Personality, socioeconomic status, attitude, intention and risky driving behavior

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Abstract: Risky driving behavior (RDB) is one of the human factors contributing to the majority traffic injuries and crashes. This paper examines the influence of personality factors on RDB and the mediating role of intention and attitude in the relationship. The influence of different SES, personality, marital status, and gender characteristics on attitude, intention, and risky driving was also examined. A sample of 354 fully licensed Ghanaian drivers, including 278 males and 76 females, participated in the study at two times points separated by three months. The correlation results showed that unhealthy family relationship and negative emotions were positively associated with illegal speed-related behaviors, risky driving, and accident involvement. The results of a structural equation model suggested that personality variables significantly and positively influence intention and attitude toward speeding, with normlessness directly and positively influencing RBD. The mediation analysis shows that intention mediated the effects of personality variables on RBD. No significant mediating effect for attitude was found. The analysis of variance result shows that drivers with high socioeconomic status and personality had the high intention and attitude toward speeding and reported more RDB. Finally, drivers who had been divorced significantly reported more positive attitude toward speeding.
than the married and single group. Based on the results, the study concludes that, in accessing the effect of personality measures on RDB, it is important to include intention as a possible mediator for more accurate decision. Practical implications for managing different personalities and socioeconomic positions are also discussed.

**Subjects: Social Sciences; Behavioral Sciences; Education**

**Keywords: socioeconomic status; sensation-seeking; normlessness; risky driving behavior, intention; attitude**

1. **Introduction**

Road safety is influenced by human factors in several ways. To enhance drivers’ performance, crashworthiness, and crash avoidance, transportation infrastructures have significantly been improved in Ghana. However, human factor makes up a greater percentage of traffic crashes and injuries (Damsere-Derry, Ebel, Mock, Afukaar, & Donkor, 2010) with the main cause being involved in risky driving such as speeding (Atombo, Wu, Zhong, & Zhang, 2016; Damsere-Derry et al., 2010). According to the Road Traffic Statistics and analysis information in Ghana, from 2012 to 2015, the number of vehicles involved in accidents stood at 81,425 and out of these, 7,835 people were killed while 47,350 sustained various degrees of injuries. Despite the significant effort to increase road safety, the majority of drivers in Ghana do not perceive risky driving such as speeding as serious traffic offense especially on highways, motorways, and non-residential roads. Some drivers tend to take risk because of their perceived driving ability and being experienced than their fellow drivers. Perceived gain has also been found to be associated with a traffic violation in Ghana (Akaateba & Amoh-Gyimah, 2013). More so, the divergent point of view that it is legitimate to drive above the speed limits as long as the driver’s capabilities can much the road conditions also triggers risky driving. As such, risky driving behavior remains the major factor associated with serious traffic crashes in Ghana. However, timely identification of factors militating risky driving behavior is necessary for behavioral modification and safe driving.

Prior studies have demonstrated that risky driving and its related injury are sometimes influenced by age and gender characteristics (Bachoo, Bhagwanjee, & Govender, 2013; Elliott, Armitage, & Baughan, 2004), acceptance of higher level of risk, personality, underestimating of risk (Goldenbeld & van Schagen, 2007; Sarkar & Andreas, 2004), socioeconomic and marital status (Banakar & Fard, 2012; Grimm & Treibich, 2010; Jafarpour & Rahimi-Movaghar, 2014; Piiff, Stancato, Côte, Mendoza-Denton, & Keltner, 2012; Whitlock, Norton, Clark, Jackson, & Macmahon, 2004), and road condition (Edquist, Rudin-Brown, & Lenne, 2009; Goldenbeld & van Schagen, 2007) among others. With the use of survey study, other studies have indicated that risky driving behavior (RDB) is determined by driver’s attitude toward violations (Ma, Yan, Huang, & Abdel-Aty, 2010; Moan, 2013).

Risky driving includes many behaviors such as dangerous overtaking, speeding, crossing a red light, and use of mobile phone while driving. In this study, the speeding behavior is of interest because it is a major contributor of road accidents in Ghana compared to other behaviors (Atombo et al., 2016; Atombo, Wu, Zhang, & Wemegah, 2017; Damsere-Derry et al., 2010). Therefore, this study focused on the factors that are related to the greater involvements in risky driving which included drivers’ personality, socioeconomic status, marital status, gender characteristics, intention, and attitude toward speeding. The present study aims to examine the influence of personality factors on RDB and the mediating role of intention and attitude in the model, using structural equation model. The study also aims to examine the influence of different groups of SES, personality, marital status, and gender on attitude, intention, and RDB. A better understanding of determinants of factors underpinning intention and attitude toward speeding as well as risky driving behavior could inform the appropriate remedial measures which may eventually modify behaviors and reduce the risk of road crashes.
1.1. Personality and risky driving

Driver’s personality is an important factor that can influence risky driving. Attention has been attracted in examining the association between personality measures and RDB involvement (Schwebel, Severson, Ball, & Rizzo, 2006). Some facets of drivers’ personality traits (i.e. sensation-seeking and normlessness) have been found to have a significant relation to risk-taking behavior in traffic (Ulleberg & Rundmo, 2003). Hence, the present study focused on sensation-seeking and normlessness. Sensation-seeking (SS) is generally used to explain why one tends to seek and enjoy high stimulus, exciting, novel as well as diverse outcome experiences in relation to those stimuli (Zuckerman, 2007). Sensation-seeking has a significant association with driving behavior (Dahlen, Martin, Ragan, & Kuhlman, 2005) and a strong predictor of fast and reckless driving and accident involvement (Zuckerman, 2007; Roberti, 2004) with both high sensation-seekers, males and females, being more likely to engage in risky behavior (Roberti, 2004). Normlessness also explains the belief that socially unapproved behaviors are required to achieve certain aims (Ulleberg & Rundmo, 2003). The understanding of the effects of these personality variables on RDB is of most importance for improving traffic safety.

1.2. Socioeconomic status and risky driving

Socioeconomic status (SES) is a combined economic and sociological total measure of a person’s work experience and of an individual or families’ economic and social positions based on income, education, occupation, and other factors (Marmot, 2004). In the field of research, SES has been identified as one of the major contributing factors affecting the performance of behavior with high SES significantly more likely to report higher self-esteem (Veselska et al., 2010).

Studies in traffic safety have addressed the influence of SES on crash-related injuries and have found a significant relationship (Hosking, Ameratunga, Exeter, Stewart, & Bell, 2013; Moodie, 2002; Whitlock et al., 2003). The majority of these studies have found low and medium SES groups to be more vulnerable. The findings on how SES is related to aberrant driving behaviors which is the primary cause of road crashes in Ghana are not yet known. Meanwhile, SES such as income and educational level are factors that can significantly determine the state of a driver (Banakar & Fard, 2012; Grimm & Treibich, 2010). In view of this, the present study seeks to address this gap in the available literature to provide further explanation and understanding of the factors that may influence drivers’ unsafe behaviors. SES in this study would be defined as social and economic experiences and realities that mold one’s attitude, intention, and behavior. Among socioeconomic factors considered are education, household monthly income, and occupational position.

Marital status is also one of the important aspects of social standing, as this could influence or direct a risk-taking (Whitlock et al., 2004). In the case of drivers, a study on driving behaviors, risk perceptions, and stress noted that people with divorce problems are mostly involved in an accident (Mitra-Sarkar & Andreas, 2009). Considering the social positions and economic situations in Ghana, socioeconomic variables are likely to influence drivers’ intention, attitude toward violation, and RDB, which in turn could reduce road safety.

1.3. Rationale for including intention and attitude as mediators

In social cognition theory such as TRA/TPB, behavioral intention has long been an important predictor of actual behavior in many diverse research areas. According to Theory of Reasoned Action (Fishbein & Ajzen, 2011), intention is the sole determinant of behavior. For instance, intention has been used to predict actual usage of instance message (Lu, Zhou, & Wang, 2009) speeding behavior of drivers (Elliott et al., 2004; Forward, 2010). These studies have shown that intention is, overall, able to predict behavior and that individuals’ propensity to engage in speeding is based upon their intentions to speed.

Whereas personality research has focused on the predictive value of personality measures, social psychological research has attempted to explain risk-taking behavior and accident involvement within the framework of social cognition models. Despite the importance given to behavioral
intention in social cognition theory and the widespread use of intention measures in practice, many studies that integrated variables from personality trait approach and the social cognition approach (e.g. Bachoo et al., 2013; Chen, 2009) did not include intention in their model. In sum, personality traits have not been studied together with intention as a mediator for understanding factors underlying drivers’ risk-taking behavior in traffic.

There have been many misconceptions that intention actually causes behavior and have suggested various variables to better predict behavior than intention. For instance, Sheeran (2002) suggested that human behavior is governed by automatic processes rather than intentions. Furthermore, some authors have argued that past behavior would be a better predictor of future behavior than intention (Wong & Mullan, 2009). Whether these assumptions are accurate or wrong is not as clear as it seems to be. Therefore, we believe intention cannot be ignored in assessing RDB influenced by personality factors. Based on the facts that previous studies did not include intention in their model to assess its mediating role in the relationship between personality measures and RDB, we sought to include intentions to examine this relationship in order to understand the underlying factor influencing risky driving behavior such as speeding.

In addition, a previous study found attitude to mediate the relationship between the likelihood of crash and RDB factors (Ma et al., 2010). However, due to limited studies as well as the differences in traffic safety culture in driving populations between countries, results found in other countries may not be the same as Ghana. Therefore, we included attitude in our model to validate the cross-cultural applicability of these findings and concepts.

1.4. Research hypotheses
Based on the review of the above-related studies and the rationale of the current study, personality variables were expected to directly influence intention, attitude, and RDB. In addition, attitude and intention included in the model were expected to mediate the effect of the personality variables on RDB. Finally, as studies have evidenced that different SES and personality behave differently (e.g. Roberti, 2004; Veselska et al., 2010), it was also expected that differences in SES, personality, marital status, and gender characteristics would behave differently on attitude, intention, and risky driving.

2. Methods
2.1. Procedure and participants
The study samples were taken from international automobile dealership repair centers. The centers are opened to public vehicle owners where drivers from almost every region in Ghana maintain their vehicles. Therefore, it was highly possible to get heterogeneous drivers who come to the centers to participate in the study and adequately represent drivers in Ghana. Random sampling technique was used in selecting the drivers after permission was sought from the management of the selected dealership repair centers to allow their customers (drivers) to participate in the study.

Before conducting the main study, the questionnaire was tested on 50 drivers to validate the measures. The respondents were asked to comment on the length, the format, and the wording of the scales. Based on feedback from the pilot sample, the survey instrument was revised by traffic psychology and safety experts to improve clarity, readability, and appropriately address the study objectives. Based on the suggestions and comments from the experts, the questionnaire for the main study was finally constructed.

The main study data were collected at two time points separated by 3 months. This method was adapted to reduce common method variance (Elliott et al., 2004). At Time 1, personality factors, attitude, intention, SES indicators, and accident history were measured. The participants were provided information about the research, including a brief explanation of the purpose of the research, how to participate as well as anonymity and confidentiality assurances. The participants who agreed to participate were given the questionnaire to answer. The questions were mainly closed-ended ones.
where the participants were asked to tick appropriate responses that suited them. Each questionnaire has a unique identifier with a 4-digit number and a section for respondents to provide their email addresses and telephone numbers. It took each respondent about 35 min to complete the questions. At both the pilot stage and the Time 1, the on-site survey was adapted.

At Time 2, three months later, the participants who completed the questionnaire at Time 1 were sent risky driving scenarios, which included photographs of real roads, through the email addresses provided at Time 1: scenarios with a cover letter explaining that the study was about driving behavior, that the participation was entirely voluntary, and that there were no right or wrong answers to any of the questions. The participants were assured that their email address would not be linked to the responses. Follow-up calls were made to remind the participants three weeks after the initial mailing of the driving scenarios. Time 1 and Time 2 data were matched using the unique identifier. All data were analyzed in aggregate to avoid the identification of individual participants.

Four hundred and fifty licensed drivers responded to the questionnaire at Time 1. Three hundred and fifty-four (79%) of the respondents at Time 1 returned the Time 2 risky driving behavior scenarios. Therefore, Time 2 non-responders were excluded from the analysis. The remaining valid responses included 278 (78.5%) males and 76 (21.5%) females. The majority (47.5%) of the respondents were within the productive age group between 25 and 35 years with 46.9% having up to Senior High School level of education. The annual mean mileage was 11,936 km (SD 8,937) and the total mean number of accidents since obtaining the driving license was 2.26 (SD = 2.22). In terms of marital status, 211 (59.6%) were married with 36% indicating they had been booked by police for exceeding the posted speed limit. The comfortable speed limit for most respondents 139 (39.3%) was between 80 and 120 km/h.

2.2. Measures
A questionnaire design was based on validated measures of instruments available in the literature for all the items under investigation. Seven-point bipolar scales were employed for all the items in the constructs with personality constructs scaled as “strongly disagree” to “strongly agree”. The attitude items for example were ranged from “unpleasant” to “pleasant”. Risky driving behavior scale was rated as “never” to “very often”. The items in intention were rated as “very unlikely” to “very likely”. A reliability test based on a recommended Cronbach’s α cut-off criterion of 0.7 (Hair, Black, Babin, Anderson, & Tatham, 2006) was used to indicate the degree of internal consistency among the items for each scale. The mean score on each scale was computed based on the items within each scale. The items in each scale are listed in Table A1.

2.2.1. Personality
Personality factors were measured with sensation-seeking and normlessness. The sensation-seeking items were obtained from the International Personality Item Pool (IPIP) (Costa & McCrea, 1992), which provides freely available measures of the NEO-Personality Inventory constructs in a public domain (i.e., https://ipip.ori.org). Normlessness was measured by four items taken from Kohn and Schooler’s (1983) normlessness scale. The Cronbach’s α coefficient among the items in sensation-seeking (0.89) and normlessness (0.86) shows a satisfactory degree of scale reliability.

2.2.2. Attitude and intention
The items used to measure attitude and intention in the present study were related to speeding. Five items adapted from Moan (2013) were used to measure the participants’ attitude toward speeding. The items were formed as follows: for me, speeding above the posted speed limit is unpleasant-pleasant, unnecessary-necessary, punishing-rewarding, uncomfortable-comfortable, and unsafe-safe.

Four items were adopted from Fishbein and Ajzen (2011) and were modified to measure drivers’ intention to speed. These included the following: e.g. “When driving, I intend to drive faster, if
possible”. The Cronbach’s coefficient among the items of attitude and intention was 0.88 and 0.87, respectively, indicating satisfactory degree of scale reliability.

2.2.3. Risky Driving Behavior
Risky driving was measured with three items based on scenario methodology adopted from previous studies (Conner et al., 2007; Goldenbeld & van Schagen, 2007). Each scenario included a photograph that matched a real road. The pictures were taken on November, 2015. The scenario was concerned with drivers exceeding the posted speed limits on roads and the respondents were asked to indicate how often they partook in the acts (e.g. This road is a three travel lane in each direction passing through a town with a posted speed limit of 80 km/h. How often do you exceed the posted speed limit more than 20 km/h on this type of road? The photographs and the scenarios are shown in Figure A1. It is important to note that, in Ghana, the acceptable speed limit on the residential road is 50 km/h and on the highway passing through a town is between 50 and 80 km/h. However, the posted speed limit also depends on the road design, the location, and the conditions on the road. Therefore, in accordance with the literature (Elvik, Christensen, & Amundsen, 2004), speeding above the posted speed limit could be considered as RDB.

2.2.4. Socioeconomic Status
Socioeconomic status was assessed through indicators such as highest education level attained (i.e. tertiary education, upper secondary education or post-secondary, non-tertiary education, vocational education, lower secondary education), occupational position (i.e. entrepreneur, professional, higher manager, self-employed, lower manager, skilled clerk, unskilled clerk, farmer, skilled manual worker, unskilled manual worker), and household monthly income.

2.3. Statistical analysis
Descriptive statistics were applied to investigate characteristics of the respondents. Exploratory factor analysis was used to examine the factor structure of the scale. Correlation analysis was performed to establish the relationship among risky driving behavior, family relationships, and other speeding-related variables. It is always recommended to first perform Confirmatory Factor Analysis (CFA) to develop an acceptable measurement model that describes the link between the latent constructs and the measured variables (Anderson & Gerbing, 1988). Therefore, CFA was carried out to examine how well the measurement variables reliably reflect their latent variables.

For a reason, that measurement model does not specify underlying relationships between the latent constructs. Structural Equation Model (SEM) was used by transforming the measurement model to describe the causal relationships among the latent constructs of the model and for testing the hypothesis using AMOS version 22. The mediational hypotheses were tested and bootstrapping applied to examine the significant indirect effects of sensation-seeking and normlessness on RDB with attitude and intention treated as mediating variables. SEM has some unique features and can handle multifaceted relationships among latent variables, where some constructs can be unobserved. In addition, SEM can estimate all the coefficients in the model at the same time which makes it possible to assess the significance and strength of a particular relationship in the framework of the entire model. Another unique feature of SEM is that it can account for multi-collinearity. Furthermore, measurement errors are estimated when latent constructs are used. Therefore, valid coefficients are obtained (Anderson & Gerbing, 1988). Based on the complex relationships between personality factors and RBD as well as the mediating role of attitude and intention that are modeled in this study, SEM is an adequate tool for model development and analysis.

The differences of SES, personality, marital status, and gender in attitude, intention, and risky driving were further assessed by multivariate analysis of variance (MANOVA) using SPSS version 24. Analysis of variance (ANOVA) was conducted as a follow-up to the MANOVA with SES, personality, marital status, and gender entered as fixed factors and attitude, intention, and RDB as dependent variables. Post hoc Bonferroni test was then used to perform pairwise comparisons. Cohen’s d-values
were calculated in order to examine the effect sizes between groups. According to Cohen (1988), 0.01 is a small effect, 0.06 is a moderate effect, and 0.14 is a large effect.

3. Results

3.1. Factor structure
Principal axis factoring analysis was performed on 24 items to analyze the factor structure. Kaiser Criterion of eigenvalues greater than 1.0, the Cattell scree plot test, and parallel analyses were used to determine the number of factors to be retained. Cattell’s scree test and parallel analysis suggested five-factor structure, as these factors contributed most to the explanation of the variance in the data-set. In addition, Promax rotation was chosen to interpret the five factors because the data-set was quite large (n = 354) and Promax is fast, conceptually simple, and can account for the correlated factors. The results indicated that the five-factor structure (normlessness, sensation-seeking, attitude, intention, and risky driving) had satisfactory item loadings and acceptable internal consistency coefficients.

3.2. Measurement model
Two-step approaches were used based on Anderson and Gerbing’s (1988) recommendations. Prior to the testing of the structural model, the measurement items were subjected to CFA to evaluate the validity and reliability of the constructs. According to Hair et al. (2006), goodness-of-fit index (GFI), adjusted goodness-of-fit index (AGFI), comparative fit index (CFI), and normed fit index (NFI) values of 0.9 or above and root mean square error of approximation (RMSEA) of 0.05 or less indicate a good fit between the model and the data. In Table 1, the model comparisons fit indices indicate that the hypothesized model fitted the observed variance-covariance matrix. However, this model was not within the acceptable range as the RMSEA value (0.059) was high above the recommended value of 0.05 or below. The original model was improved by correlating the error terms (SAT2) and (SAT4). After the model modification, the RMSEA value of 0.053 was obtained in the model-1, which represents a better fit to the data than the original model. Table 1 shows the original and modified models.

As displayed in Table A1, all the composite reliabilities (CRs) and Cronbach’s $\alpha$ were over 0.7, indicating that the scales had good reliabilities. The standardized estimates of factor loadings (SFL) for the measurement models are also displayed. As indicated, all the items were significant at the 0.001 level, suggesting that the level of association between scale items and their corresponding latent variables was good and permitted for further analysis. The squared multiple correlations (SMCs) range from 0.52 (SS2) to 0.79 (SS5) indicating the explanatory power of the study model (See Figure 1).

The average variance extracted (AVE) for each construct ranges from 0.63 to 0.68 (see Table 2). These values were over the recommended value of 0.5 (Hair et al., 2006), indicating that the scales have good convergent validities. More so, the square roots of AVEs of each construct on diagonal cells are greater than the correlation coefficients with other constructs, indicating good discriminant validity.

Table 1. Fit statistic comparison of the default model and nested models

| Fit statistics       | CFI  | NFI  | GFI  | AGFI | TLI  | IFI  | RFI  | $p$  | CMIN/ DF | RMSEA | $\chi^2$ |
|----------------------|------|------|------|------|------|------|------|------|----------|--------|---------|
| Original model value | 0.97 | 0.96 | 0.89 | 0.86 | 0.97 | 0.98 | 0.95 | 0.00 | 2.246    | 0.059  | 543.575 |
| df = 242             |      |      |      |      |      |      |      |      |          |        |         |
| Modified model-1     | 0.98 | 0.96 | 0.90 | 0.88 | 0.98 | 0.98 | 0.96 | 0.00 | 2.029    | 0.053  | 489.091 |
| value                |      |      |      |      |      |      |      |      |          |        |         |
| df = 241             |      |      |      |      |      |      |      |      |          |        |         |

Note: Modification indices (MI)—Model 1 = 46.997.
3.3. Correlation among risky driving behavior, family relationship, and speeding-related variables

The relationship among risky driving behavior, family relationship, and speeding-related variables was investigated using Pearson correlation coefficient. Preliminary analyses were performed to ensure no violation of the assumptions of normality, linearity, and homoscedasticity. In Table 3, the results indicate that speeding-related variables (i.e., booked for speeding, speeding above the legal posted limit, comfortable speed limit) significantly and positively correlated with each other and the number of traffic accidents. Among the speeding-related variables, the association between perceived comfortable speed limit and speeding above the legal limit had a very strong positive significant coefficient ($r = 0.67$). Unhealthy family relationship and negative emotion had a positive association and further correlated with speeding-related variables. The result further shows that number of driving hours positively correlated with perceived comfortable speed limit, speeding above the legal limit, negative emotion, and the number of traffic accidents. Finally, risky driving behavior positively correlated with booked for speeding, speeding above the posted limit, and the number of traffic accidents.

3.4. Structural Model

The structural model was estimated using the whole sample data to examine the hypotheses. The estimated results of the model with standardized path coefficients in each path from the construct of the personality measures (normlessness and sensation-seeking) to attitude and intention and subsequently to the risky driving behavior (RDB) are shown in Figure 1. The indirect effects of
personality measures on RDB were also measured via the mediating factor, intention, and attitude toward speeding. Age, gender, and mileage were included in the model as control variables.

The fitness measures indicate that the model fits the data well: \( \chi^2 = 618.572, \text{df} = 305 (p < 0.000) \), \( \chi^2/\text{df} = 2.028 \), RMSEA = 0.053, GFI = 0.89, CFI = 0.97, NFI = 0.95, and AGFI = 0.86. The findings provided strong support for most of the research hypotheses except for the path from attitude and sensation-seeking to RDB, which was insignificant. As displayed in Figure 1, the correlation between normlessness and sensation-seeking was significant (\( \beta = 0.46 \)). The coefficient direct path from both normlessness and sensation-seeking to attitude (\( \beta = 0.42, \) and \( \beta = 0.38, \) respectively) and intention (\( \beta = 0.32 \) and \( \beta = 0.45, \) respectively) was significantly positive. The significant predictors explained 47 and 49% of the variance in intention and attitude toward speeding, respectively. In addition, normlessness and intention had a direct significant positive effect on RDB. Together these constructs explained 49% of the variance in RDB measure.

It was hypothesized that attitude and intention mediate the effects of normlessness and sensation-seeking on RDB. The mediation analyses were tested using bootstrapping method with bias-corrected confidence intervals (Preacher & Hayes, 2004). In this study, the 95% confidence interval of the indirect effects was obtained with 1,000 bootstrapping resample (Cheung & Lau, 2007). In Model 1, it was found that normlessness was positively associated with RDB (\( \beta = 0.41, p < 0.001 \)) without mediation. When the intention was introduced in the model as a mediator, the standardized regression weight decreases from \( \beta = 0.41 \) to 0.20, which was still significant (\( p < 0.001 \)). The bootstrapping result indicated that standardized indirect effect of normlessness on RDB was significant (\( p < 0.01 \)) suggesting the case of partial mediation (see Table 4). On the other hand, Model 2 shows that when the attitude was introduced in the model as a mediator, the relationship between normlessness and RDB decreases from \( \beta = 0.41 \) to 0.22 which was still significant (\( p < 0.001 \)). However, the bootstrapping result indicated that standardized indirect effect of normlessness on RDB was insignificant (\( p = 0.071 \)), demonstrating the case of no mediation (see Table 4).

With regard to sensation-seeking as displayed in Table 4, Model 3, it was observed that intention fully mediated the relationship between sensation-seeking and RDB. Sensation-seeking was
positively associated with RDB ($\beta = 0.20, p < 0.001$) without mediation. When intention was introduced in the model as a mediator, the standardized regression weight became insignificant (reduced from $\beta = 0.20$ to $-0.09$). However, the bootstrapping results indicated that the standardized indirect effect of sensation-seeking on RDB was significant ($p < 0.01$) (See Table 4). Finally, in model 4, when the attitude was introduced in the model as a mediator, the standardized regression weight was reduced from $\beta = 0.20$ to $-0.07$, which was insignificant. The standardized indirect effect of sensation-seeking on RDB was also found to be insignificant ($p = 0.082$) indicating that attitude does not mediate the relationship.

3.5. Disparities in the impact of SES and personality on attitude, intention, and risky driving

The SES was split into three categories (low, medium, and high) while the personality traits were divided into two groups (low and high) to describe the area an individual driver belongs. The results of MANOVA showed significant multivariate difference between SES and personality groups on the combined attitude, intention, and risky driving behavior scales: Wilks' $\lambda = 0.725$, $F(6, 698) = 20.28$, $p = 0.000$, partial eta square = 0.15 and Wilks' $\lambda = 0.774$, $F(3, 350) = 33.97$, $p = 0.000$, partial eta square = 0.23 for SES and personality traits, respectively. Analysis of variance (ANOVA) on the dependent variables was conducted as a follow-up to the MANOVA. Using the Bonferroni method, each ANOVA was tested at 0.017 levels. There exists statistically significant difference in drivers' attitude [$F(2, 351) = 54.51, p = 0.000$], intention [$F(2, 351) = 38.43, p = 0.000$], and risky driving behavior [$F(2, 351) = 29.04, p = 0.000$] for the SES. For personality groups: attitude [$F(1, 352) = 67.42, p = 0.000$], intention [$F(1, 352) = 87.35, p = 0.000$], and risky driving behavior [$F(1, 352) = 54.49, p = 0.000$]. The differences in mean scores between the groups were quite high. Post hoc comparisons test indicated that the SES mean score for low group ($M = 2.71, SD = 1.28$) was significantly different from medium and high groups scoring higher than the low group. The medium group did not differ significantly from high group. The same trends of statistical differences were found in intention and risky driving behavior.

With personality, a statistically significant difference exists between low and high groups with high group scoring more than the low group. Using the guidelines proposed by Cohen (1988), the results of effect sizes (partial eta square ($\eta^2$)) indicated that differences were large for both SES and personality groups. Mean, standard deviation, and the effects size are displayed in Table 5.

3.6. Disparities in the impact of marital status and gender on attitude, intention, and risky driving

In Table 5, the marital status was divided into three groups (married, single, and divorced) while the gender was divided into two groups (female and male). The results of MANOVA showed a significant multivariate difference between marital status groups on the combined attitude, intention, and risky driving behavior scales: Wilks' $\lambda = 0.732$, $F(6, 698) = 20.18$, $p = 0.000$, partial eta square = 0.15 and Wilks' $\lambda = 0.772$, $F(3, 350) = 33.97$, $p = 0.000$, partial eta square = 0.23 for marital status and gender, respectively. Analysis of variance (ANOVA) on the dependent variables was conducted as a follow-up to the MANOVA. Using the Bonferroni method, each ANOVA was tested at 0.017 levels. There exists statistically significant difference in drivers' attitude [$F(2, 351) = 54.51, p = 0.000$], intention [$F(2, 351) = 38.43, p = 0.000$], and risky driving behavior [$F(2, 351) = 29.04, p = 0.000$] for the marital status. For gender groups: attitude [$F(1, 352) = 67.42, p = 0.000$], intention [$F(1, 352) = 87.35, p = 0.000$], and risky driving behavior [$F(1, 352) = 54.49, p = 0.000$]. The differences in mean scores between the groups were quite high. Post hoc comparisons test indicated that the marital status mean score for married group ($M = 3.83, SD = 0.76$) was significantly different from single and divorced groups scoring higher than the married group. The single group did not differ significantly from divorced group. The same trends of statistical differences were found in intention and risky driving behavior.

With personality, a statistically significant difference exists between low and high groups with high group scoring more than the low group. Using the guidelines proposed by Cohen (1988), the results of effect sizes (partial eta square ($\eta^2$)) indicated that differences were large for both marital status and gender groups. Mean, standard deviation, and the effects size are displayed in Table 5.

### Table 4. Test of the mediation effect: Personality variables on risky driving behavior

| Models | Direct without mediation | Direct with mediation | Indirect |
|--------|--------------------------|-----------------------|----------|
|        | Variables | Estimate | $p$ | Variables | Estimate | $p$ | $p$ | Effects |
| Model 2 | NM → RDB | 0.41 | 0.000 | NM → INT → RDB | 0.20 | 0.000 | 0.001 (2-tailed) | Partial mediation |
| Model 1 | NM → RDB | 0.41 | 0.000 | NM → ATT → RDB | 0.22 | 0.000 | 0.071 (2-tailed) | No mediation |
| Model 4 | SS → RDB | 0.20 | 0.000 | SS → INT → RDB | −0.09 | 0.129 | 0.001 (2-tailed) | Full mediation |
| Model 3 | SS → RDB | 0.20 | 0.010 | SS → ATT → RDB | −0.07 | 0.235 | 0.082 (2-tailed) | No mediation |

Notes: NM: Normlessness, RDB: Risky driving behavior, SS: Sensation-seeking, ATT: Attitude, and INT: Intention.
Table 5. Means and standard deviations of socioeconomic status, personality, marital status, and gender on intention, attitude, and risky driving behavior (N = 354).

Notes: Numbers in each group, Socioeconomic status (Low = 126, Medium = 212, High = 29), Personality (Low = 142, High = 212), Marital status (Married = 211, Single = 96, Divorced = 47). NA: not applicable.

| Variables | Mean ± SD | F-value | $\eta^2$ | p-value | 1–2 | 1–3 | 2–3 |
|-----------|-----------|---------|---------|---------|-----|-----|-----|
| Intention |           |         |         |         |     |     |     |
| Attitude toward speeding | Socioeconomic status | 54.52*** | 0.23 | 0.12 | 0.01 | 0.000 |
| 1. Low | 2.71 ± 1.28 | | | | | |
| 2. Medium | 3.83 ± 0.76 | | | | | |
| 3. High | 3.84 ± 0.56 | | | | | |
| Personality | 64.42*** | 0.16 | NA | NA | 0.000 |
| 1. Low | 2.89 ± 1.29 | | | | | |
| 2. High | 3.80 ± 0.77 | | | | | |
| Marital status | 4.64* | <0.01 | 0.03 | 0.06 | 0.01 | 0.13 |
| 1. Married | 3.38 ± 1.14 | | | | | |
| 2. Single | 3.34 ± 1.03 | | | | | |
| 3. Divorced | 3.89 ± 0.96 | | | | | |
| Gender | 0.19 | <0.01 | NA | NA | 0.66 |
| Male | 3.45 ± 1.11 | | | | | |
| Female | 3.39 ± 1.08 | | | | | |
| Risky driving behavior | Socioeconomic status | 29.04*** | 0.14 | 0.10 | 0.02 | 0.000 |
| 1. Low | 3.10 ± 1.23 | | | | | |
| 2. Medium | 3.91 ± 0.74 | | | | | |
| 3. High | 4.22 ± 1.23 | | | | | |
| Personality | 54.49*** | 0.14 | NA | NA | 0.00 |
| 1. Low | 3.15 ± 1.21 | | | | | |
| 2. High | 3.98 ± 0.89 | | | | | |
| Marital status | 1.96 | 0.01 | 0.03 | <0.01 | 0.14 |
| 1. Married | 3.55 ± 1.16 | | | | | |
| 2. Single | 3.75 ± 0.89 | | | | | |
| 3. Divorced | 3.99 ± 0.89 | | | | | |
| Gender | 0.41 | <0.01 | NA | NA | 0.67 |
| Male | 3.67 ± 1.12 | | | | | |
| Female | 3.57 ± 0.97 | | | | | |

*p < 0.05.
***p < 0.001.
driving behavior scale: Wilks' \( \lambda = 0.960, F(6, 698) = 2.37, p = 0.022, \) partial eta square = 0.02. There was no significant difference in gender group Wilks' \( \lambda = 0.999, F(3, 350) = 0.142, p = 0.935, \) partial eta square = 0.001. Analysis of variance (ANOVA) on the dependent variables was conducted as a follow-up to the MANOVA. Using the Bonferroni method, there exists a statistically significant difference in the marital groups on attitude scale \( F(2, 351) = 4.64, p = 0.01 \). Despite reaching statistical significance, the actual difference in mean scores between the groups was quite small. Post hoc comparisons test indicated that the mean score for the married and single group did not differ significantly. However, divorced group \( (M = 3.89, SD = 0.96) \) scored higher than the married \( (M = 3.38, SD = 1.14) \) and single \( (M = 3.34, SD = 1.03) \) groups. There was no statistical difference found in intention and risky driving behavior. The effect sizes \( (\eta^2) \) indicated that differences were small. There were no significant differences found in gender on all studied variables (see Table 5).

4. Discussion
The study aims to examine the influence of personality factors (normlessness and sensation-seeking) on risky driving behavior and the mediating role of intention and attitude in the relationship. Differences in driver attitude, intention, and RDB were also investigated using SES, personality, marital status, and gender as grouping variables. Findings of this study have implications for the development of interventions for modification of drivers' behaviors.

The correlation results show that individual unhealthy family relation and negative emotion are factors contributing to speed violations. This could be that a driver with unhealthy family relationships worries, and this affects their emotions negatively and consequently increases their risky driving behaviors (Hu, Xie, & Li, 2013) than when they are of good mind (Ge et al., 2014). The negative emotion was positively associated with driving hours, illegal speed limit, perceived comfortable speeding, and the number of accidents. In accordance with previous studies, this means that the more the unhealthy family relation inducing negative emotion, the more the drivers are exposed to driving and more likely to exhibit positive attitude toward RDB (Ge et al., 2014) which could increase the probability of road crashes. Drivers who had belief in their own acceptable speed limit reported more likely to drive above the permissible speed limit and would score higher with regard to RDB.

In the structural modeling, notably, personality factors strongly predicted attitude and intention toward speeding. A possible explanation is that when drivers tend to seek excitement, stimulation, and belief that unapproved behaviors are required to achieve their aims, attitude and intention toward speeding is likely to increase in traffic. The result further explains that RDB is largely influenced by normlessness and intention to speed. On the basis of the definition of normlessness, a plausible explanation for this relationship is that drivers who have a high score on normlessness are likely to have low barriers toward violation and RDB in traffic (Ulleberg & Rundmo, 2003). In accordance with the previous study, it is also important to acknowledge that the association of driver's intention to speed with RDB could be influenced by perceived gains in traffic (Akaateba & Amoh-Gyimah, 2013). In addition, this result suggests that in taking proactive intervention for improving traffic safety, we are to not only target risky behaviors but also focus on driver's personality and what they intend to do on the road as factors that can have greater repercussion on crashes. Attitude as an important predictor of drivers' actual behavior (Ma et al., 2010) was insignificantly related to risky driving. This could be that attitude can only affect risky behavior through drivers' behavioral intention (e.g. Conner et al., 2007).

As expected, the mediating analysis confirmed the mediating role of intention in the effects of normlessness and sensation-seeking on RDB. Intention partially mediated the effect normlessness has on RDB, suggesting that there is not only a significant relationship between the intention and RDB, but there is both direct and indirect effect of normlessness on RDB through the mediation of intention to speed. In addition, this means that normlessness explains some unique amount of variance in RDB that is not also explained through intention. However, intention explains a lot of the variance than the normlessness explained in RDB.
In accordance with previous findings, sensation-seeking directly affects RDB (Dahlen et al., 2005; Schwebel et al., 2006) without the inclusion of intention as a mediator. On the other hand, the findings show that, with the inclusion of intention as a mediator, the direct effect of sensation-seeking on RDB becomes insignificant. Rather, sensation-seeking indirectly affects RDB through intention. This means that the entire amount of variance the sensation-seeking explains on RDB is actually explained through driver's intention to speed. More so, this result suggests that increased sensation-seeking will also increase the driver's intention to speed, which in turn could increase the likelihood of engaging in RDB. The study has demonstrated that intention is the main predictor of driver's risky behavior irrespective of driver personalities. Thus, in accessing the influence of personality traits on behaviors, it is important to include intention as a possible mediator.

Furthermore, present results confirm the existence of socioeconomic inequalities in the performance of a behavior. The findings show that drivers with high and medium SES reported more RDB, intention, and attitude toward speeding than their peers with low SES. Thus, these groups of drivers are more likely to break the driving regulations than the lower class drivers (Piff et al., 2012). Previous findings show that higher income is associated with high driving speed (Grimm & Treibich, 2010). Therefore, high SES driver's intention, attitude toward speeding, and risky driving might be the reflection of their perception of their wealth. In addition, studies have indicated that individuals with higher education are more liable to take risks (Shinar, 2007). Drivers with high education level and income may afford to buy sophisticated vehicles with high engine capacity and may be considered as a symbol of prestige (Banakar & Fard, 2012) and could lead to more positive attitudes toward risky driving and other related behaviors. The present study has clearly demonstrated that to improve road safety, drivers with medium and high socioeconomic status are the possible important target group in the promotion of behavioral change.

Similar to previous studies, the result further illustrated that high personality trait was associated with attitude toward speeding and risky driving behavior (Roberti, 2004), and intention to speed. This could be that sensation-seekers seek excitement and stimulation in traffic and do not perceive speeding to be risky driving behavior that could lead to undesirable consequences. It could also be that drivers scoring high on normlessness have low respect for law and authorities and such traits eventually influence their unsafe driving (Ulleberg & Rundmo, 2003).

Finally, in support of previous studies (Mitra-Sarkar & Andreas, 2009), it was revealed that drivers with divorced status reported more positive attitude toward speeding compared to the married and single groups. The possible explanation for this finding may be that the divorce induces psychological negative thoughts or emotions, dislike, anxiety, tension, and frustration which significantly affect the divorced drivers' speeding attitude (Ge et al., 2014; Iliescu & Sârbescu, 2013). Again, it could be that the divorced respondents used to have regular speed behavior, and the divorce caused them to change their speeding behavior. Another option is that those divorced respondents had certain personality traits (e.g. sensation-seeking, or lack of stability) that influenced their speeding behavior throughout their driving career, and the same traits influenced their divorce probabilities. Finally, it could also be that divorced drivers do not drive carefully because they have no family at home waiting for them.

Researchers have found dangerous driving behaviors associated with driver’s gender. In this present study, there were no significant differences found in gender. However, comparing the mean values, male drivers score slightly high on all the scales than the female drivers. Therefore, differences exist but small to identify a clear significant difference. This finding is worthy of further investigation.

4.1. Practical implication for interventions
There have been several measures such as law enforcement and increasing of spot fine to countermeasure risky driving behavior among drivers in Ghana. Yet, risky driving behavior continues to increase. There may be several reasons for the lack of effective means of changing behavior. According
to our results, one possible reason could be that the role of personality characteristics in risky driving behavior is underestimated and often neglected in campaign strategies. Therefore, one of the interventions would be to acknowledge the importance of personality traits in traffic safety campaigns. It should be noted, however, that this does not mean the intervention strategies should attempt to change driver’s personality since this effort would yield no success. A study found that messages with a high sensation value (ability to elicit sensory, affective, and arousal responses) are more attractive and efficient for high sensation-seekers to modify their behaviors (Donohew et al., 2000). Hence, one important strategy could be of applying messages of high sensation value in traffic safety campaign. This could be done by modifying campaign messages of risky driving and the importance of obeying traffic rules according to driver personality characteristics, SES, and marital status in order to be more alluring to high-risk drivers to promote road safety.

Concerning individuals scoring high on normlessness, these drivers may assume to have prestige (e.g. drivers of higher office) and this could influence them to have low respect for traffic laws and authority, thus making this category of drivers very resistant to change in behavior. One of the strategies that has been applied successfully in safety program for professional drivers (Gregersen, Brehmer, & Morén, 1996) and has been supported to be the alternative traditional authority-based strategy is to let these drivers draw their own conclusion on the need for behavioral change. Therefore, this strategy rather than the control measures could be applied for this group of drivers.

As indicated, negative emotion was related to speed-related behaviors and later related to accident involvements. This could be that when a driver is in the state of negative emotion, any unfriendly traffic condition could trigger anger and can easily cause speeding and other rule violations. Unlike the control group strategy, the best method that has been experimented and found to be an effective strategy to reduce driving anger and risky driving behavior is to make traffic to be more functional (Gehlert, Hagemeister, & Özkan, 2014) to enhance cognitive relaxation (Deffenbacher, Dahlen, Lynch, Morris, & Gowensmith, 2000) in traffic. That is, infrastructural intervention measures require a reasonable location and good implementation. Therefore, applying these above interesting strategies in road safety could be a valuable tool for modification of unsafe driving behaviors in traffic.

In addition, it might be appropriate for road safety countermeasures to be targeted not only, for example, on age and gender characteristics as the only factors influencing traffic crashes and injuries but, specifically, include socioeconomic status and personality traits management given the mediating role of intention in the effects of personality on RDB.

In summary, based on the current study’s findings, appropriate campaign strategies have been suggested focusing on how to properly manage drivers to observe traffic rules in all conditions in order to reduce risky driving and improve their safety.

5. Conclusion and limitations
The tendency to commit traffic violation is associated with many factors. Driver’s social standing, marital status, gender characteristics alongside personality and emotional state have the tendency to influence RDB. The risky driving influenced by these factors might depend on driver’s intention to violate the traffic rules. Nevertheless, the challenge might be a culture of perceived gains and low respect for traffic regulations on the part of some unscrupulous drivers.

In addition to the key findings, this study has further provided useful intervention strategies for managing socioeconomic status and personality characteristics in order to improve drivers’ ability to manage and adjust their violation behaviors on the road. Furthermore, the study theoretically contributes to the applicability of psychological theories in investigating the effect of socioeconomic status and personality measures on risky driving. This study has demonstrated that drivers from low socioeconomic groups should not be the only target group to be considered in safety education; rather, medium and high groups should be the possible target groups to be considered as well.
It should be noted however that the results of this study may not necessarily be applicable to every country since social conditions and behaviors, cognitive processes, and attitudes are influenced by cultural background including values and norms (Özkan, 2006). Therefore, appraisal and ways of expressing behaviors can be expected to vary from culture to culture.

Albeit the extensive contribution of this study to the growing body of literature on factors influencing RDB, it has some limitations that should be taken into account when interpreting the results. For instance, the data were based solely on drivers’ self-report behaviors. It is possible that, because of fear of worry, some respondents will report a low or high level of behavior. However, because the respondents completed the questionnaires anonymously, this approach hopefully reduces the presence of biased responses (Ma et al., 2010). In addition, previous studies have shown that self-reported measures are useful for measuring specific dangerous behaviors (Arthur et al., 2005). More so, the survey data were limited, as only a few samples of Ghanaian drivers were used. Hence, these findings might not wholly represent the driver’s behaviors. However, a valuable contribution has been made to the available literature. Finally, the majority of studies have found differences in gender with males relating more to risky driving behaviors compared to their female counterpart. In this study, the differences in speeding and risky driving behaviors with respect to gender were very small and might not wholly represent the driver’s behaviors. However, a valuable contribution has been made to the available literature. Finally, the majority of studies have found differences in gender with males relating more to risky driving behaviors compared to their female counterpart. In this study, the differences in speeding and risky driving behaviors with respect to gender were very small and might not wholly represent the driver’s behaviors. However, a valuable contribution has been made to the available literature. Finally, the majority of studies have found differences in gender with males relating more to risky driving behaviors compared to their female counterpart. In this study, the differences in speeding and risky driving behaviors with respect to gender were very small and might not wholly represent the driver’s behaviors. However, a valuable contribution has been made to the available literature. Finally, the majority of studies have found differences in gender with males relating more to risky driving behaviors compared to their female counterpart. In this study, the differences in speeding and risky driving behaviors with respect to gender were very small and might not wholly represent the driver’s behaviors. Therefore, appraisal and ways of expressing behaviors can be expected to vary from culture to culture.

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Competing Interests
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### Appendix A

Table A1. Confirmatory factor analysis of the measurement model

| Constructs/items               | Mean ± SD | Items codes | Error variance | SFL  | CR  | α   |
|-------------------------------|-----------|-------------|----------------|------|-----|-----|
| **Normlessness (NM)**         |           |             |                |      |     |     |
| It is all right to do anything you want, provided you keep out of trouble | 3.67 ± 0.97 | NM1          | 0.29           | 0.24 | 0.87 | 0.89 |
| It is OK to get around laws and rules provided you don’t break them directly |           | NM2          | 0.24           | 0.24 | 0.87 | 0.89 |
| If something works, it is less important whether it is right or wrong |           | NM3          | 0.41           | 0.41 | 0.77 |     |
| Some things can be wrong to do even though it is legal to do it |           | NM4          | 0.36           | 0.36 | 0.80 |     |
| **Sensation-seeking (SS)**    | 3.84 ± 1.10 |             |                |      |     |     |
| Willing to try anything once  |           | SS1          | 0.47           | 0.47 | 0.73 |     |
| Enjoy being reckless          |           | SS2          | 0.48           | 0.48 | 0.72 |     |
| Seek danger                   |           | SS3          | 0.45           | 0.45 | 0.74 |     |
| Love action                   |           | SS4          | 0.23           | 0.23 | 0.88 | 0.92 |
| Love excitement               |           | SS5          | 0.21           | 0.21 | 0.89 |     |
| Seek adventure                |           | SS6          | 0.45           | 0.45 | 0.74 |     |
| Act wild and crazy            |           | SS7          | 0.42           | 0.42 | 0.76 |     |
| Enjoy being part of a loud crowd |       | SS8          | 0.24           | 0.24 | 0.87 |     |
| **Attitude (ATT)**            | 3.44 ± 1.10 |             |                |      |     |     |
| For me, speeding is unpleasant/pleasant |   | ATT1         | 0.29           | 0.29 | 0.84 |     |
| For me, speeding is unnecessary/necessary | | ATT2         | 0.33           | 0.33 | 0.82 |     |
| For me, speeding is punishing/rewarding |  | ATT3         | 0.28           | 0.28 | 0.85 | 0.90 |
| For me, speeding is uncomfortable/comfortable |  | ATT4         | 0.44           | 0.44 | 0.75 |     |
| For me, speeding is unsafe/safe |       | ATT5         | 0.28           | 0.28 | 0.85 |     |
| **Intentions (INT)**          | 3.64 (0.99)| INT1         | 0.34           | 0.34 | 0.81 |     |
| When driving, I am likely to drive faster than the speed limit |           | INT2         | 0.33           | 0.33 | 0.82 | 0.88 |
| When driving, I intend to speed, if possible |  | INT3         | 0.39           | 0.39 | 0.83 | 0.87 |
| When driving, I intend to pass other cars more often | | INT4         | 0.38           | 0.38 | 0.79 |     |
| When driving, I will try to speed |       | INT5         | 0.38           | 0.38 | 0.79 |     |
| **Risky Driving Behavior (RDB)** | 3.15 ± 1.11| RDB1         | 0.38           | 0.38 | 0.79 |     |
| Exceed the posted speed limit more than20 km/h |  | RDB2         | 0.31           | 0.31 | 0.83 | 0.85 |
| Exceed the posted speed limit more than 10 km/h | | RDB3         | 0.33           | 0.33 | 0.82 |     |
| Overtake car in front when it is driving at the posted speed limit | | RDB4         | 0.33           | 0.33 | 0.82 |     |

Notes: SFL: Standardized factor loading; CR: Composite reliability; α: Cronbach’s α.
Figure A1. (a) This road is a three travel lane in each direction passing through a town with a posted speed limit of 80 km/h.

How often do you exceed the posted speed limit more than 20 km/h on this type of road?

- Never
- Hardly ever
- Occasionally
- Don’t know
- Not often
- Often
- Very often.

(b) This is a neighborhood or residential road with a 50 km/h posted speed limit.

How often do you exceed the posted speed limit more than 10 km/h on this type of road?

- Never
- Hardly ever
- Occasionally
- Don’t know
- Not often
- Often
- Very often.
(c) This is a road with one travel lane in each direction and sharp curves with a 40 km/h posted speed limit.

How often do you overtake a car in front when it is driving within the posted speed limit on this type of road?

☐ Never ☐ Hardly ever ☐ Occasionally ☐ Don’t know ☐ Not often ☐ Often ☐ Very often.