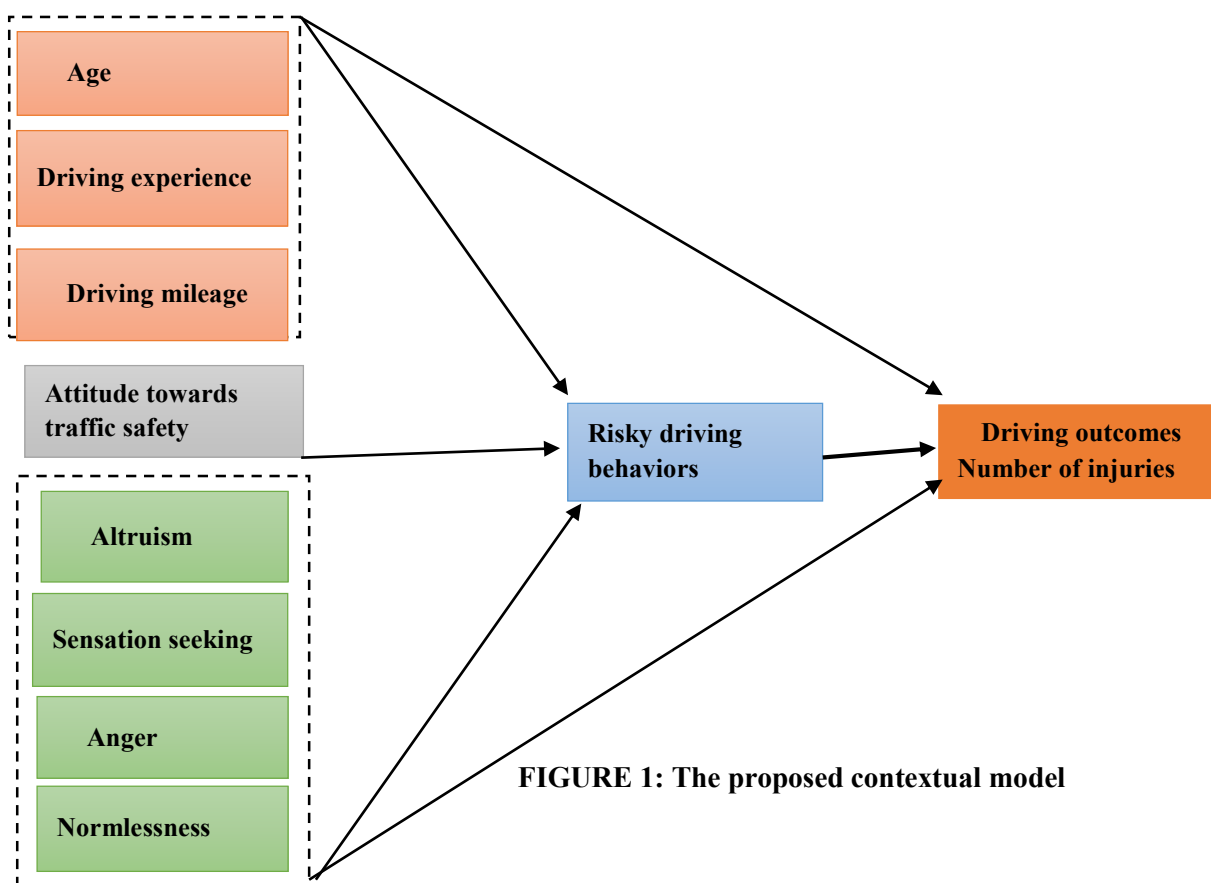


FIGURE 1: The proposed contextual model

2. METHOD

2.1 Design

A cross-sectional study design was followed to find whether personality traits, drivers demographic factors, attitude towards traffic safety predict self-reported number of crashes both directly and indirectly through the mediating effect of risky driving behaviors.

2.2 Participants

According to the data from the Addis Ababa Roads and Transport Bureau cited on (Negatu, 2013), overall, there are five taxi zones in the city with a total of 360 taxi routes. The 12-seat white and blue minibus taxi service are being provided by 13 minibus taxi associations operating in a specified zone. Among the available four taxi associations in the study area (Yeka sub city) two of them, namely, Addis Hiwot and Negat taxi associations were purposely selected. These two associations have more than 883 minibus taxi drivers that are serving 29 taxi routes in the study area (Negatu, 2013). The sample size for this study was determined by using single population proportion formula of one sample with a dichotomous outcome variable (driving outcome in terms of injury involvement). Minibus taxi drivers crash involvement in the latest report (Bloomberg Philanthropies Initiative for Global Road Safety, 2018) in Addis Ababa city during the year 2016-2017 was 24% and the desired margin of error I of 0.05 was used. Accordingly, a total of 232 participants were selected based on convinces sampling from the area to participate on the current study.

2.3 Instruments

The detail description of the data collection tool is discussed as follows.

2.3.1 Demographic Information

The first section of the questionnaire consists of questions related to demographic characteristics such as age, driving experience, education level of drivers and vehicle mileage per week and taxi ownership status.

2.3.2 Personality traits

Regarding personality traits, items from The International Personality Inventory were administered to measure the three personality traits: sensation seeking, altruism, and anger each having nine, seven and five items respectively. Items from the IPIP has been increasingly applied in various studies examining the relationship between personality traits and driving behavior and driving outcomes. The nine items for measuring sensation seeking (e.g. "I have persuaded others to do something really adventurous or crazy") was adapted from the sensation-seeking: impulsive thrill-seeking subcategory developed by Hoyle et al., (2002) under the IPIP broad category (See the NEO-PI-R constructs in a public domain (i.e. <http://ipip.ori.org>). Anger was measured by six items (e.g. "I get angry easily"). Altruism (defined as being considerateness for others) was also another trait that was assessed using 7 items (e.g. "I make people feel welcome") from the IPIP. As far as normlessness is concerned, the 4 -item normlessness scale (e.g. "It is all right to do anything you want as long as you keep out of trouble") which was originally developed by Kohn and Schooler, (1983) as cited on (Ulleberg & Rundmo, 2003) was used. As far as scoring is concerned, all the 25 items for the personality dimensions were answered based on a Likert type scale with six possible alternatives ranging from "never" to "nearly all the time". At the end, a mean score on each of the traits was calculated based on the number of items in each domain and higher score on a scale indicated a high tendency of the drivers on the measured trait.

2.3.3 Attitude towards traffic safety

The items concerning drivers' attitude towards traffic safety was adapted from a previous study by Iversen (2004). This scale has a total of 16 items with three dimensions concerning matters related to the traffic violation and other safety concerns. The three dimensions are;

1. Attitude towards rule violations and speeding (11 items; e.g. "traffic rules must be respected regardless of road and weather conditions").
2. Attitude about careless driving of others (3 items; e.g. "I don't want to risk my life and health by riding with an irresponsible driver").
3. Attitude about drunk driving (2 items; e.g. "I would never drive the morning after drinking if I am not certain that alcohol is out my body"). Even though, scoring of the items in the original scale was on a five-point scale ranged from "strongly agree" to "strongly disagree", for the sake of maintaining some degree of consistency with the other measures of this questionnaire the answering format in the current study was slightly modified (i.e. six anchors ranging from "never" to "nearly all the time" was utilized).

An exploratory factor analysis using a principal component extraction, method and varimax rotation of the 16 self-report attitude towards traffic safety items was conducted on the participant drivers. The Kaiser- Meyer-Olkin measure of sampling adequacy was .75 indicating that the present data were suitable for principal component analysis. Similarly, the Bartlett's test of sphericity was significant ($P < 0.001$) indicating sufficient correlation between the variables to proceed with the analysis. From the 16 items on the original scale, some items did not load in their expected factors and were thus excluded. Only 7 items with a three factors accounted for 70 % of the total variance. **Factor 1:** attitude towards traffic safety accounted for 25% of the variance and had three items; **factor 2:** factor two was renamed as attitude towards speeding and accounted for 21% of the variance and had two items; and **factor 3** attitude towards drink driving accounted for 24% of the variance and had two items. For the current study, the three attitude scales were aggregated as one global attitude towards traffic safety score and higher score on this scale indicated a negative attitude towards traffic safety, meaning higher tendency for risk-taking in traffic.

2.3.4 Risky Driving behaviors

Drivers self-reported driving behavior was also assessed by the famous DBQ by Reason et al. (1990). However, for the current study, items measuring lapses were excluded. Instead, another six new items representing typical driving violations observed among drivers in Addis Ababa (e.g. "How often do you drive having passengers above the authorized weight") were included. The answering format for the current study was exactly the same as the original DBQ one, which ranges from 0 = never; 1 = hardly ever; 2 = occasionally; 3 = quite often; 4 = frequently; 5 = nearly all the time. The 16 items from the two dimensions of the DBQ and the six common violations in the city were subjected to principal component analysis using varimax rotation. The Kaiser- Meyer-Olkin measure of sampling adequacy was .81 indicating that the present data were suitable for principal component analysis. Similarly, the Bartlett's test of sphericity was significant ($P < 0.001$) indicating sufficient correlation between the variables to proceed with the analysis. The EFA showed, three basic factors: violations (8 items, Cronbach's $\alpha = .75$), errors (7 items, Cronbach's $\alpha = .84$), and common violations (6 items, Cronbach's $\alpha = .71$) explaining 45% of the variance. Mean scores based on the EFA were computed for all participants where higher score on each subscale indicated a high degree of risky driving.

2.3.5. *Driving Outcomes*

Participants were also asked to indicate if they were involved in car crash and if they had received tickets (Yes/No) during the past one year. They were also asked to report the number of these crashes.

2.5 Translation and piloting

The translating process of the original tool into the official language of the country (Amharic) was conducted by the researcher with the help of another two English language professionals. In order to enhance the quality of the translation process and avoid any potential problem, the following consideration was made as suggested by Scherest (1972). Firstly, detail orientation of the proposed study and its objective was explained by the researcher to the translators. The translation process was heavily inclined to maintain the conceptual equivalent of a word, a phrase and experiential meaning of the original tool with the local understanding and usage. In this regard, apart from using a dictionary, we tried to translate words as we expect to be used by our participants. For instance, the experiential meaning of “Sunday drivers” from the original item of attitude towards traffic safety by Iversen (2004) has less relevance if it would have been translated directly. Instead, “Sunday drivers” were translated into more contextual meaning to denote those drivers who will drive to (from) work during morning and evening of a day. The rationale was according to the comment from one of the translator, taxi drivers in the study area underestimate the driving performance of the stated drivers. Secondly, the Amharic translation was also back translated in to English to check whether or not the translated questionnaire maintains some degree of equivalency from the original tool. To this end, even though there were a lot of discrepancies in the vocabularies, the translated questionnaire still maintains similar conceptual bases from the original tool. Having done the translation process, feedback from safety professionals in the area was also incorporated. Lastly, pilot test was made so as to further improve the quality and easy administration of the questionnaire.

2.4 Procedures

Participant drivers were approached while they are waiting for their passengers at their predefined zones. Data collection was carried out by the first author with help of trained data collectors from the Transportation Programs Management Office of Addis Ababa(TPMO). Data was collected only during weekdays and during normal working time. As far as specific locations are concerned, 6kilo, Piassa, Megenagia and Sammit were the four stations used as a primary source of recruiting participants. To ensure the voluntary nature of the study, an informed consent form was attached as a cover page on each questionnaire that explained the true purpose and, nature of the study, and the voluntary nature of participation in the study. All the participants gave informed consent to taking part in the study. It took approximately 20 minutes to complete the questionnaire. Mobile air time was given as a compensation for their time.

2.5 Data-analysis

Descriptive statistics methods like frequency, percentage calculation, mean and standard deviation was used to describe the characteristic of study measures using SPSS version 23. Structural path analysis was used in AMOS software as a model fit to test the theoretical model adapted the maximum likelihood model produced in AMOS will estimate the highest likelihood of the collected data being reproduced by the proposed model through the values of the parameters iteratively. In contrast to the commonly used multiple regression, the model fit in AMOS will enable researchers to consider the parameter estimate simultaneously.

3. RESULTS

3.1. Descriptive statistics of the sample

From the total of 232 drivers approached in the current study, actual number of participants were 227 drivers yielding 98% response rate. However, four questionnaires were discarded from the analysis due to high number of missing values. The sample consisted of professional drivers hired by other owners (68%) and drivers who drove their own Taxi (32%). The mean (SD) age was 33 (4.7) years, with 22 % of the participants aged 29 or below, 49% aged between 30 and 35, 23% aged between 36 and 40, and 6% aged 41 or above. Regarding their education level, most of the participants (45%) reported to have high school and above education level, 43 elementary level and 12% of them were with basic level of education (only able to read and write). On average, the sample had a driving experience of 7.5 years (SD = 3.8) and drove a mean of 600 Km/week (SD:186). The number of self-reported traffic accidents ranged from 0 to 3 (Mean = 0.4 S.D. = 0.6), with a majority (63%) of the sample reporting no accidents whereas the 37% of the sample reported that they had an accident during the pas one year. When it comes to history of traffic fines, more than half (55%) the sample reported getting at least one ticket due to traffic violations and offences from the police. The descriptive statistics and reliability coefficients for all the study variables is depicted in table 1 below. All the study variables showed acceptable internal consistency reliability with the exception of the normlessness trait which have a Cronbach alpha value of less than the commonly regard standard (Cronbach Alpha > .70). In this regard, as recommended by Schmitt (1996) the use of alpha level which is above 0.7 is not needed by considering the number of items in a given dimension. Hence it would be expected to have lowered alpha value if there are small number of items (4 items) like in the case of this study.

TABLE 1: Descriptive statistics and Cronbach's alpha of the key measures of the study

	Reponses range	Mean (SD)	Cronbach's alpha	Skewness	Kurtosis
Altruism	0-5	2.65(.85)	.70	-.526	.296
Sensation seeking	0-5	2.14 (.83)	.83	-.525	-.283
Anger	0-5	1.95 (.79)	.72	-.343	-.497
Normlessness	0-5	2.25 (.91)	.64	.292	.167
Negative attitude toward traffic safety	0-5	2.03 (.78)	.71	-.111	-3.48
DBQ-Violations	0-5	1.69 (.74)	.75	.229	-2.03
DBQ- Errors	0-5	1.66(.81)	.84	.110	-.743
Common violations	0-5	2.21(.72)	.71	.074	-.148

3.2 Associations among major variables

The bivariate correlation of among major variables was also computed. Looking some of the coefficients in table 3, the four personality traits were significantly correlated with aberrant driving measures. In particular, drivers with a high score on the sensation seeking measure reported, a high number of violation ($r = .171$, $p < 0.05$) and driving errors ($r = .162$, $p < 0.05$). Similarly, normlessness score of participants showed to have a significant correlation with all the categories

in the proximal context (DBQ-violations, $r=.261$, $p<0.01$; Driving errors, $r=.278$, $p<0.01$; Common violations, $r=.168$, $p<0.01$). Similarly, participants score on three of the personality measures with the exception of altruism score also revealed to have a link with number of self-reported injuries. As far as the attitude –behavior relationship is concerned, interestingly, attitude towards traffic appeared to have a significant correlation with both risk driving behavior and history of traffic injury involvement. Drivers who underestimate the risk related to traffic rule violation reported that they were more likely to drive aberrantly and to report one or more self-reported traffic crashes during the past one year. Examination of the correlation matrix also revealed, all of the three aberrant driving measures were significantly related with the number of self-reported injuries. Surprisingly, demographic factors failed to show any significant relationship with most of the variables in the proximal context except that of age which was correlated with drivers' tendency to commit common violations ($r=.252$, $p<0.05$).

3.3 Factors influencing accident involvement (the contextual mediated model)

A structural casual analysis (path modeling) was performed in order to investigate whether the hypothesized effect of personality dimensions, attitude towards traffic safety and other distal factors upon crash involvement of drivers was mediated through the so-called proximal factors such as risky driving behaviors.

The following model of measurement equation was used;

$$Y = \beta_1x_1 + \beta_2x_2 + \dots + \beta_nx_n + \text{error}_y$$

Where: Y is the measured dependent variable that also included for the variance from the error term.

The path coefficients were assessed for statistical significance at $p<0.05$, $p<0.01$ and $p<0.001$. The maximum likelihood approach was used to calculate the path coefficients. The final path outcome of the re-specified model that hypothesized personality traits would predict self-reported number of injuries both directly, and through the effects of risky driving behaviors is illustrated in figure 2 below. Although the chi square was significant, indicating a poor fit; $X^2(39 N= 223) = 5.5$, $p<0.01$, the observed data showed adequate but marginal fit values in several other indices; the goodness-of-fit index (GFI = .90), the adjusted goodness-of-fit index (AGFI = .77), the comparative fit index (CFI = .85), the normed fit index (NFI = .85), the incremental fit index (IFI = .87) and The root mean square residual (RMSR = .038). Hence, the result of the current study supports the contextual mediated model where personality, attitudinal factors as a distal factors influence crash involvement of drivers indirectly through proximal factors such as driving behaviors (tendency to commit errors, and violations). As depicted in figure 2 above, the path model explained 24% of the total variance in predicting the number of self-reported crashes using both the proximal and distal contexts. With respect to the paths between the distal and proximal contexts, the three aberrant driving measures were significantly predicted by some explanatory variables. The four personality traits and the score on the attitude towards traffic safety measures explained an overall 19%, 15% and 5% of the variance in driving violation (measured by DBQ), errors and common violations respectively. In particular, as indicated by the size of the standardized path coefficient ($\beta=.19$ and $\beta=.18$), there was a considerable effect of normlessness score on aberrant driving behaviors. Similarly, negative attitude towards traffic safety was also related to risky driving behaviour in traffic in the path model. More specifically, participant drivers with a negative attitude towards traffic safety were more likely to commit errors while driving, as indicated by the size of standardized path coefficient ($\beta=.30$, $p<0.$).

As far as the paths between the aberrant driving measures and the outcome variable is concerned, surprisingly, DBQ errors accounted the highest percentage of variance ($\beta=.26$, $p < 0.001$) in crash involvement followed by DBQ-Violations ($\beta=.23$, $p < 0.001$) and other violations that are commonly seen on the local traffic ($\beta= .23$, $p < 0.001$). The absence of significant direct effects of the personality and the attitudinal factors on the number of self-reported crashes among participants' entails that driving behaviors were mediating personality-attitude -accident association model.

TABLE 2: Model of goodness fit

Fit indices	Fit measure	Model	Recommended threshold
Absolute fit indices	GFI	0.96	0.90
	AGFI	.769	0.90
	RMSEA	0.14	Less than 0.1
	RMSR	0.038	Less than 0.05
Incremental indices	fit		
	NFI	0.852	0.90
	CFI	0.859	0.90

Although it was small and not significant, direct effects of the distal contexts on the number of self-reported crash involvement were also observed. In particular, the standardized direct (unmediated) effect of anger and negative attitude towards traffic safety on crash involvement is .039 and .038 respectively. That is, when negative attitude towards traffic safety goes up by 1 standard deviation, number of self-reported crashes goes up by 0.034 standard deviations. On the other hand, higher score on altruism were associated with low risk in crash involvement. Both direct and indirect effects of the distal contexts were computed. As it can be inferred from table 4 below, a relatively higher variance of the self-reported crash involvement of drivers were predicted through the indirect effect of the distal factors. Particularly, higher scores on the normlessness trait and the attitude measure differentiated 12% and 16% of the variance in terms of number of self-reported crash involvement indirectly via a tendency to engage in aberrant driving patterns. In contrast, sensation seeking, anger and altruism have relatively minimal indirect effects ($\beta=0.05$, $\beta = 0.05$ and $\beta= - 0.06$, respectively). It is also worth to mention that there were significant covariance coefficients among variables in the distal context (see figure 2). More specifically, normlessness covariate positively with negative attitude towards traffic safety and sensation seeking. The attitude measure was also covariate positively with all the four personality dimensions. It is also intriguing that altruism trait was positively covariate with negative attitude towards traffic safety.

TABLE 3 Bivariate correlations among major variable

	1	2	3	4	5	6	7	8	9	10	11
Age	---										
DE	.060	---									
DM	.145*	.012	---								
Anger	-.022	.048	-.139	---							
SES	.033	-.118	-.002	.187	---						
Altruism	-.119	-.083	-.080	.226	.076	---					
Norm	-.033	.014	-.127	.072	.177**	.109	---				
NATS	-.006	.015	.005	.257**	.093	.170*	.278**	---			
Errors	-.052	.026	.011	.158*	.162*	-.029	.278**	.360**	---		
Violations	.060	.043	-.026	.141*	.171*	-.024	.261**	.307**	.463**	---	
CV	.252*	.080	.068	.110	.044	.024	.168*	.164*	.207**	.103	---
#injuries	-.055	.058	.068	.143*	.133*	-.012	.198**	.243**	.428**	.387**	.290**

Correlation is significant at the 0.01 level (2-tailed). **

Correlation is significant at the 0.05 level (2-tailed). *

DE: Driving experience, DM: Driving mileage, NATS = Negative attitude towards traffic safety, SES: Sensation seeking, CV: common violations, Norm: Normlessness, # number of self-reported crashes

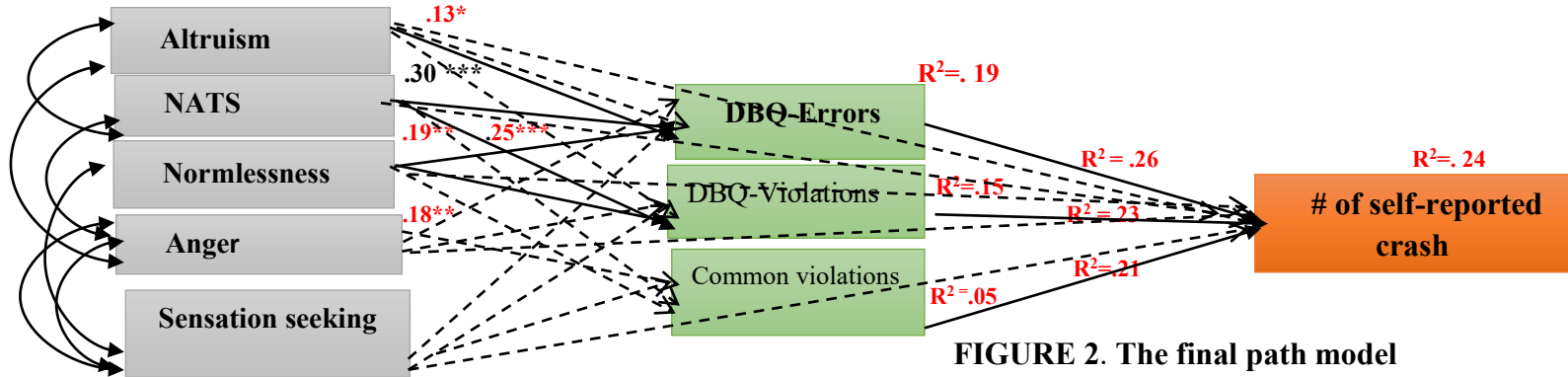


FIGURE 2. The final path model

N.B. The continuous unidirectional line in figure 2 above denotes significant paths obtained at* $p < .05$, ** $p < .01$, *** $p < .001$ through the structural path analysis using Amos 23. For simplicity reasons, all the not significant paths between personality dimensions, attitudes and aberrant driving behaviors, and the paths between personality dimensions and number of self-reported injuries are denoted in a dash arrow without their standardized estimate.

TABLE 4 Direct, indirect and total effects of the personality traitsa on self-reported number of crashes during the past one year (standardized coefficients).

	Altruism	Anger	Sensation seeking	Normlessness	Negative attitude traffic safety
Direct effect	-.024	.039	.034	.020	.038.
Indirect effect	-.063	.052	.050	.116.	.156
Total effect	-.087	.091	.084	.136	.194

4. Discussion

It was hypothesized that drivers' demographic factors, personality traits and their perceived attitude towards traffic safety would relate to driving outcomes both directly and indirectly, through the effects of different indicators of aberrant driving behaviors (i.e. Violations and errors) as proposed by the contextual mediated model (Sümer, 2003). Accordingly, examination of the simple bivariate correlations across the study variables at the early stage of the study showed the absence of considerably significant relationship among age, driving experience and driving mileage as a distal factor with that of all forms of aberrant driving measures. It is very intriguing that as most past studies (Constantinou et al., 2011; Mohamed & Bromfield, 2017; Tao et al., 2017; Ulleberg & Rundmo, 2003) in the international driving literature asserted the link between drivers demographic contexts with various forms of aberrant driving measures. In fact, conflicting findings are there concerning the effect of demographic factors of such as age and driving tenure on self-reported risky driving behaviors and accident involvement in Addis Ababa city. In some studies, being a young driver and with a lower level of driving experience were found to be predictors of accident outcomes (Bloomberg Philanthropic Initiative for Global Road Safety, 2018; Tulu et al., 2013). On the other hand, findings are also there that dictates older and more experienced drivers exhibited a more unsafe driving behaviors than younger ones (Newnam et al., 2014). To make matters more complex, the current study did fail to find any association between demographic factors of drivers and consequent driving behaviors and driving outcomes. But this might be also attributed to a sampling issue. Considering this, demographic factors were not introduced in the model fit assessment of the observed data with the theoretical model adapted.

Results from the path analysis demonstrated that the overall fit of the observed data appear to be marginally adequate to fit with the theoretical model tested, and the study provides some insights and expands the evidence by replicating previous findings regarding the relationship between personality traits and driving outcomes. The personality traits and drivers perceived attitude towards traffic safety showed direct effects on the proximal variables of risky driving behaviors but not on the number of self-reported crashes during the past one year. Accordingly, all the distal contexts explained an overall 39 % of the variance in all forms of risky driving behaviors (i.e. 20% of driving violations and 19% driving errors). Specifically, the study found that among the four

personality traits, normlessness trait was associated with higher influence in determining both self-reported violations and driving errors. Drivers with higher score on the normlessness trait are less likely to be observant of the normal traffic rules and more likely to underestimate socially appropriate way of doing things that would in turn predict higher tendencies of aberrant driving behaviors. In contrast, higher altruism score was significantly associated with lower level of self-reported driving errors. This is in line with previous findings (Demir et al., 2016; Lucidi, Mallia, Lazuras, & Violani, 2014; Mallia et al., 2015; Šucha & Černochová, 2016; Ulleberg & Rundmo, 2003). That said, while a bunch of previous studies (Dahlen, Edwards, Tubre, Zyphur, & Warren, 2012; Monteiro et al., 2018; Sümer, 2003) found an association between sensation seeking and anger traits in relation to predicting risky driving behaviors, this relationship was not significantly observed in the current study. Congruent with previous findings (Mallia et al., 2015; Mohamed & Bromfield, 2017; Tao et al., 2017; Ulleberg & Rundmo, 2003) in the current study, lower score on the aggregate measure of the attitudinal factor (negative attitude towards traffic safety) was also appeared to directly explain risky driving violations ($\beta=.30$) and driving errors ($\beta=.25$). Thus, the more negative attitude towards traffic safety the respondents had, the higher they reported aberrant driving measures.

As far as the paths between the proximal contexts and the dependent variable is concerned, unlike that of past studies (Af Wahlberg et al., 2015; Mohamed & Bromfield, 2017; Parker et al., 1995) which reported DBQ violations to be more predictor of accident involvement, in the current study, it is surprising that, DBQ-errors appeared to contribute the highest share ($\beta=.26$, $p<0.001$) followed by DBQ violations ($\beta=.23$, $p<0.001$) and other items that make up commonly seen traffic violations ($\beta=.05$, $p<0.001$) in the city. Considering the direct and significant nature of normlessness and negative attitude towards traffic safety in predicting driving error than the other aberrant driving measures, it is plausible that individual might behave reluctantly which in turn increase their chance of being associated with negative safety outcomes. Congruent with the current finding, DBQ errors were also found to be a significant predictor of accidents than violations in another previous study by DeLucia et al. (2003). As observed from the paths of the final model, on one end, the fact that all of the variables considered in the distal factor were not able to predict self-reported accident involvement directly would entail the support of the contextual mediated model. On the other end, despite being related to all the three forms of aberrant driving measures, sensation seeking and anger traits failed to achieve statistical significance in predicting crash involvement indirectly. However, considering the indirect effect of normlessness and negative attitude towards traffic safety, the current study did confirm the contextual mediated model (Sümer, 2003), labeling personality, attitude towards traffic safety and other variables such as hazard perception as a distal factors play a role in understanding crash risk and involvement indirectly via the mediating effect of aberrant driving behaviors.

5. CONCLUSION AND IMPLICATIONS

It is well known that human behavior is a significant causes of road crashes. This maladaptive behavior may emanate from motivation, knowledge, and skill. However, a wealth of knowledge has shown that most traffic-related burdens are not borne by lack of knowledge or skill on the part of the individual, rather it is their reluctance to behave in a safe way. The present study was driven by the motivation to better understand the importance of psychological factors specifically the personality traits and attitudinal factors in relation to risk behavior and crash involvement in traffic among taxi drivers in Addis Ababa. This is very vital in that, like that of many low and middle-income countries, in Ethiopia, enforcement of traffic laws related with speeding, drink driving and

other aberrant driving violation is very negligible (rated 2 out of 10 points by the WHO (2018) assessment). This would also suggest that drivers are not open to law enforcement due to psychological factors that create an immunity to the current interventions.

Overall, the findings in the current study have both theoretical and practical implications. Theoretically, our findings replicate the contextual mediated model which assert variables in the distal context such as personality traits, attitudes another motivational elements dictate safety outcomes indirectly through a mediating effect commonly studies proximal variables such as speeding violation, errors, and other aberrant driving behaviors. As far as our best knowledge goes, there was no prior study which has employed the variables that were considered in the current study to understand the dynamics of driving behavior and safety outcomes among Ethiopian drivers. Hence, this study would also serve as a first impetus in understanding the psychological factors underlying drivers risky driving behavior in the study population in a way that hasn't been done before. That noted, a practical implication of the current study would be to acknowledge the importance of personality traits and other social cognitive elements such as attitude towards traffic safety in the designing of road safety campaigns in the city. Various scholars (Dutta-Bergman, 2003; Ulleberg & Rundmo, 2003) in the field have speculated that one possible reason for less efficacy of road safety campaigns aimed at reducing traffic-related injuries is the ignorance of personality factors in the designing of the campaign. This is partly evidenced as most road safety media campaigns are mainly employing demographic variables such as age, gender, and certain geographic as segmentation variables (Dutta & Youn, 1999 as cited on Dutta-Bergman (2003). Nevertheless, if significant progress is to be made in designing evidence-based and successful road safety campaigns, it is vital that health promotion and behavior change campaigns follow the so-called bottom-up approach where messages take a consumer-centered approach that gives due consideration on how audiences will react to certain characteristics of the campaigned message (Dutta-Bergman, 2003). To this end, this study not intend to recommend changing the personality of drivers, rather it is to ascertain that having a keen understanding of drivers' personality in tailoring safety promotion campaigns in line with the personality characteristics of the driver. In fact, we feel that there are reasonable grounds in the current study to provide road safety campaign planners in the city to initiate theory-driven, well-articulated and targeted behavioral change safety promotion campaigns to curb the ever increasing road accident problem in the city.

In addition to dealing with drivers' personality traits, a more meaningful intervention targeting drivers' attitude towards speeding, traffic violations and drunk driving could be profitably. The findings in our study also showed the importance of tackling socially learned and normative influence of individuals' behavior towards traffic behavior. In this regard, since creating a law abiding citizen in traffic requires collective effort and collaboration among all members of the society, it is warranted to use various strategies, campaigns, persuasion techniques at all levels to change informal norms which contradicts towards respecting rules in traffic. Parallel to tackling these maladaptive norms, reinforcing and appreciation of altruistic norms shall be strengthened.

Another practical implication of the current study is, in Ethiopia, there is no any assessment on aspects such as intelligence, attention and personality in the drivers screening and licensing system. Though, the understanding of traffic psychology in Ethiopia in general and the results from the current study are too infant and limited to justify this mandatory screening to get a license, we feel there is still a room to suggest the incorporation of this aspects in the curriculum and training procedures for novice drivers. Moreover, effort has to made by local transport authorities in order to improve drivers' skill and reliability through continuous initiatives and programmes not only for novice drivers, but also for experienced drivers.

5.1 Limitations and directions for future studies

This study will share some of the drawbacks of cross-sectional studies that depend on self-reported measure. Since the study measures in self-reported design require participants to remember behaviors and crashes that happened in the past, there is a lot of intentional and unintentional bias related to recalling of these behaviors (Elander et al., 1993). Though one-year period is selected to minimize recalling biases in the current study, there is no guarantee to check if participants are reporting unsafe behaviors and crashes that happened outside of the time framework-a phenomena called forward telescoping which is also another demerit of cross sectional surveys (Prohaska, Brown, & Belli, 1998). Despite the mentioned limitations, our research helps to better understand the underlying psychological factors affecting both aberrant driving behaviors and crash involvement in the city. That said, future studies should consider to replicate the findings using another study designs that will reduce the above limitations. Additionally, future research should also aim to focus on larger and heterogeneous samples (bus, truck and other professional drivers) to deepen the understanding of the personality-driving behavior- crash model among local drivers. Even though it is encouraging that we tried to incorporate locally relevant variables (common driving violations) in the current study, future studies should further introduce context relevant factors contributed to longstanding safety problems in the city. The last but not the least, considering the unexpected high nature of driving errors in predicting crash involvement in the current study, it is also a broad avenue for future studies to consider not only personality and other motivational factors, but also other characteristic of drivers (such as information processing skill, hazard perception ability) in the distal context.

Acknowledgment

I would like to acknowledge and sincerely thank Professor Kris Brijs and Veerle Ross for their constructive and unreserved guidance throughout the completion of this research project. I am also grateful to all individuals that helped me in the translation and reviewing of the instrument, and during the data collection process. Finally, I am still indebted to the Flemish Inter-University Council (Vlaamse Interuniversitaire Raad/ VLIR-UOS) for providing me the full financial support for my Master's degree at University of Hasselt.

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