Understanding Aggressive Driving: The Role of Personality and Individual Differences

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The goal of the present study was to examine the role of personality and individual differences on aggressive driving. It was hypothesized that personality and individual differences would be significantly related to aggressive driving behavior. A sample of n = 252 participants from a southeastern university and surrounding community were required to complete a series of driving questionnaires; the ADBQ, DBQ, and CFQ-D; and a series of personality questionnaires; the IPIP-NEO-PIR and BFI. Our results indicated that personality factors and individual differences significantly predicted aggressive driving outcomes. These results provided a preliminary personality based characteristic profile of the aggressive driver. These results also support the use of trait anger and trait cooperation independently from the subscales they are derived from (Neuroticism and Agreeableness) to predict aggressive driving behaviors. Theoretical and practical implications are discussed.

INTRODUCTION

Vehicular accidents are the second leading cause of death in the United States (US). Recent government reports have found that 56% of fatal vehicular crashes in the US in 2014 were linked to aggressive driving behavior (AAA, 2016). In the same year, 78% of US drivers reported engaging in at least one aggressive driving behavior while operating their vehicle (AAA, 2016). In 2017, NHTSA's Fatal Accident Report System (FARS) reported that 37.5% of reported crash fatalities in the US could be traced back to aggressive driving behavior. The fatal impact of aggressive driving on vehicular accident rates cannot be ignored. Understanding the individual propensities of the driver can assist in further understanding aggressive driving. Due to the impact of aggressive driving on roadway safety, it is crucial to further examine personality and individual differences in aggressive driving behavior.

The goal of the present study was to empirically examine the role of personality and individual differences in aggressive driving behaviors.

Previous research has largely focused on three out of five Five-Factor Model (FFM) personality factors which does not account for the breadth of factors that comprise personality within the FFM (Bone & Mowen, 2006; Chraif et al., 2016; Dahlen et al., 2005; Sârbescu & Maricutoiu, 2019; Găianu et al., 2020). Prior studies also tend to use only one personality measure, which is inadequate in accounting for differences between measures that may pick up different relationships between the relevant personality constructs (Bone & Mowen, 2006; Chraif et al., 2016; Găianu et al., 2020; Dahlen et al., 2005; Sârbescu & Maricutoiu, 2019). The present study aimed to fill these gaps in breadth and consistency by using multiple personality measures to gain an in-depth view of the relevant personality factors and their corresponding subfactors and their impact on aggressive driving behavior.

Furthermore, prior research measures aggressive driving behavior via aggregate aggressive driving questionnaires, created by utilizing aggressive driving sections from various driving questionnaires (Bone & Mowen, 2006; Sârbescu & Maricutoui, 2019; Găianu et al., 2020). These questionnaires were not standardized across studies, and these questionnaires were not developed as dedicated, aggressive driving questionnaires (Bone & Mowen, 2006; Sârbescu & Maricutoui, 2019; Găianu et al., 2020). The present study aimed to fill this gap by utilizing a questionnaire purposefully constructed for the measurement of aggressive driving behaviors (Mouloua et al., 2007)

Previous investigation of the role of individual differences in aggressive driving has indicated the importance of accounting for biological sex and cognitive limitations in the driving context (Mouloua et al., 2007; Reason et al., 2014).

Biological sex differences in aggressive driving engagement have been observed but are still poorly understood (Mouloua et al., 2007). The present study aimed to fill this gap by further examining the role of biological sex differences in aggressive driving.

Cognitive limitations in driving are characterized as errors due to adaptive limitations rather than intentional transgressions (Reason et al., 2014). Cognitive failures have been observed to impact the aggressive driving experience (Sani et al., 2017, Tabibi et al., 2015). The relationship of cognitive failures to aggressive driving is also poorly understood. The present study aimed to fill this gap by further examining the role of cognitive failures in aggressive driving.

Research Hypotheses

Previous research has indicated a relationship between personality factors and aggressive driving behavior (Chraif et al., 2016; Bone & Mowen, 2006; Găianu et al., 2020; Sârbescu & Maricutoui, 2019). Due to this, we hypothesized that the Five-Factor Model (FFM) personality factors would be related to aggressive driving with the following hypotheses:

H1. Neuroticism will show a significant relationship with aggressive driving behaviors.

H2. Extraversion will show a significant relationship with aggressive driving behaviors.

H3. Openness will show a significant relationship with aggressive driving behaviors.

H4. Conscientiousness will show a significant relationship with aggressive driving behaviors.

H5. Agreeableness will show a significant relationship with aggressive driving. Behaviors

The present study also utilized measures for biological sex and cognitive failures to account for non-personality-related individual differences. Prior studies indicated that biological sex differences are present in aggressive driving behaviors (Mouloua et al., 2007; Gurda et al., 2012). Cognitive failures have also been found to impact the driving experience (Reason et al., 2014, Sani et al., 2017; Tabibi et al., 2015). The present study sought to examine the role of biological sex differences and cognitive failures in aggressive driving with the following hypothesis:

H6. Females and males will show a significant difference in their propensity to engage in aggressive driving behavior.

H7. Cognitive failures will show a significant relationship with aggressive driving behaviors.

METHOD

Design and Participants

The present study used a correlational design involving the FFM Personality factors, biological sex, cognitive failures, and aggressive driving. The FFM personality factors and cognitive failures test measures were introduced as predictors of aggressive driving. Between-groups differences as a function of biological sex were also explored. A power analysis using the G-Power 3.1statistical program (Faul, Erdfelder, Lang & Buchner, 2007) was performed to determine the desired participant count of n = 136.

A total sample of n = 252 (female = 162, male = 89) participated. The participant age range was between 18 and 62 years of age (M = 20.60, SD = 5.43). Participants were recruited through the University participant recruitment system (SONA) and approved social media platforms. All student participants received extra credit for their participation.

All participants were required to hold a valid driver's license at the time of their participation. All participants were treated according to the American Psychological Association's research and ethical guidelines.

Materials and Procedure

All materials were administered to participants via the University-provided Qualtrics system. Student participants accessed the survey with direct links from SONA. Non-student participants were provided an anonymous link through alternate approved social media distribution points. All participants acknowledged their consent prior to participating. All study items were approved by the University of Central Florida's Institutional Review Board (IRB) prior to recruitment and distribution. The materials were sequenced as follows:

Explanation of Research (EOR). The EOR is an IRB-approved document that details participant expectations, rights, and documents consent for the study.

Demographics and Driving Behavior Questionnaire (DBQ; Reason et al., 1990). The DBQ is a 24-item self-report survey that measures violations, error, and lapses of attention, with items rated on a six-point scale (0-5).

Aggressive Driving Behavior Questionnaire (ADBQ; Mouloua et al., 2007). The ADBQ is a 20-item self-report questionnaire that measures individual engagement in aggressive driving behaviors, with items rated on a six-point Likert-type scale (1-6)

International Personality Item Pool NEO Personality Index Revision (IPIP NEO PI-R; Maples et al., 2014). The IPIP NEO PI-R is a 120-item self-report questionnaire that measures the individual levels of the five personality constructs in the FFM. This questionnaire utilizes subscales (subfactors) for each factor. Each item is rated using a 5-point Likert-type scale (1-5).

Big Five Personality Inventory (BFI; John et al., 1991; John et al., 2008, John et al., 1999). The BFI is a 44-item self-report survey that measures individual levels of the FFM personality constructs. Each item is rated on a 5-point Likert-type scale (1-5).

Cognitive Failures Questionnaire- Driving (CFQ-D; Broadbent et al., 1982; Kass et al., 2008). The CFQ-D is a 30-item self-report survey that measures the individual frequency of cognitive and psychomotor errors while driving. Each item is rated on a 5-point Likert-type scale (1-5).

Upon survey completion, participants were thanked for their participation and granted participation credit when appropriate.

RESULTS

Reliability Analyses

Cronbach's alpha reliability analyses were conducted to establish the reliability of the driving and personality test items used. The ADBQ, CFQ-D, and BFI-subscales each had high reliability (Cronbach's $\alpha \geq .75$).

The IPIP NEO PI-R-subscales of Self-Consciousness (neuroticism-derived), Adventurousness (openness-derived), and Morality (agreeableness-derived) each had extremely low reliability (Cronbach's $\alpha \leq .19$). The low reliability of these subscales excluded them from further analyses. All other IPIP NEO PI-R-subscales had adequate reliability (Cronbach's $\alpha \geq .60$).

Incomplete questionnaires and outliers were excluded from the analysis**.** Only the measure scales with adequate reliability were included in the subsequent analysis.

Bivariate Correlations

Bivariate correlations were calculated for the BFI and IPIP (see table 1). The bivariate correlations indicated significant positive relationships for the BFI scale of Neuroticism and aggressive driving. The bivariate correlation also indicated a significant negative relationship for the BFI scale of Agreeableness.

The bivariate correlations indicated significant positive correlations for the IPIP subscales of Anxiety, Anger, Depression, Immoderation, Vulnerability, Excitement-Seeking, and Emotionality with aggressive driving. The bivariate correlations also indicated significant negative correlations for the IPIP subscales of Agreeableness, Intellect, Trust, Self-Discipline, and Cautiousness with aggressive driving.

A bivariate correlation indicated a significant positive relationship between cognitive failures and aggressive driving (see table 1).

Table 1: Correlation Table for Personality and Aggressive Driving Behaviors

Pearson Correlation

	Aggressive Driving Behavior Score
BFI Agreeableness Score	-.32**
BFI Neuroticism Score	.33**
Trait Anxiety Score	.30**
Trait Anger Score	.48**
Trait Depression Score	.22**
Trait Immoderation Score	.14*
Trait Vulnerability Score	.24**
Trait Excitement-Seeking Score	.16*
Trait Emotionality Score	.20**
Trait Intellect Score	-.13*
Trait Trust Score	-.20**
Trait Cooperation Score	-.44**
Trait Self-Discipline Score	-.13*
Trait Cautiousness Score	-.26**
Cognitive Failures Score	.46**

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

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

Multiple Regression Analyses

We introduced each significant personality correlation and the significant cognitive failure correlation into a multiple regression analysis as predictors of aggressive driving. The analysis extracted three significant linear regression models.

Model 1 (see table 2). The first significant simple linear regression model revealed trait anger to be a significant predictor of aggressive driving (R^2 = .231, R^2_a = .228, F (1, 250) = 75.05, p < .001). This model showed a significant correlation with aggressive driving at the p < .001 level. The R^2_a = .228 for trait anger indicated that 22.8% of aggressive driving behavior in this model is accounted for by trait anger. This model produced a significant positive regression coefficient for trait anger.

Table 2: Multiple Regression Model 1 Summary

Variable	*B*	*SE B*	β
Trait Anger	.282	.033	.481*
R^2		.231	
R^2_a		.228	
F for change in R^2		75.053*	

*$p < .001$

Model 2 (see table 3). The second significant multiple linear regression model revealed trait anger and cognitive failure to be significant predictors of aggressive driving (R^2 = .357, R^2_a = .352, F (1, 250) = 75.05, p < .001). This model showed a significant correlation with aggressive driving at the p < .001 level. The R^2_a = .352 for trait anger indicated that 35.2% of aggressive driving behavior in this model is accounted for by trait anger and cognitive failure. Controlling for cognitive failure, 23.1% of the observed variability in aggressive driving behavior in this model was accounted for by trait anger, sr^2 = .231. Controlling for trait anger, 20.8% of the observed variability in aggressive driving behavior in the model was accounted for by cognitive failure, sr^2 = .208. This model produced a significant positive regression coefficient for trait anger and cognitive failures.

Table 3: Multiple Regression Model 2 Summary

Variable	*B*	*SE B*	β
Trait Anger	.233	.031	.397*
Cognitive Failures	.415	.059	.365*
R^2		.357	
R^2_a		.352	
F for change in R^2		48.923*	

*$p < .001$

Model 3 (see table 4). The third significant multiple linear regression model revealed trait anger, cognitive failure, and trait cooperation to be significant predictors of aggressive driving (R^2 = .396, R^2_a = .389, F (1, 250) = 75.05, p < .001). This model showed a significant correlation with aggressive driving at the p < .001 level. The R^2_a = .389 for trait anger indicated that 38.9% of aggressive driving behavior in this model was accounted for by trait anger, cognitive failure, and trait cooperation. Controlling for cognitive failure and trait cooperation, 23.1% of the observed variability in aggressive driving behavior in this model was accounted for by trait anger, sr^2 = .231. Controlling for trait anger and trait cooperation, 20.8% of the observed variability in aggressive driving behavior in the model was accounted for by cognitive failure, sr^2 = .208. Controlling for trait anger and cognitive failure, 19.0% of the observed variability in aggressive driving behavior in the model was accounted for by cognitive failure, sr^2 = .190. This model produced significant positive regression coefficients for trait anger and cognitive failures. This model also produced a significant negative regression coefficient for trait cooperation.

Table 4: Multiple Regression Model 3 Summary

Variable	*B*	*SE B*	β
Trait Anger	.167	.034	.285*
Cognitive Failures	.397	.058	.349*
Trait Cooperation	-.175	.044	-.229
R^2		.396	
R^2_a		.389	
F for change in R^2		15.972*	

*$p < .001$

Biological Sex Differences: Independent Samples T-Test

Independent samples t-test's (IST's) were conducted to analyze for biological sex differences in aggressive driving behavior. Due to non-equivalent sample sizes for biological sex (female = 162, male = 89), equal samples analysis was conducted alongside a complete sample analysis due to skewed sample size. Two equal samples of 89 females and 89 males were utilized for the equal samples analysis.

Complete sample. The IST for the complete participant sample did not reveal a significant difference for mean aggressive driving scores between females and males, $t(249) = -1.627$, $p = .105$.

Equal sample one. The IST for the first equal sample participant sample did not reveal a significant difference for mean aggressive driving scores between females and males, $t(176) = -1.118$, $p = .265$.

Equal sample two. The IST for the second equal sample participant sample did reveal a marginally significant difference for mean aggressive driving scores between females and males, $t(176) = -1.896$, $p = .060$ at the $\alpha = .10$ level.

Due to the insignificance of the IST's no further analysis for biological sex differences was conducted.

DISCUSSION

The goal of the present study was to empirically examine the role of personality and individual differences in aggressive driving behaviors. Our findings suggest that the personality factors of trait anger, trait cooperation, and the individual difference of cognitive failures were significant predictors of aggressive driving behavior. The inconclusive results for biological sex differences necessitate further exploration with a larger sample size.

The low-reliability findings of the Cronbach's alpha reliability analysis for the IPIP subscales of Self-Consciousness, Adventurousness, and Morality did not fit previous research that determined the high reliability of these scales (Maples et al., 2014). Further investigation of these scales to improve internal consistency is recommended.

It is also noteworthy to mention that none of the IPIP FFM factors had all its six subfactors significantly correlated with aggressive driving. This implies that general personality factors would not be best suited for predicting aggressive driving behaviors but rather the subfactors of the generalized factors would be.

The multiple regression analysis findings indicate that the relationship of Neuroticism and aggressive driving can be better accounted for by the subfactor of trait anger. The same pattern is observed regarding Agreeableness. The relationship of Agreeableness and aggressive driving is observed to be better accounted for by trait anger. The findings for cognitive failures expanded on previous research by suggesting that cognitive failures may more largely impact aggressive driving behavior than previously found (Sani et al., 2017; Tabibi et al., 2015; Wickens et al., 2007; Whitney et al., 2004).

The findings for trait anger expand on research indicating driver anger as significantly related to aggressive driving (Lajunen et al., 2001; Bogdan et al., 2016) by providing support for a distinction between trait anger and driver anger (driving contextualized anger). This finding also suggests that measures for trait anger (in and outside of the driving context) should be considered when further examining the role of trait anger in aggressive driving. This finding for trait anger also provides evidence suggesting that higher trait anger significantly increases aggressive driving behavior.

The relationship between cognitive failures and aggressive driving is noteworthy, as they suggest that higher cognitive failures may significantly increase engagement in aggressive driving behaviors. However, these conclusions are limited due to the method of the measurement of cognitive failures utilized in the present study.

Further, the findings for trait cooperation follow previous research by Dahlen and colleagues (2016). While the assumption for trait cooperation is that it is a pro-social behavior, low levels of trait cooperation encompass asocial behaviors such as being uncooperative, discourteous, and antagonistic (Dahlen et al., 2016). Lower levels of pro-social behaviors in favor for a-social behaviors may increase aggressive driving behaviors.

The findings of the analyses provide support for a profile of personality characteristics of the 'aggressive driver' as high in trait anger and cognitive failures and low in trait cooperation. Utilizing a characteristic profile such as these, we suggest that tailored driver selection and training techniques be developed to ensure driver training fits trainees' unique characteristics. While tailored driver training can be useful, research has suggested that limitations exist in driver attitudes towards the usefulness of the training (Li et al., 2019).

Limitations

Another limitation of this study is related to the nature of its current design. Initially, it was designed to be used in a simulated driving environment. However, because of COVID-19 research restrictions, it was reverted to online survey research.

The self-report nature of this study is sensitive to response and social desirability biases. The risk of these biases was highest for the cognitive failures measure; the CFQ-D. Due to cognitive failures containing characterizations of memory issues (primarily memory loss). Thus, there exists an inherent threat that participants who experience memory related cognitive failures would fail to remember their

incidences of cognitive failures, and inadvertently report false values of cognitive failure incidences.

Similarly, it would be especially useful to include more driver contextualized personality measures that relate to driving such as the Driving Anger Scale; DAS (Deffenbacher et al., 1994) contributes to understanding personality inside and outside of the driving context. We also suggest that future studies utilize contextualized personality measures, as has originally been done in similar previous studies (Mouloua et al., 2007).

Finally, it is noteworthy to mention that the present findings may contribute to the development of a research characteristic profile for future experimental studies of the same nature.

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