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UNDERSTANDING AGGRESSIVE DRIVING BEHAVIOR: THE ROLE OF  
PERSONALITY AND INDIVIDUAL DIFFERENCES

by

ENILDA MAITE VELAZQUEZ

A thesis submitted in partial fulfillments of the requirements  
for the Honors in the Major program in Psychology  
in the College of Sciences  
and in the Burnett Honors College  
at the University of Central Florida  
Orlando, Florida

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2020

Thesis Chair: Dr. Mustapha Mouloua

## **ABSTRACT**

According to recent reports, 56 percent of total vehicular accident deaths were related to aggressive driving. Previous research on aggressive driving was related to cognitive failures, sex differences, individual driving habits, and to a lesser extent, personality. Personality focused aggressive driving research has not produced a consensus on the predictive nature of personality traits on the propensity to engage in aggressive driving. However, a lack of consensus on personality's role in aggressive driving warrants further empirical examination into the relationship between personality and aggressive driving. Similarly, the impact of individual differences on aggressive driving behavior cannot be ignored; the role of individual differences in aggressive driving is imperative to examine. The goal of this study was designed to examine the role of personality and individual differences in aggressive driving. It was hypothesized that personality and individual differences would be significantly related to aggressive driving behavior. A sample of (N= 252) participants were recruited via the online SONA System. All participants were required to complete a series of driving (ADBQ, CFQ-D&DBQ) questionnaires. They were also required to complete a series of personality questionnaires, including the IPIP NEO PI-R and BFI. Results indicated that personality factors and individual differences were significant predictors of aggressive driving outcomes. A series of stepwise regression analyses revealed a significant linear relationship between trait anger and aggressive driving; trait anger and cognitive failures with aggressive driving; trait anger, cognitive failures, and trait cooperation with aggressive driving. However, the stepwise regression did not show a significant relationship between personality factors of Neuroticism and Agreeableness in relation to aggressive driving. Interestingly, the models supported the use of trait anger and trait cooperation as predictors of aggressive driving behavior. Theoretical and practical implications are discussed, and directions for future research are also presented.

## DEDICATION

Para mí mamá, eres mi corazón, mi alma, mi inspiración.

Para mí papá, como yo en ti, tú estas en mí.

Para mí tío Ernesto, te quiero, siempre.

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## TABLE OF CONTENTS

LIST OF TABLES .....	vii
CHAPTER 1: INTRODUCTION .....	1
CHAPTER 2: RELEVANT RESEARCH .....	3
Driver Aggression .....	3
Personality Factors .....	5
Examining the Role of Personality in Aggressive Driving .....	7
Examining the Role of Individual Differences in Aggressive Driving .....	10
<i>Sex Differences in Aggressive Driving</i> .....	10
<i>Cognitive Failures in Aggressive Driving</i> .....	12
CHAPTER 3: RESEARCH HYPOTHESES .....	14
Current Study .....	14
Research Hypotheses .....	15
CHAPTER 4: METHODOLOGY .....	17
Design .....	17
Participants .....	17
Materials .....	18
<i>Aggressive Driver Behavior Questionnaire</i> .....	18
<i>Cognitive Failures Questionnaire-Driving</i> .....	18
<i>Driver Behavior Questionnaire</i> .....	19
<i>Big Five Inventory</i> .....	19
<i>IPIP NEO-PI-R</i> .....	20
<i>Demographics and Driving History Questionnaire</i> .....	21
Procedure .....	21
CHAPTER 5: RESULTS .....	22
Reliability Analyses .....	22
Bivariate Correlations .....	24
<i>Personality and Aggressive Driving</i> .....	24
<i>Cognitive Failures and Aggressive Driving</i> .....	26
Multiple Regression Analyses .....	27

Sex Differences .....	30
<i>Sample Manipulation Procedure</i> .....	30
<i>Independent Samples T-Test Complete Sample</i> .....	31
<i>Independent Samples T-Test Equal Sample One</i> .....	32
<i>Independent Samples T-Test Equal Sample Two</i> .....	32
CHAPTER 6: DISCUSSION .....	33
Personality and Individual Differences .....	33
Theoretical and Practical Implications .....	39
Limitations .....	42
Direction for Future Research .....	45
APPENDIX A: .....	46
APPENDIX B: .....	51
APPENDIX C: .....	54
APPENDIX D: .....	57
APPENDIX E: .....	59
APPENDIX F: .....	64
APPENDIX G: .....	67
APPENDIX H: .....	69
REFERENCES .....	71

## LIST OF TABLES

Table 1: Correlation Table for Personality and Aggressive Driving Behaviors .....	26
Table 2 Summary of Multiple Regression Analysis for Variables Predicting Aggressive Driving Behaviors (n = 252) .....	29
Table 3: ANOVA Summary for Multiple Regression Analysis (n = 252) .....	30



## **CHAPTER 1: INTRODUCTION**

A recent government report published by The National Highway Traffic Safety Administration (NHTSA) defined aggressive driving as "when individuals commit a combination of moving traffic offenses as to endanger other persons or property" (NHTSA, 2016; NHTSA, 2009). These moving traffic offenses encompass a wide variety of behaviors such as speeding, red-light running, tailgating, weaving, rapid lane changes, etc. (Richard, Magee, Bacon-Abdelmoteleb, & Brown, 2018). NHTSA's Fatal Accident Report System (FARS) data for the period of 2003-2007 were analyzed in a 2009 study conducted by the American Automobile Association for Traffic Safety Foundation (AAA) to determine the impact of aggressive driving on automobile accident fatality. The AAA's examination of the FARS data found that from 2003-2007, 56 percent of fatal crashes were linked to aggressive driving behavior. A recent study (AAA, 2016) examined the frequency of self-reported aggressive driving behavior within the United States (AAA, 2016). The results showed that 78 percent of United States drivers reported engaging in at least one aggressive driving behavior. The most common behaviors found in the study were "purposeful tailgating", "yelling at another driver", honking their horn to show anger or annoyance, and giving drivers "the bird" (AAA, 2016). Similarly, FARS 2017 statistics indicated that 37.5 percent of reported crash fatalities were also linked to aggressive driving behavior. Taken together, the results from NHTSA (2009, 2016) and AAA (2009, 2016) collectively point out to the importance of further research into the factors that influence aggressive driving behavior.

Previous research on the role of personality and individual differences in aggressive driving behavior have not been extensively examined and the findings have not been clearly defined. Multiple facets of personality and individual determinants of aggressive driving have been theorized to maintain differing effects on aggressive driving. Thus, it is crucial to further examine the role of personality and individual differences in aggressive driving behavior.

Understanding these roles will allow for expanded research into the causal role of personality and individual differences of aggressive driving in field experiments or simulator studies. This effort will also allow for a profile characterization of the aggressive driver to better understand the nature of aggressive driving in a simulated environment.

## **CHAPTER 2: RELEVANT RESEARCH**

### **Driver Aggression**

Theoretically defining aggressive driving has long been an important issue within the fields of psychology and transportation safety. This is due to the inherent complexity and multifaceted nature of the driving task. In addition, this also requires the understanding of the role of individual characteristics and personality factors in the context of aggressive driving. Aggression has been difficult to define due to its broadness of its scope and relevance to aggressive driving. While a plausible definition has been postulated (NHTSA, 2016), this definition is still insufficient in accounting for the complexity of aggression. Thus, understanding general aggression theory aides in understanding aggressive driving behavior theory.

In this chapter, we begin with the first of these theories, known as the Frustration-Aggression hypothesis, this was first developed in 1939 by Dollard, Miller, Mowrer, and Sears. This theory characterized aggression through the frustration-aggression paradigm (hence the name). Frustration is attributed to one individual interfering in another individual's goal-directed behavior, and by nature of this, an individual interfering in another individual's anticipation of goal-consumption (Dollard et al., 1939). This frustration would then lead to an aggressive response, halting the interference and relieving the discomfort caused by the interference (Dollard et al., 1939). This would establish the goal-oriented behavior back to its normal state, allowing the individual to reap the rewards of goal completion (Dollard et al., 1939).

Recent theorists have also attempted to expand on the frustration-aggression hypothesis by describing aggression using a series of dichotomies; emotional versus instrumental

aggression, direct versus indirect aggression, and displaced versus triggered aggression (Dewall, Anderson, & Bushman, 2012). Each dichotomy accounts for the aggression experience's specific traits, allowing the categorization of the aggression experience within one portion of each dichotomy section (Dewall et al., 2012).

Researchers have also identified the significant role of intention within the aggression scenario (Baron & Richardson, 1994; Ramirez & Andreu, 2006). They indicated that aggression carries an intention to cause harm (Baron & Richardson, 1994), a tenant embodied in NHTSA's (2009) definition of aggressive driving. The definition provided by NHTSA (2016), also embodies tenants of the Frustration-Aggression hypothesis (Dollard et al., 1939), in that engaging in aggression is an end-goal behavior.

Within the transportation literature, aggressive driving has been defined as dysfunctional social behavior (Houston, Harris, & Norman, 2003; Mouloua, Brill, and Shirkey, 2007) that poses significant risks to public safety (Houston et al., 2003). This distinction of dysfunctional social behavior allows for the examination of the role of individual differences within the aggressive driving experience. Theoretical conceptualization of aggressive driving tends to base itself on similar characteristics presented within the general aggression theory literature. Aggressive driving theory examines the roles of frustration, dichotomies, individual, and contextual characteristics that impact aggressive driving (Chraif, Anitei, Burtaverde, Mihaila, 2016).

While these theories each account for specific nuances within the aggression scenario, there still tends to be a lack of emphasis on the role of personality and individual differences in the examination of engagement in the driver aggression scenario.

### **Personality Factors**

When considering the motivational factors for individual engagement in driver aggression, previous research has reported the need to examine both the driver situation context and individual characteristics (Richard et al., 2018; Patil, Shope, Raghunathan, & Bingham, 2006; Hennessy, 2011). The examination of personal factors in relation to driver behavior is a logical progression within the aim of defining driver aggression. Because individual drivers are so uniquely different, it is important to systematically examine the role of individual differences and personality factors within the context of aggressive driving (McCrae & Costa, 1997; Hennessy, 2011).

Like aggression, personality has been defined in a multitude of ways. Still, the broadly agreed-upon definition of personality encompasses the patterns of thoughts, feelings, and actions that emerge in an individual during personal development and maintain a level of stability across time (Hennessy, 2011). Personality then is the culmination of these patterned thoughts, feelings, and actions, that fall under these stable specific categories defined as traits. This definition was hallmarked by McCrae and Costa (1997) and is known as trait theory,

The Five-Factor Model (FFM) of personality, originally presented by Tupes and Christal (1961; Digman, 1990) and later presented by various researchers, has expanded greatly upon trait theory (McCrae & Costa, 1997) to better explain the personality traits observed in individuals.

Previous research by Lewis Goldberg (1992) further-refined the FFM into the trait definitions and descriptions predominantly used in personality research today (John, Naumann, & Soto, 2008; John, Donahue, & Kentle, 1991; Benet-Martinez, & John, 1998; Goldberg, Johnson, Eber, Hogan, Ashton, Cloninger, Gough, 2006).

The Five-Factor Model of personality (Tupes & Christal, 1961; Goldberg, 1992; McCrae & Costa, 1992; John et al., 1991; John et al., 2008) identified five unique personality traits that are termed the "Big-Five" (acronym; OCEAN), these are; Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism. The characteristics of these are as follows:

- Openness is characterized by open-mindedness, originality, and has been coined as Openness to experience in mental and experimental life (Goldberg, 1992; Goldberg, 1999; John et al., 2008; John and Srivastava, 1999).
- Conscientiousness is characterized by levels of behavior constraint and impulse control (measured in the negative within measures of impulsiveness); the impulse control and constraint here are socially prescribed and are described as a measure of constraint/control with goal-directed behavior (Goldberg, 1992; Goldberg, 1999; John et al., 2008; John and Srivastava, 1999).
- Extraversion is characterized by energy and enthusiasm levels, implying the energy of attitude towards the social world, with traits of sociability, activity, assertiveness, and positive emotions (Goldberg, 1992; Goldberg, 1999; John et al., 2008; John and Srivastava, 1999).

- Agreeableness is characterized by levels of altruism and affection. This construct measures prosocial behavior, communal orientation, altruism, and trust, within an individual's approach to the personal and social world (Goldberg, 1992; Goldberg, 1999; John et al., 2008; John and Srivastava, 1999).
- Neuroticism is characterized by negative emotions, nervousness, anxiety, tenseness, and emotional stability. This construct primarily measures levels of emotional instability and temperateness and negative emotionality within an individual's approach to the personal and social world (Goldberg, 1992; Goldberg, 1999; John et al., 2008; John and Srivastava, 1999).

### **Examining the Role of Personality in Aggressive Driving**

Prior research concerning personality determinants of aggressive driving behavior has had mixed results and conclusions surrounding the use of the FFM factors as predictors of aggressive driving behaviors. A study conducted by Bone and Mowen (2006) hypothesized that the traits of emotional instability (Neuroticism), Conscientiousness, and need for arousal (Extraversion) to be associated with aggressive driving. These three traits were found to be significantly associated with aggressive driving, reaching the extent of being predictors of aggressive driving (Bone & Mowen, 2006).

Chraif et al. (2016) hypothesized that the OCEAN traits would show clearly defined relationships (positive or negative) with self-report aggressive driving behavior. Their results supported a negative predictive relationship between emotional instability and aggressive driving, a negative predictive relationship between Agreeableness and aggressive driving, and a

negative predictive relationship between Conscientiousness and aggressive driving, but the results presented in Chraif et al. (2016) did not support the specified relationships between Extraversion and aggressive driving and Openness and aggressive driving. The Chraif et al. (2016) findings for Extraversion and aggressive driving are in direct contradiction to the Bone and Mowen (2006) results and highlight the need for further refined research in the role of Extraversion on aggressive driving behavior to clarify the resulting relationship.

It is also important to note that while Chraif et al.'s (2016) results did support the prior results shown in Bone and Mowen's (2006) study regarding the traits of Neuroticism and Conscientiousness, both studies used different measures for aggressive driving that were subscale measurements taken from different driver behavior questionnaires. This highlights the need for further research using comprehensive questionnaires that focus solely on driver aggression to evaluate the extent of personality's role within aggressive driving behavior.

Recently, Iancu, Hogeia, and Olteanu (2016) conducted a meta-analysis of research articles published in the transportation literature regarding personality and aggressive driving to determine which personality model (between the FFM and Alternate Factor Model) best predicted aggressive driving behaviors. They only reviewed the literature concerning three personality dimensions: Extraversion, Neuroticism, and Agreeableness (Iancu et al., 2016). Weak relationships were reported between these three dimensions and aggressive driving, which is in direct contradiction to prior personality research regarding aggressive driving, in which Extraversion, Neuroticism, and Agreeableness were reported to have strong relationships to aggressive driving (Iancu et al., 2016; Dahlen et al., 2005; Bone & Mowen, 2006; Chraif et al.,



2016). The meta-analysis findings support conducting further studies that use a variety of personality and aggressive driving measures to better understand the role of personality on aggressive driving behavior.

Iancu et al. (2016) also identified differences in moderation effects when studies solely used the personality measure of the International Personality Item Pool (IPIP; Goldberg, 1999) as compared to other personality measures. This provides support for the study of differences between the personality measures themselves, to understand the nuances in personality that play a role in aggressive driving (Iancu et al., 2016).

Sarbescu and Maricutoiu (2019) conducted a seven-week longitudinal study to explore the intra-individual and inter-individual variations of dangerous driving behavior (categorized as errors, violations, and aggression); they used personality measures to examine the predictor relationship of personality on their intra-individual and inter-individual outcomes. Sarbescu and Maricutoiu (2019) found that the factors of Conscientiousness, Openness, and emotional stability (Neuroticism) all had associations with aggressive driving. The predictive nature of Conscientiousness and emotional stability aligned with previous findings from personality and aggressive driving literature (Sarbescu and Maricutoiu, 2019; Chraif et al., 2016; Bone & Mowen, 2006). Sarbescu and Maricutoiu (2019) did find an interesting outcome regarding the factor of Openness, in that their study found that Openness negatively predicted errors. While not associated with aggression, this finding highlights the multifaceted nature of personality within the driving scenario, highlighting the further need for research examining the role of personality within the driving context.

Recently, Gaianu, Giosan, and Sarbescu (2020) further examined trait anger's role in aggressive driving behavior. Gaianu and colleagues (2020) hypothesized that trait anger, measured using the Neuroticism subscale from the NEO IPIP (Goldberg et al., 2006), would account for more variance in aggressive driving violations than behavioral aspects. They reasoned that because aggressive violations are characterized under emotional aggression, rather than hostility (instrumental aggression), they would be more apt to influence by trait anger, thus would confirm the consensus in the literature that driver behavior is linked to stable traits (Gaianu et al., 2020).

Gaianu and colleagues (2020) results did not support this hypothesis, and Neuroticism did not account for most of the variance in aggressive driving behaviors. Rather, their results support the conclusion that driver behavior (including aggressive behaviors) can be subject to variability and may not be as stable as once thought (Gaianu et al., 2020). Gaianu et al.'s (2020) conclusions support the further investigation of the role of personality factors on aggressive driving, using methods that include multiple measures for each construct to determine the extent of the role of personality on aggressive driving, if this is a variable construct, or if the role of personality on aggressive driving is stable.

## **Examining the Role of Individual Differences in Aggressive Driving**

### *Sex Differences in Aggressive Driving*

Previous research has also investigated the role of biological sex differences (biological sex otherwise known as 'sex assigned at birth') within aggressive driving. These studies have produced strong results for the existence of sex differences in aggressive driving behavior (Sarbescu & Maricutoiu, 2019; Mouloua et al., 2007; Gurda, 2012). Similarly, other

studies have also reported significant sex differences in aggressive driving behaviors and traffic anger (Gonzalez-Iglesias et al., 2011; Mouloua et al., 2007; Gurda, 2012). Furthermore, research by Gonzales-Iglesias and colleagues (2011) indicated that significant sex differences were found for driver anger within the context of the aggressive driving scenario. The transportation literature also shows that male drivers engage in more hostile forms of aggressive driving behavior than female drivers (Mouloua et al., 2007; Sarbescu & Maricutoui, 2019; Gonzalez-Iglesias et al., 2011; Shinar & Compton, 2004). Interestingly, it has been shown that female drivers take more passive approaches to driver aggression and indicate higher proneness to errors than male drivers (Mouloua et al., 2007; Shinar & Compton, 2004; Winter & Dodou, 2010).

Previous findings of sex differences explain the observed sex differences via the aggression dichotomy of hostility/passivity (Mouloua et al., 2007; Sarbescu & Maricutoui, 2019; Gonzalez-Iglesias et al., 2011; Shinar & Compton, 2004). These explanations do not consider other definitions of aggressive driving behaviors, such as the role of frustration, intentionality, and other observed aggression dichotomies (emotional/instrumental, displaced versus triggered; Dewall et al., 2012). These explanations of sex differences in aggressive driving behaviors utilizing a singular construct are inadequate, as the complexity of the aggressive driving scenario should be examined utilizing multidimensional constructs.

Due to the observed relationships of biological sex with aggressive driving, it is imperative to examine further the role of biological sex within the aggressive driving context. Thus, the present study aimed to further examine the role of sex differences in aggressive driving behaviors.

### *Cognitive Failures in Aggressive Driving*

Furthermore, Reason et al.'s 2014 study on cognitive failures provided necessary definitional distinctions of cognitive failures within the driving outcome context, in which cognitive failures while driving is distinguished as errors due to adaptive limitations rather than violations due to intentional transgressions (violations). The definitional distinctions of Reason et al. (2014) allows for further delineation of the role of cognitive errors within the driving experience.

Cognitive failures due to adaptive limitations denotes an inherent lack of intentionality of the driver whose transgressions are due to cognitive failures. This spearheads the understanding that cognitive failures are separate from intentional transgressions (violations) (Reason et al., 2014). This also further clarifies the notion that cognitive failures are more a characteristic of an individual difference rather than a proneness to intentional transgression.

Recent investigation into the topic of cognitive failures within the driving experience has focused on the impact of memory, attention, and demographic variables (age and gender) on cognitive failures while driving (Wickens et al., 2007; Tabibi et al., 2015; Metz et al., 2011). The role of working memory and attention on aggressive driving behaviors (and more holistically general driving outcomes) have been of more extensive interest within the transportation literature (Sani et al., 2017; Tabibi et al., 2015; Wickens et al., 2007; Whitney et al., 2004). While working memory and attention are integral parts of cognition, these facets do not account for cognition as a whole. Therefore, the literature shows a lack of studies that focus on the role of cognitive failures (rather than working memory or attention separately) within the aggressive

driving scenario. Thus, the present study aimed to understand the role of cognitive failures within the aggressive driving experience to fill this gap present in the transportation literature.

## **CHAPTER 3: RESEARCH HYPOTHESES**

### **Current Study**

The goal of the present study was to empirically examine the role of personality and individual differences in aggressive driving behaviors. To date, research on the role of personality factors in relation to aggressive driving has not been extensively studied, presenting a lack of consensus in the literature. Similarly, the impact of individual differences on aggressive driving is not well understood.

When evaluating the role of personality in aggressive driving, previous research largely centers on three of the five FFM personality factors (Bone & Mowen, 2006; Chraif et al., 2016; Dahlen et al., 2005; Sarbescu & Maricutoiu, 2019; Gaiana et al., 2020). Similar studies we examined tend to use only one personality measure, which is inadequate in accounting for differences between measures that may pick up different relationships between constructs that are relevant when studying personality effects on aggressive driving (Bone & Mowen, 2006; Chraif et al., 2016; Gaiana et al., 2020; Dahlen et al., 2005; Sarbescu & Maricutoiu, 2019). Previous research lacks consistency and breadth of personality measurement in examining the role of personality in aggressive driving. To this end, the present study aimed to fill this gap in consistency and breadth by using multiple personality measures that offered an in-depth measurement of personality factor and subfactors.

Also, previous studies measured aggressive driving utilizing aggregate aggressive driving questionnaires, created by utilizing aggressive driving sections from other questionnaires (Bone & Mowen, 2006; Sarbescu & Maricutoiu, 2019; Gaiana et al., 2020). These aggregate

questionnaires were not standardized across studies, and these studies did not use a dedicated aggressive driving behavior questionnaire (Bone & Mowen, 2006; Sarbescu & Maricutoui, 2019; Gaiana et al., 2020). While using aggregate questionnaires may measure the intended construct, utilizing a dedicated aggressive driving behavior questionnaire may provide more reliable measurements of aggressive driving behavior. The present study aimed to fill this gap by utilizing a questionnaire constructed for the measurement of aggressive driving behaviors (Mouloua et al., 2007).

### **Research Hypotheses**

Previous research indicated that personality factors were significantly related to aggressive driving (Chraif et al., 2016; Bone & Mowen, 2006; Gaianu et al., 2020; Sarbescu & Maricutoui, 2019); we hypothesized that the FFM personality factors would be related to aggressive driving. To this end, we have specifically postulated 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.

Studies have provided mixed results on the effect of sex differences in aggressive driving that may mimic the personality effects hypothesized (Sarbescu & Maricutoiu, 2019; Mouloua et al., 2007). These studies have shown that sex does tend to show a relationship with aggressive

driving (Mouloua et al., 2007; Brill & Mouloua, 2011; Gurda, 2012). Therefore, this study also sought to examine the role of sex differences in the propensity to engage in aggressive driving behaviors.

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

Cognitive failures were also categorized as individual differences in this study. Reason et al. (2014) defined cognitive failures while driving as errors due to adaptive limitations (memory lapses, daydreaming, missing cues, etc.) rather than violations (traffic offenses, aggression). Because of the impact that cognitive failures have on the driving experience, this study also sought to examine the effects of cognitive failure on the propensity to engage in aggressive driving behaviors.

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



## CHAPTER 4: METHODOLOGY

### Design

The present study used a correlational design involving FFM Personality factors (e.g., Openness, Conscientiousness, Extraversion, Agreeableness, Neuroticism), gender, cognitive failures, and aggressive driving. The personality factors, cognitive failures, and gender test measures were introduced as predictors of aggressive driving. We also explored the between-groups differences as a function of gender.

A power analysis using the G-Power 3.1 statistical program (Faul, Erdfelder, Lang, & Buchner, 2007) was performed to determine the desired sample size for this study. The power analysis determined that a total of 123 participants would be needed for the study to detect a medium effect size of .15 with power=.90 and .05 significance level. We added an additional 13 participants (calculating 10 percent of the  $N$  the power analysis revealed) to our desired  $N$  to account for attrition, missing data, etc. The total desired participant count was  $N=136$ .

### Participants

A total sample ( $N=252$ ) including 89 male and 162 female participants took part in this study. All participants ranged between 18 and 62 years ( $M = 20.60$ ,  $SD = 5.43$ ). They were recruited through the University SONA System and received extra credit for their participation (if applicable as a student). In addition, they were required to hold a valid driver's license at the time of their participation to ensure driving experience. All participants were treated according to the American Psychological Association's research and ethical guidelines.

## **Materials**

All materials used in this study were administered through the Qualtrics survey system and accessed via the SONA system and using specific links. Participants outside the SONA system accessed these study materials through alternate distribution points using links provided from approved social media outlets (Facebook, Instagram, and Snapchat).

### *Aggressive Driver Behavior Questionnaire* (ADBQ; Mouloua et al., 2007)

The ADBQ is a 20-item self-report questionnaire consisting of specific questions about individual engagement in aggressive driving behaviors. Individuals rate each response on a 6-point Likert-type scale (1-Never, 2-Hardly at all, 3- Occasionally, 4-Often, 5-Quite Frequently, 6- Nearly All the Time) (Mouloua et al., 2007). Examples of the aggressive driving behaviors used within the ADBQ include verbal insults, red-light running, profane hand signaling, and tailgating (Gurda, 2012). The ADBQ was used to assess participants' likelihood of exhibiting aggressive driving behaviors (Mouloua et al., 2007). The ADBQ has demonstrated high internal consistency ( $\alpha = .86$ ) and high reliability ( $\alpha = .84$ ) (Gurda, 2012). (see Appendix A)

### *Cognitive Failures Questionnaire-Driving* (CFQ-D: Broadbent, Cooper, Fitzgerald, and Parkes, 1982; Kass, Layton, and Doolen, 2008)

The CFQ-D was originally created by Broadbent et al. (1982) and later revised for assessment of cognitive failures within the driving context by Kass et al. (2008) ) is a 30 item self-report survey that measures the frequency of self-report incidences of cognitive and psychomotor errors while driving. Individuals rate each response on a 5-point Likert-type scale (1-Never, 2-Very Rarely, 3- Occasionally, 4-Quite Frequently, 5-Very Frequently; Kass et al.,

2008). The CFQ-D has not had widespread use within the driving literature. Its use in this study will contribute to measuring the effects of cognitive failures on aggressive driving. (see Appendix B),

#### *Driver Behavior Questionnaire*

(DBQ; Reason, Manstead, Stradling, Baxter, & Campbell, 1990)

The DBQ (Reason et al., 1990) is a self-report 24-item survey. It uses a three-factor structure to measure self-reported violations, errors, and lapses of attention. Items are rated by the participant on a six-point scale (0-5); the closer scores are to 5, the higher the likelihood for engagement in the specified risky driving behavior (Reason et al., 1990). The DBQ was developed to measure the differences between errors and violations, according to Reason et al. (1990), errors are a product of performance limitations, whereas violations are product of intended driver behavior. The DBQ contains a subscale intended for the measurement of aggressive driving behaviors (categorized under violations). The DBQ has demonstrated high internal consistency for errors ( $\alpha = .65$ ), and violations ( $\alpha = .90$ ) (Varmazyar et al., 2014). The data provided from this study is useful for the support of the utility of the DBQ to measure aggressive driving and provide support for the utility of the DBQ within survey designs. (see Appendix C)

#### *Big Five Inventory*

(BFI; John, Naumann, & Soto, 2008; John, Donahue, & Kentle, 1991; Benet-Martinez, & John, 1998)

The BFI (John et al., 1991; John et al., 2008) is a 44-item self-report survey that uses the FFM to measure the "Big Five" personality constructs; Openness, Conscientiousness,

Extraversion, Agreeableness, and Neuroticism. Individuals rate each item on a 5-point Likert-type scale (1- Disagree Strongly, 2- Disagree a Little, 3- Neither Agree nor Disagree, 4- Agree a Little, 5- Agree Strongly; John et al., 1991, 2008). Items are shortly worded statements developed using the taxonomy of the FFM personality descriptions. The BFI has demonstrated high reliability ( $\alpha=.75-.8$ ) and internal consistency ( $\alpha=.8$  and  $\alpha=.9$ ) (John and Srivastava, 1999). The use of the BFI contributed to the measurement of personality within the study, as a well-respected measure of personality that has not been used widely in the transportation literature. (see Appendix D)

#### *IPIP NEO-PI-R*

(Maples, Guan, Carter & Miller, 2014)

The IPIP NEO PI-R (see Appendix E) was developed to create an open-access measure of the FFM personality factors using existing measures developed from the IPIP (Maples et al., 2014; Goldberg, 1999, 2006). The IPIP NEO PI-R measures the five personality constructs and includes subscales for each construct termed "Facet Scales," to provide a detailed view of the personality factors by examining their sub-factors. The IPIP-NEO (Goldberg, 1999, 2006) is a widely available scale that the IPIP NEO PI-R was developed from. The IPIPI NEO PI-R has been used widely within transportation literature due to its thoroughness (Goldberg, 1999, 2006). The IPIP NEO PI-R has demonstrated high internal consistency across its factor and facet scales ( $\alpha=.6-.8$ ) and high validity ( $\alpha=.77$ ) (Maples et al., 2014). The use of the IPIP NEO PI-R is a well-accepted form of personality measurement within the transportation literature. The use of the IPIP contributed to the measurement of personality within the study, as a well-respected measure of personality within the transportation literature.

### *Demographics and Driving History Questionnaire* (DDHQ)

The DDHQ is comprised of the demographics portion of the CFQ-D and other researcher-made demographics questions (Broadbent et al., 1982; Kass et al., 2008). Participant information such as age and gender are collected. The participant's possession of a current driver's license was also verified using this questionnaire. Questions also include self-report accident numbers and traffic ticket numbers, to measure for established driver violations. The DDHQ will allow for the consideration of individual participant differences, which will allow us to clarify the data within our analyses using considerations for these individual differences. (see Appendix F)

### **Procedure**

This study was approved by the University of Central Florida's Institutional Review Board (IRB) prior to the recruitment and distribution of materials to all participants. All measures were placed into a survey using Qualtrics software provided by the University of Central Florida. The measures were sequenced in a manner that controls for order and fatigue effects. All participants were provided an IRB approved consent form (see Appendix G) at the beginning of the survey. Participants were required to provide their consent before administration of the survey. Upon survey completion, participants were granted participation credit (if applicable) and were thanked for their participation.

## CHAPTER 5: RESULTS

All data were entered into SPSS 27.0 (IBM Statistics) and statistically analyzed using a series of bivariate correlations and multiple regression analysis.

### Reliability Analyses

To establish the reliability of the driving measures used, Cronbach's alpha was calculated for the ADBQ and CFQ-D. The ADBQ (20 items) and the CFQ-D (30 items) were both found to have high reliability (ADBQ: Cronbach's  $\alpha = .84$  ; CFQ-D: Cronbach's  $\alpha = .90$  ).

To establish the reliability of the BFI personality measure used, Cronbach's alpha was calculated for the BFI subscales OCEAN. The BFI subscales of Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness were found to have high reliability (Neuroticism: Cronbach's  $\alpha = .85$  ; Extraversion: Cronbach's  $\alpha = .77$  ; Openness: Cronbach's  $\alpha = .76$ ; Agreeableness: Cronbach's  $\alpha = .86$  ; Conscientiousness: Cronbach's  $\alpha = .75$ ). Each scale consisted of eight to ten items.

To establish the IPIP NEO PI-R personality measure's reliability, Cronbach's alpha was calculated for the IPIP OCEAN subscales (approximately six subscales per OCEAN factor). The IPIP Neuroticism subscales for Anxiety, Anger, Depression, and Vulnerability, consisting of four items each, were found to have high reliability (Anxiety: Cronbach's  $\alpha = .80$ ; Anger: Cronbach's  $\alpha = .88$ ; Depression: Cronbach's  $\alpha = .90$ ; Vulnerability: Cronbach's  $\alpha = .76$ ). The IPIP Neuroticism subscale for Immoderation, consisting of four items, was found to have moderate reliability (Cronbach's  $\alpha = .60$ ). The IPIP Neuroticism subscale for Self-Consciousness, consisting of four items, was found to have extremely low reliability (Cronbach's  $\alpha = .13$ ). Due

to the low reliability of the IPIP Self-Consciousness subscale, this subscale was excluded from further analyses.

The IPIP Extraversion subscales for Friendliness, Gregariousness, and Assertiveness were found to have high reliability (Friendliness: Cronbach's  $\alpha = .82$ ; Gregariousness: Cronbach's  $\alpha = .83$ ; Assertiveness: Cronbach's  $\alpha = .84$ ). The IPIP Extraversion subscales for Activity Level, Excitement Seeking, and Cheerfulness were found to have moderate reliability (Activity Level: Cronbach's  $\alpha = .69$ ; Excitement Seeking: Cronbach's  $\alpha = .65$ ; Cheerfulness: Cronbach's  $\alpha = .69$ ).

The IPIP Openness subscales for Imagination, Artistic Interests, Intellect, and Liberalism were found to have high reliability (Imagination: Cronbach's  $\alpha = .72$ ; Artistic Interests: Cronbach's  $\alpha = .76$ ; Intellect: Cronbach's  $\alpha = .76$ ; Liberalism: Cronbach's  $\alpha = .75$ ). The IPIP Openness subscale for Emotionality was found to have moderate reliability (Cronbach's  $\alpha = .66$ ). The IPIP Openness subscale for Adventurousness was found to have extremely low reliability (Cronbach's  $\alpha = .19$ ). Due to the low reliability of the IPIP Adventurousness subscale, this subscale was excluded from further analyses.

The IPIP Agreeableness subscales for Trust, Cooperation, and Modesty, were found to have high reliability (Trust: Cronbach's  $\alpha = .84$ ; Cooperation: Cronbach's  $\alpha = .70$ ; Modesty: Cronbach's  $\alpha = .70$ ). The IPIP Agreeableness subscales for Altruism and Sympathy were found to have moderate reliability (Altruism: Cronbach's  $\alpha = .65$ ; Sympathy: Cronbach's  $\alpha = .60$ ). The IPIP Agreeableness subscale for Morality was found to have negative reliability (Cronbach's  $\alpha = -.18$ ); this violates the reliability model assumptions and is due to the prescribed item coding.

Due to the reliability issues with the IPIP Morality subscale, this subscale was excluded from further analyses.

The IPIP Conscientiousness subscales for Self-Efficacy, Orderliness, Self-Discipline, and Cautiousness were found to have high reliability (Self-Efficacy: Cronbach's  $\alpha = .73$ ; Orderliness: Cronbach's  $\alpha = .73$ ; Self-Discipline: Cronbach's  $\alpha = .80$ ; Cautiousness: Cronbach's  $\alpha = .85$ ). The IPIP Conscientiousness subscales for Dutifulness and Achievement Striving were found to have moderate reliability (Dutifulness: Cronbach's  $\alpha = .67$ ; Achievement: Cronbach's  $\alpha = .70$ ).

### **Bivariate Correlations**

#### *Personality and Aggressive Driving* (See Table 1)

Bivariate correlations were calculated for the BFI and IPIP (see Table 5) factor subscales with aggressive driving behaviors. These correlations indicated significant relationships for specifically derived subscales of Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness with aggressive driving.

Bivariate correlations indicated significant positive relationships for the Neuroticism derived subscales of Anxiety, Anger, Depression, Immoderation, and Vulnerability with aggressive driving (Anxiety:  $r(250) = .30, p < .001$ ; Anger:  $r(250) = .48, p < .001$ ; Depression:  $r(250) = .22, p = .001$ ; Immoderation:  $r(250) = .14, p = .030$ ; Vulnerability:  $r(250) = .24, p < .001$ ). These results indicated that participants who scored higher on anxiety, anger, depression, immoderation, or vulnerability had significantly higher scores on aggressive driving behavior.

Further, bivariate correlations indicated a significant positive relationship for the Extraversion derived subscale of Excitement-Seeking with aggressive driving ( $r(250) = .16, p =$



.01). This result indicated that participants who scored higher on excitement-seeking had significantly higher scores on aggressive driving behavior.

The Openness derived subscale of Emotionality was also found to have a significant positive correlation with aggressive driving ( $r(250) = .20, p = .001$ ). This result indicated that participants who scored higher on emotionality had significantly higher scores on aggressive driving behavior. The Openness derived subscale of Intellect was found to have a significant negative relationship with aggressive driving ( $r(250) = -.13, p = .040$ ). These results indicated that participants who scored higher on openness had significantly lower scores on aggressive driving behavior.

Bivariate correlations indicated significant negative relationships for the Agreeableness derived subscales of Trust, and Cooperation with aggressive driving (Trust :  $r(250) = -.20, p = .001$ ; Cooperation:  $r(250) = -.44, p < .001$ ). These results indicated that participants who scored higher on trust and cooperation had significantly lower scores on aggressive driving behavior.

Additionally, bivariate correlations indicated significant negative relationships of the Conscientiousness derived subscales of Self-Discipline and Cautiousness with aggressive driving (Self-Discipline:  $r(250) = -.13, p = .046$ ; Cautiousness :  $r(250) = -.26, p < .001$ ). These results indicated that participants who scored higher on self-discipline and cautiousness had significantly lower scores on aggressive driving behavior.

Bivariate correlations for the BFI Neuroticism subscale indicated a significant positive relationship of Neuroticism with aggressive driving ( $r(250) = .33, p < .001$ ). This result indicated that participants who scored higher on Neuroticism had significantly higher scores on

aggressive driving behavior. Bivariate correlations for the BFI Agreeableness subscale indicated a significant negative relationship of Agreeableness with aggressive driving ( $r(250) = -.32, p < .001$ ). This result indicated that participants who scored higher on Agreeableness had significantly lower scores on aggressive driving behavior.

*Cognitive Failures and Aggressive Driving*

A bivariate correlation was calculated to determine the existing relationship between cognitive failures and aggressive driving. This correlation revealed a significant positive relationship between cognitive failures and aggressive driving ( $r(250) = .46, p < .001$ ) (See Table 1). This result indicated that participants who scored higher on cognitive failures had significantly higher scores on aggressive driving behavior.

*Table 1: Correlation Table for Personality and Aggressive Driving Behaviors*

Pearson Correlation	
	<b>Aggressive Driving Behavior Score</b>
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 stepwise regression analysis as predictors of aggressive driving. The analysis extracted three significant linear regression models.

The first significant simple linear regression model revealed trait anger to be a significant predictor of aggressive driving ( $R^2 = .231$ ,  $R^2_{\text{Adjusted}} = .228$ ,  $F(1, 250) = 75.05$ ,  $p < .001$ ) (See Table 2 and Table 3). This model showed a significant correlation with aggressive driving at the  $p < .001$  level. This model produced a significant positive regression coefficient indicating that participants with higher scores in trait anger were expected to also have higher mean aggressive driving behavior scores. The coefficient of determination,  $R^2_{\text{Adjusted}} = .228$ , for trait anger indicated that 22.8% of aggressive driving behavior is accounted for by trait anger.

The second significant multiple linear regression model revealed trait anger and cognitive failure as significant predictors of aggressive driving ( $R^2 = .357$ ,  $R^2_{\text{Adjusted}} = .352$ ,  $F(1, 249) = 48.92$ ,  $p < .001$ ) (See Table 2 and Table 3). This model showed a significant correlation with aggressive driving at the  $p < .001$  level. This model also produced a significant positive regression coefficient for trait anger. These results indicated that participants with higher scores in trait anger were expected to also have higher mean aggressive driving behavior scores. Further, this model produced a significant positive regression coefficient for cognitive failures. This result implies that participants who indicate higher frequency of cognitive failures were expected to also have higher mean aggressive driving behavior scores. The coefficient of determination (adjusted) for trait anger and cognitive failures ( $R^2_{\text{Adjusted}} = .352$ ) indicated that

35.2% of aggressive driving behavior in the sample is accounted for by trait anger and cognitive failures. 23.1% of the observed variability in aggressive driving behavior scores in the model were accounted for by trait anger after controlling for cognitive failures ( $sr^2 = .231$ ). 20.8% of the observed variability in aggressive driving behavior scores in the model were accounted for by cognitive failures after controlling for trait anger ( $sr^2 = .208$ ).

Finally, the third multiple linear regression model revealed trait anger, cognitive failure and trait cooperation as significant predictors of aggressive driving ( $R^2 = .396$ ,  $R^2_{\text{Adjusted}} = .389$ ,  $F(1, 248) = 15.97$ ,  $p < .001$ ) (See Table 2 and Table 3). This model accounted for the most variance in aggressive driving out of the three extracted models at . This model also showed a significant correlation with aggressive driving at the  $p < .001$  level. This model produced positive regression coefficients for trait anger and cognitive failures, which indicated that participants who scored higher on trait anger and cognitive failures would also be expected to have higher mean aggressive driving behavior scores. This model also produced a negative regression coefficient for trait cooperation, this indicates that participants who scored higher on trait cooperation would also be expected to have lower mean aggressive driving behavior scores. The result for trait cooperation also indicates that drivers who scored lower on trait cooperation would also be expected to have higher mean aggressive driving behavior scores. The coefficient of determination (adjusted) for trait anger, cognitive failures, and trait cooperation ( $R^2_{\text{Adjusted}} = .389$ ) indicated that 38.9% of aggressive driving behavior in the sample is accounted for by trait anger cognitive failures, and trait cooperation. 23.1% of the observed variability in aggressive driving behavior scores in the model were accounted for by trait anger after controlling for

cognitive failures and trait cooperation ( $sr^2 = .231$ ). 20.8% of the observed variability in aggressive driving behavior scores in the model were accounted for by cognitive failures after controlling for trait anger and trait cooperation ( $sr^2 = .208$ ). 19% of the observed variability in aggressive driving behavior scores in the model were accounted for by trait cooperation after controlling for trait anger and cognitive failures ( $sr^2 = .190$ ).

*Table 2 Summary of Multiple Regression Analysis for Variables Predicting Aggressive Driving Behaviors (n = 252)*

Variable	Model 1			Model 2			Model 3		
	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$	<i>B</i>	<i>SE B</i>	$\beta$
Trait Anger	0.282	0.033	.481*	0.233	0.031	.397*	.167	.034	.285*
Cognitive Failures				0.415	0.059	.365*	.397	.058	.349*
Trait Cooperation							-.175	.044	-.229
$R^2$		.231			.357			.396	
$R^2_{Adjusted}$		.228			.352			.389	
<i>F</i> for change in $R^2$		75.053*			48.923*			15.972*	

\* $p < .001$

Note: Trait Anger corresponds to the IPIP NEO PI-R N2 subscale. Trait Cooperation corresponds to the IPIP NEO PI-R A4 subscale.

Table 3: ANOVA Summary for Multiple Regression Analysis ( $n = 252$ )

Source	DF	SS	MS	F
Model 1	1	22.553	22.553	75.053*
T	250	97.675		
E	251	75.122	.3	
Model 2	2	34.889	17.444	69.182*
T	249	97.675		
E	251	62.786	.252	
Model 3	3	38.688	12.896	54.218*
T	248	97.675		
E	251	58.987	.238	

Dependent: Average Aggressive Driving Behavior Score

\* $p < .001$

### Sex Differences

Independent samples t-tests were conducted to determine the existence of sex differences in aggressive driving. The total participant sample  $N = 252$  contained a female participant count of  $n_{\text{female}} = 162$  and a male participant count of  $n_{\text{male}} = 89$ .

#### Sample Manipulation Procedure

The sample percent difference between males and females was 58.17%. This indicated that the female sample was 58.17% larger than the male population. Due to this discrepancy between the female and male samples, it was of interest to conduct equal sample analyses alongside a complete sample analysis for sex differences in aggressive differences. Two equal sample datasets were constructed utilizing the original dataset.

For the first equal sample, the first 89 females in the sample (female participants 1-89 inclusive) were included. The remaining 73 female participants were excluded (female participants 90-162 inclusive) to create a first female equal sample of  $n_{\text{female1}} = 89$ . The first equal sample paired this constructed female sample with the original total male sample  $n_{\text{male}} = 89$ . The participant counts for the first equal sample were as follows:  $n_{\text{total}} = 178$ ,  $n_{\text{female1}} = 89$ ,  $n_{\text{male}} = 89$ .

For the second equal sample, the remaining 73 female participants (female participants 90-162 inclusive) and the 16 female participants immediately prior to the set of 73 (female participants 74-89 inclusive) were included to create a second female equal sample of  $n_{\text{female2}} = 89$ . The second equal sample paired this constructed female sample with the original total male sample  $n_{\text{male}} = 89$ . The participant counts for the second equal sample were as follows:  $n_{\text{total}} = 178$ ,  $n_{\text{female2}} = 89$ ,  $n_{\text{male}} = 89$ .

The original sample contained  $n_{\text{female}} = 162$  and  $n_{\text{male}} = 89$ , while both equal samples each contained  $n_{\text{female}} = 89$  and  $n_{\text{male}} = 89$ . The original sample, equal sample one, and equal sample two were used for the independent samples t-test analyses for sex differences in aggressive driving.

#### *Independent Samples T-Test Complete Sample*

The independent samples t-test for the complete sample of  $n_{\text{female}} = 162$  and  $n_{\text{male}} = 89$  did not reveal a significant difference for mean aggressive driving scores between females and males,  $t(249) = -1.627$ ,  $p = .105$  (See Figure 4). These results indicate that females and males in the complete sample did not differ in their propensity to engage in aggressive driving behavior.

*Independent Samples T-Test Equal Sample One*

The independent samples t-test for the first equal sample of  $n_{\text{female1}} = 89$  and  $n_{\text{male}} = 89$  did not reveal a significant difference for mean aggressive driving scores between females and males  $t(176) = -1.118, p = .265$  (See Figure 5). These results indicated that females and males in the first equal sample did not differ in their propensity to engage in aggressive driving behavior.

*Independent Samples T-Test Equal Sample Two*

The independent samples t-test for the second equal sample of  $n_{\text{female2}} = 89$  and  $n_{\text{male}} = 89$  revealed a marginal significant difference for mean aggressive driving scores between females and males  $t(176) = -1.896, p = .060$  (See Figure 6) at the  $\alpha = .10$  level. These results indicate that females and males in the second equal sample marginally significantly differ in their propensity to engage in aggressive driving behavior.



## **CHAPTER 6: DISCUSSION**

The goal of the present study was to empirically examine the role of personality and individual differences in aggressive driving behaviors. Our findings indicated that the personality factors of trait anger, trait cooperation, and the individual difference of cognitive failures were significant predictors of aggressive driving behavior. Results also showed marginally significant sex differences in aggressive driving behavior. These partial results of sex differences necessitate further exploration using a larger sample size.

### **Personality and Individual Differences**

The reliability analyses indicated that the IPIP subscales of Self-Consciousness (N4), Adventurousness, and Morality did not have adequate reliability to be considered for use in further analyses. This was not in line with previous research that determined these scales have high internal reliability (Maples et al., 2014). Further investigation of these scales is recommended to improve the internal consistency of the scale across varying samples.

The significant correlations of BFI Neuroticism and BFI Agreeableness with aggressive driving behavior were in line with previous research suggesting that Neuroticism and Agreeableness were significantly related to aggressive driving behaviors (Sarbescu et al., 2019, Iancu et al., 2016; Dahlen et al., 2005). This did not support previous findings relating the personality factors of Conscientiousness, Extraversion, and Openness to aggressive driving behaviors (Arthur & Graziano, 1996). Nor did these findings support previous literature relating every personality factor except Agreeableness to aggressive driving behaviors (Sarbescu et al., 2019).

These thirteen significant correlations of personality with aggressive driving using the IPIP NEO PI-R, were in line with previous literature (Sarbescu et al., 2019, Iancu et al., 2016; Dahlen et al., 2005; Arthur & Graziano, 1996). It is also noteworthy to mention, that although each personality factor in the IPIP had at least one significant subfactor correlation, none of the personality factors had all six subfactors significantly correlated. This could imply that general personality factors by themselves would not be best at predicting aggressive driving behaviors. Our study revealed that exploring the underlying personality subfactors were more useful in predicting aggressive driving behaviors. The Neuroticism and Agreeableness derived subfactors of the IPIP NEO PI-R were shown to have the most correlations out of the five factors. The correlation of cognitive failures and aggressive driving also expands on previous findings (Sani et al., 2017; Tabibi et al., 2015; Wickens et al., 2007; Whitney et al., 2004)

The multiple regression analyses removed the factors of BFI Neuroticism and BFI Agreeableness in their general form and produced significant findings for the specific subfactors of these factors; trait anger and trait cooperation. These findings suggest that while a specific personality factor may show a relationship with aggressive driving, it may be a specific subfactor within the over-arching factor that accounts for this relationship. In other words, rather than Neuroticism and Agreeableness wholly showing a relationship with aggressive driving behaviors, their subfactors of trait anger and trait cooperation more adequately account for the significant relationship with aggressive driving.

The first regression model was in line with previous studies in which Neuroticism was significantly related to aggressive violations in driving contexts (Bone & Mowen, 2006; Chraif et

al., 2016; Iancu et al., 2016; Sarbescu & Maricutoiu, 2019). Interestingly this finding is in direct contradiction with the findings of Gaianu and colleagues (2020), where trait anger was not significantly related to aggressive driving behaviors. These findings imply that further research into the role of Neuroticism and its subfactors is necessary to delineate the relationships between the Neuroticism subfactors and aggressive driving.

The finding of trait anger as a significant predictor of aggressive driving behavior expands on the significant relationship of Neuroticism in aggressive driving behavior (Bone & Mowen, 2006; Chraif et al., 2016; Iancu et al., 2016; Sarbescu & Maricutoiu, 2019; Gaianu et al., 2020). This finding provides evidence for the utility of subfactor measures of Neuroticism in relation to aggressive driving behaviors. This model provided significant evidence supporting Hypothesis 1, in which Neuroticism was hypothesized to show a significant relationship with aggressive driving. These results indicated that further investigation of the role of trait anger in aggressive driving behavior is warranted, as the predictive utility of the subfactor of trait anger is promising.

For the second regression model, the first significant positive predictor of trait anger in this model is in line with previous research on the role of trait anger in the aggressive driving scenario (Bone & Mowen, 2006; Chraif et al., 2016; Iancu et al., 2016; Sarbescu & Maricutoiu, 2019). Interestingly, the inclusion of the second predictor of cognitive failures as a significant positive predictor of aggressive driving behavior expands upon the research relating facets of cognitive failure (working memory and attention; Sani et al., 2017; Tabibi et al., 2015; Wickens et al., 2007; Whitney et al., 2004) to aggressive driving behavior. This model provided

significant evidence supporting Hypothesis 1 stating that Neuroticism would show a significant relationship with aggressive driving behavior. This model also provided significant evidence supporting Hypothesis 7 stating that cognitive failures would show a significant relationship with aggressive driving behavior. Cognitive failures have been reported as unintentional transgressions (Reason et al., 2014). Therefore, the observed relationship between cognitive failures and aggressive driving may imply that aggressive driving behaviors may also have unintentional aspects that need further exploration. Further investigation is required to delineate the intentionality of aggressive driving behavior, and if the lack of intentionality observed in cognitive failures carries over to the aggressive driving experience.

The first and second predictor variables of this model expand upon prior research into the constructs of trait anger (Bone & Mowen, 2006; Chraif et al., 2016; Iancu et al., 2016; Sarbescu & Maricutoiu, 2019) and cognitive failures (Sani et al., 2017; Tabibi et al., 2015; Wickens et al., 2007; Whitney et al., 2004; Reason et al., 2014).

The third regression model also added a third predictor variable of trait cooperation. The inclusion of trait cooperation as a significant predictor of aggressive driving behavior was not in line with previous research by Iancu and colleagues (2016), in which Agreeableness showed a weak relationship with aggressive driving. The inclusion of trait cooperation in this model was in line with previous studies that showed a strong relationship between Agreeableness and aggressive driving (Dahlen et al., 2005; Chraif et al., 2016). It is also noteworthy to mention that while various previous studies showed a strong relationship between Agreeableness and aggressive driving (Dahlen et al., 2005; Chraif et al., 2016), this relationship was shown using a

general measure of Agreeableness. These findings do not support previous research on the role of Agreeableness in aggressive driving, where Agreeableness was not found to be significantly related to aggressive driving (Sarbescu and Maricutoiu, 2019). Our findings for trait cooperation are similar to our findings for trait anger in that the finding for trait cooperation further expands on the role of Agreeableness in aggressive driving behaviors. These results suggest that the general measure of Agreeableness may not be best suited for use as a predictor of aggressive driving behavior. Rather, specific subfactors of Agreeableness would better account for the observed relationship between Agreeableness and aggressive driving behavior. These findings suggest that further research into the role of Agreeableness and its subfactors is necessary to delineate the relationships between the Agreeableness subfactors and aggressive driving.

The third regression model provides evidence supporting Hypothesis 1 stating that Neuroticism would show a significant relationship with aggressive driving; Hypothesis 7 stating that cognitive failures would show a significant relationship with aggressive driving; and Hypothesis 5 in which Agreeableness would show a significant relationship with aggressive driving. The result presented by this model highlights the need for further research into the role of the subfactor of trait cooperation in aggressive driving behavior, rather than the relationship between Agreeableness as a whole with aggressive driving behavior.

Our results did indicate evidence supporting Hypothesis 2 stating that Extraversion would be significantly related to aggressive driving behaviors. Our results revealed significant correlations for Extraversion subscales, however this significant effect was not obtained when these subscales were introduced into the multiple regression analyses. It is noteworthy to

mention that the correlations were in line with the previous findings by Iancu and colleagues (2016).

Our results did indicate evidence supporting Hypothesis 3 stating that Openness would be significantly related to aggressive driving behaviors. Our results revealed significant correlations for Openness subscales, however this significant effect was not obtained when these subscales were introduced into the multiple regression analyses. Previous research had identified Openness as a significant predictor of errors rather than aggressive driving behavior (Sarbescu and Maricutoui, 2019).

Further, our results did indicate evidence supporting Hypothesis 4 stating that Conscientiousness would be significantly related to aggressive driving behaviors. Our results revealed significant correlations for Conscientiousness subscales, however this significant effect was not obtained when these subscales were introduced into the multiple regression analyses. Previous studies highlighted Conscientiousness as significantly related to aggressive driving behavior (Bone and Mowen, 2006; Chraif et al., 2016; Sarbescu and Maricutoiu, 2019). Our findings for Conscientiousness and its subscales were consistent with the previous research showing Conscientiousness as significantly related to aggressive driving (Bone and Mowen, 2006; Chraif et al., 2016; Sarbescu and Maricutoiu, 2019).

The results from the first and second independent samples t-tests analyses were not in line with previous findings that indicate strong evidence for the existence of sex differences in aggressive driving behavior (Mouloua et al., 2007; Sarbescu & Maricutoui, 2019; Gonzalez-Iglesias et al., 2011; Shinar & Compton, 2004).

The results from the third independent samples t-test analysis were marginally significant, indicating that females and males showed a marginally significant difference in aggressive driving behavior. These results are more in line with previous findings of sex differences in aggressive driving (Mouloua et al., 2007; Sarbescu & Maricutoui, 2019; Gonzalez-Iglesias et al., 2011; Shinar & Compton, 2004), but it is important to note that the results of this analysis for the present study were only marginally significant. These partial results of sex differences necessitate further exploration using a larger sample size.

The findings in the present study for sex differences do not provide significant evidence to support Hypothesis 6 stating that females and males would show a significant difference in their propensity to engage in aggressive driving behavior. The results for sex differences in the present study do not coincide with findings from previous research (Mouloua et al., 2007; Sarbescu & Maricutoui, 2019; Gonzalez-Iglesias et al., 2011; Shinar & Compton, 2004). The role of sex differences in aggressive driving remains to be clarified.

### **Theoretical and Practical Implications**

The significant findings for trait anger, trait cooperation, cognitive failures, and sex differences present various theoretical and practical implications. The finding for the utility of trait anger as a significant positive predictor of aggressive driving expands on research indicating driver anger as significantly related to aggressive driving behavior (Lajunen et al., 2001; Bogdan et al., 2016). A meta-analysis conducted by Bogdan and colleagues (2016) identified trait anger as being significantly positively associated with aggressive driving behavior. This study utilized a measure of trait anger specific to driving rather than a trait anger personality measure (Bogdan

et al., 2016). The inclusion of trait anger (measured via a personality scale) as a significant predictor of aggressive driving provided support for the development of driver anger and aggression theory with consideration of individual propensities for anger outside of the driving context. This finding suggests that measures for trait anger (in and outside of the driving context) should be considered in further examination of the role of trait anger in aggressive driving.

Furthermore, the third regression model presented similarly follows the findings of Dahlen and colleagues (2016), in which trait anger was found to be a significant positive predictor and trait agreeableness a significant negative predictor of aggressive driving behavior. Trait cooperation is often viewed as a pro-social behavior. Therefore, it is interesting to note that reduced trait cooperation leads to asocial propensities of being uncooperative, discourteous, and antagonistic (Dahlen et al., 2016). Together, the findings for trait anger and trait cooperation begin to provide a framework for the theoretical characterization of the aggressive driver (Dahlen et al., 2016; Chraif et al., 2016).

Utilizing frameworks such as these, we suggest that tailored driver training be developed to ensure driver training fits unique characteristics of those it intends to train. Prospective drivers could be screened for their propensities for aggressive driving, and then receive a selection of driver training intended to educate and train them in how to work around these propensities while driving. While this kind of training is useful, it is important to note that there are also limitations in utilizing training such as this. Li and colleagues (2019) found that drivers participated in risky actions even if they were aware of the risk involved with this action. This



propensity for drivers to be trained on risky driving decisions and choosing to ignore such education, invalidates driver training efforts.

Taking this into account we propose that alternative reactive interventions, as opposed to the proactive intervention that is increased driver training, could be appropriate in deterring aggressive driving. We echo Li and colleagues (2019) suggestion that in-vehicle machine agents could sense and detect when a driver is exhibiting behavioral manifestations of aggression and alert the driver to this issue to allow the driver to correct their aggressive driving. These in-vehicle machine agents could also serve as data gathering systems, in which the incidences of aggressive driving behavior on the roadways can be effectively monitored and studied (Li et al., 2019).

Other reactive interventions could focus on traffic interventions. It could be useful to introduce more physical roadway deterrents such as speed bumps, rumble strips, or traffic patterns, reducing the propensity for aggressive driving behavior. These also carry their own implications of affecting other non-aggressive drivers in their commute, and the potential to throw established traffic norms out of balance, retaining the potential to cause further accidents.

Also, we explored the possibility of introducing increased surveillance on the roadways. This is not without its limitations on driving behavior. Improved driving outcomes due to surveillance may be due to drivers understanding they are being watched and reacting accordingly, rather than drivers genuinely working on improving their propensities for aggressive driving behavior.

Overall, the framework provided in the present study should be used to guide further studies that look into not only the determinants of aggressive driving behavior but effective interventions to ensure these determinants may be mitigated to improve driving outcomes on our roadways. The results for the relationship of cognitive failures in aggressive driving further expands on research relating working memory and attention to aggressive driving (Wickens et al., 2007; Tabibi et al., 2015; Metz et al., 2011). The role of cognitive failures in aggressive driving is ill defined in the transportation literature. While cognitive failures have been identified as having significant effects on driving outcomes (Reason et al., 2014), these effects have not been reported as extending into the aggressive driving context. Cognitive failures have been categorized as errors (as opposed to violations), notating a lack of intentionality in transgressions due to cognitive failures (Reason et al., 2014). The observed relationship between cognitive failures and aggressive driving in the present study provides theoretical implications for considering the role of intentionality within the aggressive driving behavior context. It is important to note that there are certain limitations with the use of self-report measures of cognitive failures that are later discussed in the present study. Also, the data from this study add to the validity and reliability of the use of the CFQ-D to examine self-reported errors and lapses during driving. Lastly, the data provide further support for the utility of the ADBQ in investigating aggressive driving behavior.

### **Limitations**

Various limitations have been identified for the present study. Firstly, this study was previously designed as a simulation study, but due to the SARS-CoV-2 (novel corona virus of

the year 2019), this study was re-designed to use surveys to measure the intended constructs to comply with federal and local social distancing and shut-down laws. The survey design of this study relied entirely on self-report measures. Self-report measures are sensitive to response bias and social desirability bias. These biases have the potential to influence the way survey respondents answer self-report questions, thereby retaining the potential to influence the observed results. Previous research has indicated little risk posed by social desirability bias in most driving self-report measures, such as the DBQ and ADBQ (Lajunen et al., 2003) and personality measures (Grimm et al., 1999).

The risk of response bias is of larger issue for the questionnaires used in regard to cognitive failures, and further driving questionnaires. Due to cognitive failures containing characterizations of memory issues, there exists an inherent threat from response bias, in which those who experience memory related cognitive failures, report smaller frequency values of cognitive failures than are the true frequency values they experience, due to their issues with memory. In other words, those who experience memory related cognitive failures, could report less cognitive failures by virtue of their not remembering they experience cognitive failures, caused by their memory (cognitive) failures. This logic also applies for other self-report measures. Using aggressive driving as an example; those who have higher cognitive failures, could fail to report higher aggression in driving, due to their cognitive issues with memory, in which they don't remember being aggressive. This response bias poses a direct threat to the validity of the findings in the present study. In which, the observed responses may be skewed due to the way cognitive failures inherently influence memory.

While our results propose that it is possible that cognitive failures have a significant relationship with aggressive driving, our hypothesis require further empirical investigation. To better understand the utility of self-report measures of cognitive failures, we suggest that future research examines the relationship between survey measures of cognitive failures and empirically examined driving outcomes due to cognitive failures. This would allow for a better understanding of the limitations of self-report cognitive failures and their utility in further studies.

The second identified limitation is that we did not include other measures for driving contextualized personality such as the Driving Anger Scale (Deffenbacher et al., 1994). Including personality measures contextualized for the driving experience would have allowed further examination of specific personality traits as they exist inside and outside of the aggressive driving context. Thus, it is imperative to note that the measures for personality were not contextualized to the driving experience. That is, the observed relationship of trait anger should not be interpreted as driver anger. As trait anger refers to the personality trait of anger, and driver anger refers to anger experienced by a driver in the driving context. We suggest that further studies utilize contextualized personality measures, as has originally been done in previous studies (Mouloua, 2007).

Lastly, this study is a correlational design. In interpreting the observed relationships, it is important to note that the correlational relationships observed do not imply causal relationships. The framework provided via the correlational relationships observed should serve to

theoretically scaffold future experimental studies that are more apt to suit the necessary requirements for causal implications.

### **Direction for Future Research**

Further investigation into the personality determinants of aggressive driving should focus on driving contextualized and non-driving contextualized personality to determine if differences exist in personality traits inside and outside of the driving context. Further research should also investigate the role of Neuroticism and Agreeableness further, utilizing experimental designs rather than survey designs to understand the roles of these personality facets within the aggressive driving scenario. Future research into the role of cognitive failures in aggressive driving should focus on the construct of intentionality within the aggressive driving behavior context.

Additionally, we intend on following up this study by investigating the role of personality, individual differences and aggressive driving on cognitive failures. While investigation of these relationships was outside of the scope of this study, the significance of the observed associations between these variables warrants further investigation. This follow up intends on elucidating the relationship of aggressive driving and cognitive failures while also looking to understand the role of personality in cognitive failures and how this in turn effects aggressive driving. Finally, our future goal is to replicate the findings from the present study in a simulator driving environment.

APPENDIX A:  
AGGRESSIVE DRIVING BEHAVIOR QUESTIONNAIRE

Aggressive Driving Behavior Questionnaire (Mouloua et al., 2007)

Directions: Circle the response (1 thru 6) that most accurately describes how often you perform the behaviors specified in the items below.

1. Never, 2. Hardly at all, 3. Occasionally, 4. Often, 5. Quite frequently, 6. Nearly all the time.

1. You become agitated or enraged when other drivers impede you, aren't paying attention, or drive poorly around you on the road.

1                      2                      3                      4                      5                      6

2. You travel above the speed limit, even if you have more than enough time to reach your destination.

1                      2                      3                      4                      5                      6

3. When other drivers do get on your nerves, how often do you think negatively of them without reacting verbally?

1                      2                      3                      4                      5                      6

4. You think that other drivers just aren't thinking or paying enough attention when they anger you with their driving.

1                      2                      3                      4                      5                      6

5. When other drivers annoy or anger you, you try to think positively or just accept there are frustrating situations while driving.

1                    2                    3                    4                    5                    6

6. In cases where you know you can get away with it, you have no problem breaking minor laws or rules.

1                    2                    3                    4                    5                    6

7. When another driver angers you while on the road you follow very close (tailgate) or otherwise try to scare them.

1                    2                    3                    4                    5                    6

8. You give the finger to drivers who annoy or anger you.

1                    2                    3                    4                    5                    6

9. When another driver angers you while on the road you shout verbal insults towards them, even if they cannot hear you.

1                    2                    3                    4                    5                    6

10. You stick your tongue out or make faces at drivers that annoy you or make you mad.

1                    2                    3                    4                    5                    6

11. You drive intoxicated even when you realize that you may be over the legal limit.

1                    2                    3                    4                    5                    6

12. When another driver angers you at night you shine your brights in their rearview mirror.



1                    2                    3                    4                    5                    6

13. You find being stuck in traffic or behind a slow driver especially annoying.

1                    2                    3                    4                    5                    6

14. When another driver angers you while on the road you attempt to revenge them.

1                    2                    3                    4                    5                    6

15. You find drivers that are impatient (ex. Weave in and out of traffic, disregard stop signs, etc.) especially annoying.

1                    2                    3                    4                    5                    6

16. While driving you fail to notice signs or other cars, misjudge other's speed, etc.

1                    2                    3                    4                    5                    6

17. You 'wake up' to realize that you have no clear recollection of the road along which you have just traveled.

1                    2                    3                    4                    5                    6

18. You take chances and run through red lights.

1                    2                    3                    4                    5                    6

19. If another driver is following too closely you slow down or hit your breaks to get them to back off.

1                    2                    3                    4                    5                    6

20. You shake your head at a driver who annoys you.

1                    2                    3                    4                    5                    6

APPENDIX B:  
COGNITIVE FAILURES QUESTIONNAIRE

## Cognitive Failures Questionnaire-Driving (Broadbent et al., 1982; Kass et al., 2008)

The following items are common errors that most drivers make from time to time. However, certain errors may occur more or less frequently for you. Within the past year, please let us know how frequently these errors have occurred for you. Note. Your answers will be compiled with those of other respondents and cannot be individually identified, so please be as accurate as possible.

Please use the following scale:

1: Never, 2: very rarely, 3: occasionally, 4: quite frequently, 5: very frequently

1. Have you ever missed your exit despite driving a familiar route?
2. Have you ever accidentally stopped at a green light?
3. Have you ever failed to notice a red light and gone through it?
4. Have you ever gone when a green arrow is lit but your light is red?
5. When traveling down a street with multiple traffic lights, have you ever noticed the street light beyond your own and reacted upon that light?
6. Have you ever turned on your wipers instead of your blinkers?
7. Have you ever forgotten to stop for gas even after passing a gas station knowing that you needed to stop?
8. Have you ever left your car in reverse (or park or neutral) when you're trying to go forward?
9. Have you ever forgotten to take your emergency brake off?
10. Have you ever driven away with articles on top of your car (e.g., packages, cups, books, etc)?
11. Have you forgotten to turn your lights on at night?
12. Have you ever reversed without looking behind you?
13. Have you ever almost rear-ended someone while changing your radio station, texting or doing a similar task?
14. Have you ever looked down and realized you were driving way over the speed limit?
15. Have you ever stepped on the gas instead of the brake, or vice versa?
16. Have you ever zoned out/daydreamed and forgotten about the last few minutes of driving?
17. Have you ever failed to yield for pedestrians at a crosswalk while turning?

18. Do you forget where to turn on roads that you know well?
19. Have you ever almost hit a cyclist because you never saw them?
20. Have you ever underestimated the speed of an oncoming vehicle while pulling out or passing a car?
21. Have you ever failed to check your sideview mirror when changing lanes?
22. Have you ever braked too quickly on a wet road because you forgot it was wet and slid?
23. Have you ever gotten off of the freeway and then forgotten to adjust the slower speed limit of the city roads?
24. Have you ever come to a complete stop at a Yield sign despite there being no other traffic around?
25. Have you ever forgotten to turn your lights on in the rain?

APPENDIX C:  
DRIVING BEHAVIOR QUESTIONNAIRE

## Driving Behavior Questionnaire (Reason et al., 1990)

All responses recorded in this form are completely anonymous. None of your responses will be linked to any of your personal identifying information. Please respond as accurately and as honestly as you can.

(Adapted from Matthews et al., 1996)

\* Required

1. Please state your age in years \*

.....

2. Please state your gender \*

.....

3. Please state your race/ethnicity (Check as many boxes as appropriate) \*

*Check all that apply.*

- African-American / Black
- Asian
- Hispanic or Latino
- Middle-Eastern
- Native American
- Pacific Islander
- White
- Other: .....

4. What is your class year? \*

*Mark only one oval.*

- Freshman
- Sophomore
- Junior
- Senior
- Other: .....

5. Please state the year when you obtained your full driving license \*

.....

6. About how often do you drive nowadays? \*

*Mark only one oval.*

- Everyday
- 2-3 days a week
- About once a week
- Less often

7. Estimate roughly how many miles you personally drive each week \*

*Mark only one oval.*

- Less than 5 miles
- 5-15 miles
- 15-25 miles
- 25-45 miles
- Over 45 miles

8. Do you drive to and from campus? \*

Mark only one oval.

- Everyday
- Most days
- Occasionally
- Never

9. Please state which of these types of roads you use frequently (check one or more boxes as appropriate) \*

Check all that apply.

- Freeways
- Other main roads
- Urban roads
- Country roads

10. During the last three years, how many minor road accidents have you been involved in? \*

(A major accident is one in which EITHER someone required medical treatment, OR costs of damage to vehicles and property were greater than \$800, or both).

.....

11. During the last three years, how many major road accidents have you been involved in? \*

(A major accident is one in which EITHER someone required medical treatment, OR costs of damage to vehicles and property were greater than \$800, or both).

.....

12. During the last three years, have you been convicted for speeding? \*

Mark only one oval.

- Yes
- No

13. During the last three years, have you been convicted for careless or dangerous driving? \*

Mark only one oval.

- Yes
- No

14. During the last three years, have you been convicted for driving under the influence of alcohol or drugs? \*

Mark only one oval.

- Yes
- No

15. Other moving violation \*

Mark only one oval.

- Yes
- No
- Other: .....



APPENDIX D:  
BIG FIVE PERSONALITY INVENTORY

### How I am in general (John et al., 1991, 2008; Benet-Martinez, & John, 1998)

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who *likes to spend time with others*? Please write a number next to each statement to indicate the extent to which **you agree or disagree with that statement**.

1 Disagree Strongly	2 Disagree a little	3 Neither agree nor disagree	4 Agree a little	5 Agree strongly
---------------------------	---------------------------	------------------------------------	------------------------	------------------------

#### I am someone who...

- |  |  |
|--|--|
| <p>1. ____ Is talkative</p> <p>2. ____ Tends to find fault with others</p> <p>3. ____ Does a thorough job</p> <p>4. ____ Is depressed, blue</p> <p>5. ____ Is original, comes up with new ideas</p> <p>6. ____ Is reserved</p> <p>7. ____ Is helpful and unselfish with others</p> <p>8. ____ Can be somewhat careless</p> <p>9. ____ Is relaxed, handles stress well.</p> <p>10. ____ Is curious about many different things</p> <p>11. ____ Is full of energy</p> <p>12. ____ Starts quarrels with others</p> <p>13. ____ Is a reliable worker</p> <p>14. ____ Can be tense</p> <p>15. ____ Is ingenious, a deep thinker</p> <p>16. ____ Generates a lot of enthusiasm</p> <p>17. ____ Has a forgiving nature</p> <p>18. ____ Tends to be disorganized</p> <p>19. ____ Worries a lot</p> <p>20. ____ Has an active imagination</p> <p>21. ____ Tends to be quiet</p> <p>22. ____ Is generally trusting</p> | <p>23. ____ Tends to be lazy</p> <p>24. ____ Is emotionally stable, not easily upset</p> <p>25. ____ Is inventive</p> <p>26. ____ Has an assertive personality</p> <p>27. ____ Can be cold and aloof</p> <p>28. ____ Perseveres until the task is finished</p> <p>29. ____ Can be moody</p> <p>30. ____ Values artistic, aesthetic experiences</p> <p>31. ____ Is sometimes shy, inhibited</p> <p>32. ____ Is considerate and kind to almost everyone</p> <p>33. ____ Does things efficiently</p> <p>34. ____ Remains calm in tense situations</p> <p>35. ____ Prefers work that is routine</p> <p>36. ____ Is outgoing, sociable</p> <p>37. ____ Is sometimes rude to others</p> <p>38. ____ Makes plans and follows through with them</p> <p>39. ____ Gets nervous easily</p> <p>40. ____ Likes to reflect, play with ideas</p> <p>41. ____ Has few artistic interests</p> <p>42. ____ Likes to cooperate with others</p> <p>43. ____ Is easily distracted</p> <p>44. ____ Is sophisticated in art, music, or literature</p> |
|--|--|

APPENDIX E:  
120 ITEM INTERNATIONAL PERSONALITY ITEM POOL- NEO

(Maples, Guan, Carter & Miller, 2014)

Describe yourself as you generally are now, not as you wish to be in the future. Describe yourself as you honestly see yourself, in relation to other people you know of the same sex as you are, and roughly your same age. So that you can describe yourself in an honest manner, your responses will be kept in absolute confidence.

Indicate for each statement whether it is 1. Very Inaccurate, 2. Moderately Inaccurate, 3. Neither Accurate Nor Inaccurate, 4. Moderately Accurate, or 5. Very Accurate as a description of you.

1. Worry about things (1)
2. Make friends easily (2)
3. Have a vivid imagination (3)
4. Trust others (4)
5. Complete tasks successfully (5)
6. Get angry easily (6)
7. Love large parties (7)
8. Like order (10)
9. Often feel blue (11)
10. Take charge (12)
11. Experience my emotions intensely (13)
12. Make people feel welcome (14)
13. Am easily intimidated (16)
14. Am always busy (17)
15. Often eat too much (21)
16. Love excitement (22)
17. Radiate joy (27)
18. Tend to vote for liberal political candidates (28)
19. Sympathize with the homeless (29)
20. Fear the worst (31)
21. Warm up quickly to others (32)
22. Enjoy wild flights of fantasy (33)
23. Believe that others have good intentions (34)
24. Excel in what I do (35)
25. Get irritated easily (36)
26. Talk to a lot of different people at parties (37)
27. Like to tidy up (40)
28. Dislike myself (41)
29. Try to lead others (42)

30. Keep my promises (45)
31. Am always on the go (47)
32. Work hard (50)
33. Seek adventure (52)
34. Have a lot of fun (57)
35. Feel sympathy for those who are worse off than myself (59)
36. Am afraid of many things (61)
37. Feel comfortable around people (62)
38. Love to daydream (63)
39. Trust what people say (64)
40. Handle tasks smoothly (65)
41. See beauty in things that others might not notice (68)
42. Use flattery to get ahead (69R)
43. Am often down in the dumps (71)
44. Love to help others (74)
45. Find it difficult to approach others (76)
46. Do a lot in my spare time (77)
47. Love action (82)
48. Start tasks right away (85)
49. Feel that I'm unable to deal with things (86)
50. Get stressed easily (91)
51. Act comfortably with others (92)
52. Like to get lost in thought (93)
53. Have a low opinion of myself (101)
54. Am concerned about others (104)
55. Tell the truth (105)
56. Can manage many things at the same time (107)
57. Go on binges (111)
58. Believe in one true religion (118R)
59. Suffer from others' sorrows (119)
60. Jump into things without thinking (120R)
61. Lose my temper (126)
62. Know how to get around the rules (129R)
63. Take control of things (132)
64. Prefer to stick with things that I know (138R)
65. Do more than what's expected of me (140)
66. Enjoy being reckless (142)
67. Believe that I am better than others (144R)
68. Love life (147)

69. Tend to vote for conservative political candidates (148R)
70. Am not interested in other people's problems (149R)
71. Make rash decisions (150R)
72. Know how to get things done (155)
73. Rarely get irritated (156R)
74. Do not like art (158R)
75. Cheat to get ahead (159R)
76. Wait for others to lead the way (162R)
77. Seldom get emotional (163R)
78. Dislike changes (168R)
79. Love a good fight (169R)
80. Set high standards for myself and others (170)
81. Rarely overindulge (171R)
82. Am not interested in abstract ideas (173R)
83. Think highly of myself (174R)
84. Find it difficult to get down to work (175R)
85. Remain calm under pressure (176R)
86. Distrust people (184R)
87. Do not like poetry (188R)
88. Leave a mess in my room (190R)
89. Am not affected by my emotions (193R)
90. Break my promises (195R)
91. Am not embarrassed easily (196R)
92. Don't like the idea of change (198R)
93. Yell at people (199R)
94. Avoid philosophical discussions (203R)
95. Have a high opinion of myself (204R)
96. Laugh aloud (207)
97. Rush into things (210R)
98. Don't like crowded events (217R)
99. Do not enjoy going to art museums (218R)
100. Leave my belongings around (220R)
101. Get others to do my duties (225R)
102. Insult people (229R)
103. Am not highly motivated to succeed (230R)
104. Am able to control my cravings (231R)
105. Have difficult understanding abstract ideas (233R)
106. Need a push to get started (235R)
107. Know how to cope (236R)

108. Avoid crowds (247R)
109. Take advantage of others (249R)
110. Experience very few emotional highs and lows (253R)
111. Turn my back on others (254R)
112. Get back at others (259R)
113. Am not interested in theoretical discussions (263R)
114. Have difficulty starting tasks (265R)
115. Act without thinking (270R)
116. Am able to stand up for myself (286R)
117. Am attached to conventional ways (288R)
118. Make myself the center of attention (294R)
119. Am calm even in tense situations (296R)
120. Like to stand during the national anthem (298R)

\*Study author note: This is the ordered form of the Maples et al. (2014) adaptation of the IPIP NEO PI-R. The numbers in parentheses indicate the original IPIP NEO PI-R item number. If the number in parentheses has an 'R', this indicates the item is REVERSE CODED.

APPENDIX F:  
DEMOGRAPHIC QUESTIONNAIRE



## Demographics and Driving Behavior

\* Required

### Participant Number \*

The experimenter will provide this.

### Age \*

### Gender \*

- Male  
 Female  
 Prefer not to answer

### Which hand do you write with? \*

- Right  
 Left

### Is your vision at 20/20 for each eye (with or without glasses)? \*

- Yes  
 No

### To your knowledge, are you color blind? \*

- Yes  
 No

### How long, in months, have you had a driver's license? \*

### In an average week, approximately how many hours do you spend driving? \*

Have you ever received a ticket or fine for a moving violation (i.e. speeding, running a red light, etc.)? Keep in mind that this is for moving violations only, so do not include parking tickets, or tickets for a light being out, or registration and insurance violations. (NOTE: all

responses are anonymous and confidential.) \*

- Yes
- No

If you answered YES to the previous question, how many such tickets or fines have you received?

Do you have any specialized motor vehicle training beyond a standard driver's license?

- Yes
- No

Have you ever been involved in a car crash?

- Yes
- No

Number of crashes in which you were the driver at fault:

How many points do you have on your driver's license?

Average number of miles you drive per week: \*

Average number of times (per week) that you drive while under stress:

Average number of times (per week) that you drive DUE to stress:

For example, you are stressed so you decide to go for a drive.

APPENDIX G:  
CONSENT FORM



## **EXPLANATION OF RESEARCH**

Title of Project: Understanding aggressive driving behavior: the role of personality and individual differences.

Principal Investigator: Dr. Mustapha Mouloua

Other Investigators: Enilda Velazquez , Dr. Peter Hancock

Faculty Supervisor: Dr. Mustapha Mouloua

You are being invited to take part in a research study. Whether you take part is up to you. The purpose of this research is to understand the role of personality and individual differences on aggressive driving.

You will be asked to complete a series of questionnaires using Qualtrics survey software. There are six questionnaires in total, each questionnaire should take 10 minutes to complete. This research will be conducted solely online.

Your expected duration of participation will be 60 minutes.

All participants recruited from the UCF SONA system will receive 1 SONA credit, according to the current crediting schedule, upon completion of the study. Participants recruited through social media will not be receiving any compensation. Your participation, whether recruited through SONA or social media, in this study is voluntary. You are free to withdraw your consent and discontinue participation in this study at any time without prejudice or penalty. Your decision to participate or not participate in this study will in no way affect your relationship with UCF, including continued enrollment, grades, employment or your relationship with the individuals who may have an interest in this study.

No identifiable private information will be collected in this study.

You must be 18 years of age or older, hold a valid driver's license, and have normal or corrected to normal vision to take part in this research study.

**Study contact for questions about the study or to report a problem:** If you have questions, concerns, or complaints contact Enilda Velazquez, Undergraduate Student, Psychology Program, College of Sciences by email at [enildavelazquez@knights.ucf.edu](mailto:enildavelazquez@knights.ucf.edu) or Dr. Mustapha Mouloua, Faculty Supervisor, Department of Psychology by email at [mustapha.mouloua@ucf.edu](mailto:mustapha.mouloua@ucf.edu).

**IRB contact about your rights in this study or to report a complaint:** If you have questions about your rights as a research participant, or have concerns about the conduct of this study, please contact Institutional Review Board (IRB), University of Central Florida, Office of Research, 12201 Research Parkway, Suite 501, Orlando, FL 32826-3246 or by telephone at (407) 823-2901, or email [irb@ucf.edu](mailto:irb@ucf.edu).

APPENDIX H:  
RECRUITMENT DOCUMENT

Hello!

We are looking for adult drivers to volunteer in a fully online Human Factors Psychology study for an Undergraduate Honors in Major Thesis research project. For this online study you will complete questionnaires related to personality and driving behaviors. It should take approximately 60 minutes to complete the study.

Participants must be at least 18 years old, have normal or corrected to normal vision, and have a valid driver's license. This study is being conducted under the supervision of Dr. Mustapha Mouloua.

Interested participants can access the study using this anonymous link:

**[http://ucf.qualtrics.com/jfe/form/SV\\_55d3ffFopJESQHX](http://ucf.qualtrics.com/jfe/form/SV_55d3ffFopJESQHX)**

This link will be posted in the caption of this post and in the researcher's social media biography for your convenience.

If there are any questions regarding study access, please send an email to [enildavelazquez@knights.ucf.edu](mailto:enildavelazquez@knights.ucf.edu) .

Kind regards,

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