

Evaluating the psychometric properties of the aggressive driving behavior questionnaire (ADBQ)

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EVALUATING THE PSYCHOMETRIC PROPERTIES OF THE
AGGRESSIVE DRIVING BEHAVIOR QUESTIONNAIRE (ADBQ)

by

AJLA GURDA

A thesis submitted in partial fulfillment of the requirements
for the Honors in the Major Program in Psychology
In the College of Sciences
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Thesis Chair: Dr. Mustapha Mouloua

ABSTRACT

Over the past decade, aggressive driving behavior has become a topic of concern among the public, media, and researchers in the psychological community. Aggressive driving is a problematic pattern of social behavior that is not only a leading cause to motor vehicle accidents, but a serious threat to public safety. One instrument that has been developed to assess aggressive driving behavior is the Aggressive Driving Behavior Questionnaire (ADBQ). The ADBQ is a 20-item paper and pencil questionnaire intended to measure a driver's likelihood for engaging in aggressive driving behavior.

The ADBQ was developed using a factor-analytic approach that combined five previously developed aggressive driving behavior scales (Brill, Mouloua & Shirkey, 2007). Of the 81 items of the five combined scales, nineteen latent variables were extracted and accounted for 67.4% of the explained variance for the observed responses. The final 20th item was developed by splitting one of the latent variables. A previous study, conducted at Old Dominion University ($N = 230$) and Michigan Technological University ($N = 265$), examined the ADBQ's factor structure and internal consistency, and found relatively high internal consistency (Cronbach's alpha = .77) and the identification of six factors using a principal axis factor analysis (Brill & Mouloua, 2011). The ADBQ was also tested in a controlled laboratory environment and found significant evidence that suggest the ADBQ is a valid predictor of aggressive driving behavior in a simulated environment (Brill, Mouloua & Shirkey 2009).

The purpose of the present study was to further investigate the psychometric properties of the ADBQ. Based on a sample of 285 undergraduates (170 women and 115 men) from the University of Central Florida, the study examined the internal consistency, predictive and construct validity, and factor structure of the new questionnaire. A principal axis factor analysis with promax rotation yielded four factors, or joint variations between the 20 items, that were inter-correlated with eigenvalues greater than 1. The ADBQ was also found to have high internal consistency (Cronbach's alpha = .86). The four factors were used to form four subscales of aggressive driving behavior that included anger/aggression, speeding/minor infractions, overt expression, and judgment of other drivers. The four subscales were found to correlate with self-reported biographical and driver history data, as well as, gender differences across scales.

Additional analyses were conducted using data from the present sample from the University of Central Florida ($N = 285$) and the data from the previous study from Old Dominion University ($N = 230$) and Michigan Technological University ($N = 265$) for a combined sample of 780 undergraduate students.

The findings in this present study provided additional support for the consistency, predictive validity, and factor structure of the ADBQ instrument. The Aggressive Driving Behavior Questionnaire proves to be a valuable measure in predicting the likelihood of a person engaging in aggressive driving behavior. The implications for driving behavior assessment, training, and instrument development are also discussed.

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INTRODUCTION

Aggressive driving, or at its severe form “road rage”, is a pattern of unsafe driving behaviors that continues to put drivers and others at risk (Houston, Harris, & Norman, 2003). The most common aggressive driving behaviors involve honking, tailgating, speeding, flashing high beams, and rude gesturing. The National Highway Traffic Safety Administration (2000) has claimed aggressive driving to be a major cause to motor vehicle accidents and a serious public safety concern. In 2009, the U.S. Department of Transportation claimed that more than 5.5 million motor vehicle accidents occurred in the United States; the most common of those accidents was collision with another motor vehicle (NHTSA, 2009). The estimated cost of these 5.5 million crashes is over \$230 billion dollars (NHTSA, 2009), an approximate 100 billion dollar increase since 2000 (NHTSA, 2000). Aggressive driving behaviors are considered to be rising issues in many parts of the world, and any country with motor vehicles and drivers can expect to have instances (Miles & Johnson, 2003).

Given the cost, property damage, and human loss, it is not surprising that aggressive driving has become the topic of interest among the research community (Houston et al., 2003). Aggressive driving has gained a considerable amount of media attention over the past decade, and the public’s concern has led to increased governmental and police attention (Deffenbacher, White, & Lynch, 2004). Although law enforcement and the judicial system have been developing and enforcing legislation to

reduce the problem of aggressive driving, it continues to remain a significant issue (NHTSA, 2009).

Aggressive driving is defined as "the operation of a motor vehicle in a manner that endangers or is likely to endanger persons or property" (NHTSA, 2009). This definition simply identifies aggressive driving as a public safety issue; however, the underlying factors of aggressive driving tendencies are much more complex.

Researchers have attempted to investigate the underlying factors of aggressive driving behavior since the early 1970s (Galovski et al., 2006). In order to investigate these factors, researchers have developed questionnaires to better distinguish the characteristics of such behavior. The main research that strengthens and supports the current study involves various findings from work conducted decades ago, more significantly from the 1990s and 2000s.

The most recent development addressing aggressive driving behavior is the Aggressive Driving Behavior Questionnaire (ADBQ; Mouloua, Brill, & Shirkey, 2007). The ADBQ was developed to assess a driver's probability for engaging in aggressive driving behavior (Brill & Mouloua, 2011). The ADBQ could prove to be valuable for educational, selection and therapy purposes, and be implemented as a training tool for at-risk drivers. The primary purpose of this study was to investigate the psychometric properties of the ADBQ, particularly examine its predictive validity, internal consistency, and factor structure. The usefulness of the ADBQ is contingent upon evaluating its

psychometric properties, in order to provide strong supporting evidence for future implementation of the questionnaire.

Past research on aggressive driving dates back to the 1940s, however much of that work primarily focused on general aggression and motor vehicle accident (MVA) risk (Galovski, Malta, & Blanchard, 2006). The 1970s marked a period of considerable interest in the area of driver aggression research, both in simulation and naturalistic studies. Among the most primitive work on aggressive driving, Turner, Layton, and Simons (1975) incorporated driving, and horn honking as a measure of aggression. Their findings suggested that “drivers may become frustrated and angry at other drivers, and this anger or frustration can lead to various hostile reactions such as light flashing, swearing, or hand gestures” (Turner et al., 1975). Like Turner and his colleagues, many researchers who published their work relating to aggression and aggressive driving in the 1970s found evidence to support a reliable relationship between aggression and an increase in motor vehicle accidents (Galovski et al., 2006). The early literature has greatly influenced the research being conducted today and because of it, the basic concepts of aggressive driving behavior were introduced.

Although the 1970s and 80s literature developed the bases for aggressive driving research, the 1990s was a very significant period in that area (Brill & Mouloua, 2011). The development of the Driving Anger Scale was one of the first questionnaires created by Deffenbacher, Oetting, and Lynch (1994), that focused on six factors- hostile gestures, illegal driving, police presence, slow driving, discourtesy, and traffic

obstructions. The Driving Anger Scale provided a measure of the general trait, driving anger, and introduced the concept of situation specific anger, which was a first step towards exploring further on factors influencing aggressive driving behavior tendencies (Deffenbacher et al., 1994). Another useful assessment tool was The Larson's Driver's Stress Profile, originally developed in a clinical setting, to measure the frequency with which drivers "engage in anger and impatience" and behaviors that tend to "compete with and punish other drivers" (Blanchard et al., 2000). The Larson's Driver's Stress Profile was useful in which it provided evidence that anger, impatience, competing, and punishing were all strong factors in predicting aggressive driving behavior (Blanchard et al., 2000). The Driving Anger Expression Inventory (Deffenbacher, Lynch, Oetting, & Swaim, 2002), which "yielded four measures of anger expression while driving...found that verbal aggressive expression, physical aggressive expression, the use of a vehicle to express anger, and adaptive/constructive expression were all highly correlated with measures of anger, aggression, and risky behavior"(Deffenbacher, Lynch, Deffenbacher, & Oetting, 2001). Interestingly enough, adaptive/constructive expression, which included behaviors such as problem-solving, focusing on safe driving, and palliative behaviors, were negatively correlated with measures of anger, aggression, and risky behavior (Deffenbacher et al., 2001). The Driver's Angry Thoughts Questionnaire (Deffenbacher et al., 2003) found patterns of angry, revengeful, and retaliatory thinking as predictors for using a vehicle to express anger (Deffenbacher et al., 2003). Thus far, factors such as situation specific anger (Deffenbacher, Oetting, & Lynch, 1994), anger expression while driving (Deffenbacher, Lynch, Deffenbacher, &

Oetting, 2001), angry, revengeful and retaliatory thinking while using a vehicle (Deffenbacher et al., 2003), and driver-related anger, impatience, competing, and punishing behavior (Larson, 1996) are all evident predictors for engaging in aggressive driving behavior.

Following Deffenbacher and Larson, popularity on the topic of aggressive driving continued to grow among researchers in the psychology community. Wiesenthal, Hennessy, and Gibson (2000) developed the Driving Vengeance Questionnaire (DVQ) that focused on deviant driver attitudes, particularly driving vengeance as a factor for predicting aggressive driving. Wiesenthal et al., (2000) described, “drivers, who scored high on their willingness to retaliate against other drivers...may be endangering road use for others” (p. 129), thus using the DVQ to identify vengeful drivers and provide them with tools to help diminish their threat on the road. Other researchers considering investigating the reliability and validity of their assessment tools across different cultures, such as the study using the Dula Dangerous Driving Index (Willemsen, Dula, Declercq, & Verhaenghe, 2008). The DDDI was used to compare data from a U.S. university, U.S. community, and Belgian traffic offenses by testing four factors relating to drunk driving, risky driving, negative cognitive/emotional driving, and aggressive driving (Willemsen et al., 2008). Willemsen and colleagues made an important point through their research, that “cross-cultural studies should become more the norm and less the exception, as it seems there are universal driving experiences, issues and driver types” (p. 9). Agreeably, many of the past studies have primarily focused on investigating the underlying factors of aggressive driving, and not truly explored age, gender, and cultural

differences. Each of these measures provided useful tools in assessing different aspects of aggressive driving behavior; they investigated factors relating to mood states, cognitions, coping responses and various associated behaviors to aggressive driving (Houston, Harris, & Norman, 2003).

Thanks to the efforts by many of the past researchers, a more comprehensive tool to measure aggressive driving behavior tendencies, the Aggressive Driving Behavior Questionnaire (ADBQ), was developed (Brill & Mouloua, 2011). The ADBQ was developed using a factor-analytic approach (Mouloua et al., 2007), which took the items from five of the previously developed driving behavior questionnaires and combined them to create an 83-item “road rage” scale (Brill & Mouloua, 2011). These 83 items were then implemented and the data was analyzed to identify the factors that accounted for the most variance (Brill & Mouloua, 2011). According to the results, 19 items accounted for 67.4% of the variance, where as the 20th item was added by splitting one of the factors. Thus, the 20 items were used to develop a self-report aggressive driving measure, known as the ADBQ, that focused on six underlying factors-anger/aggression, absentmindedness, speeding/minor infractions, judgment of other drivers, overt expression, and a miscellaneous factor that included annoyance and impatience (Brill & Mouloua, 2011). Although Brill et al. (2009^a) investigated the predictive validity of the ADBQ in a simulated environment, with significant findings; the ADBQ still has yet to be implemented in a non simulated environment. Another study conducted by Brill and Mouloua (2011^b) focused on examining the factor structure and internal consistency of the ADBQ, where a sample was taken from two geographic

regions, Old Dominion University and Michigan Technological University. Although their findings indicate that the internal consistency of the ADBQ was high (Cronbach's $\alpha=.77$), and the factors identified accounted for 56% of the variance, the N:K ratio for each sampled region was low and will require additional data for more accurate analyses (Brill & Mouloua, 2011). The ADBQ can be an efficient, less time consuming, and more comprehensive alternative to the past measures of aggressive driving, however, supporting evidence of the questionnaire's predictive validity, internal consistency (reliability), and factor structure have not yet fully been investigated. The present study further investigated the ADBQ's psychometric properties in order to determine its usefulness as a measurement tool in identifying strong predictors of aggressive driving.

Based on the above mentioned studies, it is clear there is a crucial need to develop, test, and validate assessment tools that can characterize and predict aggressive driving behavior tendencies. There is a need for current research to take into consideration various environmental factors, which include culture, age, gender, and situational influences, and psychological factors, which involve driver stress, driving anger, and cognitive behaviors, that may influence their findings and affect a person's likelihood to engage in aggressive driving behavior (Galovski, Malta, & Blanchard 2006). Many researchers can agree that aggressive driving is a "complex behavioral phenomenon" and future research must reflect on both the underlying factors of aggressive driving and the influential factors, such as environmental and psychological influences (Galovski et al., 2006).

The goal of this study was to further examine the psychometric properties of the ADBQ in relation to its usefulness in assessing a driver's probability for engaging in aggressive driving behavior. It has been hypothesized that the ADBQ will be highly reliable as measured by its internal consistency, as well as, exhibit strong construct and predictive validity. If the psychometric properties of the ADBQ are upheld, the questionnaire can be implemented as a tool to educate at-risk drivers, be used in conjunction with other measures, and ultimately reduce aggressive driving tendencies on the road.

METHOD

Participants

A sample of 285 undergraduate students attending University of Central Florida participated in this study (170 women and 115 men). All participants were selected through a university pool of participants, particularly participants who usually seek extra credit or other incentives, by using the UCF Sona System. The individuals sampled ranged from the ages of 18 and 59 years, with 95% of the participants between 18 and 29 years of age ($M = 20.7$). All participants received extra credit for their participation and were treated according to the American Psychological Association guidelines, as well as, in accordance with the University of Central Florida Institutional Review Board.

Materials

The measures utilized in this study consist mainly of self-report measures designed to indicate basic demographic information, driving history, and a likelihood of engaging in aggressive driving behavior.

Demographics and Driving History Questionnaire

The Demographics and Driving History Questionnaire is a brief form intended to help characterize the participants based on the demographics and driving experience information they provide. The questionnaire asked questions regarding information about age, gender, and driving history and experience (see Appendix B). Example questions include approximate number of hours spent driving in a typical week, number of points currently on driver license, number of accidents where the participant was the driver, and approximate vehicle value.

Aggressive Driving Behavior Questionnaire (ADBQ)

The ADBQ is a 20-item self report paper and pencil questionnaire that prompts participants to rate each item 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) on the likelihood by which they would engage in the particular aggressive driving behavior (see Appendix A). Example behaviors include shouting verbal insults at other drivers, running red lights, giving the middle finger, and hitting brakes to get close-following cars to back off.

Procedure

The study was designed and administered online through the University of Central Florida Sona System. As undergraduate students selected to participate in the study, they were directed to the online study and were first asked to read the informed consent form that explained the confidentiality and anonymity of their participation, and acknowledged their rights to withdraw from the study at any time (see Appendix C). After they read the informed consent form, they were provided the option to continue with the study or decline participation. Once they selected to continue the study, participants were asked to complete the Demographics and Driving History Questionnaire. After completing the demographics questionnaire, the participants completed the ADBQ. Upon completion of the two questionnaires, the participants were debriefed and were informed that extra credit will be administered and are thanked for their contribution. After the deadline for participating in the study had passed, the data were coded into SPSS, a statistical analysis software, and then analyzed.

RESULTS

All analyses were performed using SPSS Statistics version 17.0 and the 20-items were analyzed using multiple analyses methods to investigate the ADBQ's reliability (i.e., internal consistency), factor structure, and predictive and construct validity.

Factor Structure and Construct Validity

A principal axis factor analysis with promax rotation was performed, where factor loading values less than .20 were suppressed from inclusion in the output. The analysis resulted in the identification of four factors with Eigenvalues greater than 1. Table 1 illustrates the initial Eigenvalues for the 20 items on the questionnaire, as well as, the rotated Eigenvalues for the four factors. In order to ensure that important factors were not missed, a Scree Plot was used to identify whether factors above or below an Eigenvalue of 1 should be retained (See Figure 1). The rotated factor matrix was useful in identifying which items compose each factor (See Table 2 for the rotated factor matrix, including the reliabilities for the items relating to each factor).

The construct validity of the ADBQ was assessed by examining the items loading on these four factors, where certain constructs were identified (See Table 3). The first factor represented anger and aggression and was exemplified by shouting verbal insults, tailgating to scare others, attempting to get revenge at other drivers. The second factor represents the construct pertaining to speeding/minor infractions which are identified in questions regarding willingness to speed, take chances and run red lights. The third factor represented overt expression which comprised of questions pertaining

Table 1. *Eigenvalues by Factor and Rotation Loadings*

Factor	Initial Eigenvalues			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total
1	6.375	31.876	31.876	4.792
2	2.383	11.914	43.789	4.330
3	1.469	7.344	51.133	4.329
4	1.120	5.601	56.734	1.114
5	.949	4.744	61.478	
6	.825	4.123	65.600	
7	.760	3.800	69.400	
8	.721	3.603	73.003	
9	.624	3.119	76.122	
10	.603	3.013	79.135	
11	.575	2.876	82.011	
12	.553	2.764	84.775	
13	.536	2.679	87.454	
14	.470	2.350	89.804	
15	.441	2.205	92.009	
16	.410	2.052	94.061	
17	.374	1.869	95.930	
18	.318	1.589	97.518	
19	.257	1.283	98.801	
20	.240	1.199	100.000	

a. When factors are correlated, sums of squared loadings cannot be added to obtain a total variance.

Figure 1. Scree Plot of the 20 Items on the Aggressive Driving Behavior Questionnaire and Corresponding Eigenvalues

Scree Plot

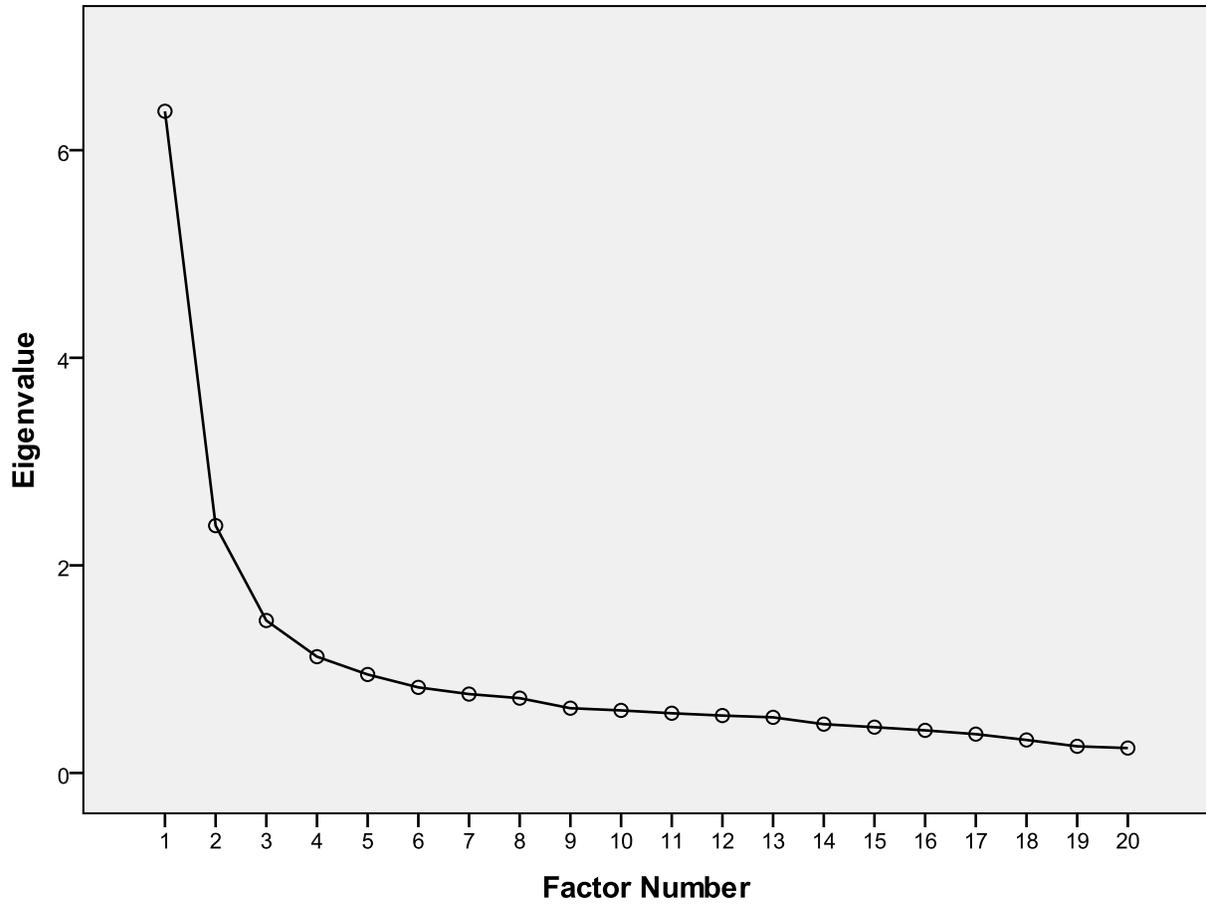


Table 2. *Promax Rotated Factor Matrix for Items on the Aggressive Driving Behavior Questionnaire*

	Factor			
	1	2	3	4
Q14	.738	.498	.636	
Q10	.688	.311	.603	
Q18	.673	.203	.338	
Q7	.672	.624	.660	
Q16	.616	.266	.304	.225
Q12	.611	.223	.430	
Q11	.581			-.209
Q17	.436	.260		.241
Q4	.236	.692	.345	.388
Q3	.227	.688	.337	.341
Q13		.682	.387	
Q1	.283	.669	.561	.248
Q2	.378	.584	.331	
Q6	.512	.513	.437	
Q9	.680	.371	.735	
Q8	.464	.444	.646	
Q19	.467	.540	.589	
Q20	.246	.440	.490	.362
Q5			-.353	
Q15				.587

to giving the finger to other drivers, sticking out your tongue, and shaking your head at drivers who annoy you. The fourth factor represented judgment of other drivers which was exemplified by finding drivers annoying, bad drivers anger you, you think negatively of drivers who get on your nerves.

The factor structure of the ADBQ, according to the principal axis factor analysis with the promax rotation method, identified inter-correlations between the four factors (See Table 4 for factor correlation matrix) and found that anger/aggression correlated with speeding/minor infractions ($r = .45$) and overt expression ($r = .61$), but did not have a strong relationship with judgment of others ($r = -.077$). Speeding/minor infractions correlated with over expression ($r = .59$) and judgment of others ($r = .21$). Overt expression did not have a strong relationship with judgment of others ($r = .057$).

Reliability

In order to determine the internal consistency of the ADBQ, Cronbach's alpha was calculated and compared to the ADBQ's previous investigations. Cronbach's alpha was found to be .86, which compared to the previous study conducted by Brill and Mouloua (2011), Cronbach's alpha was .77. The reliability of the ADBQ was further investigated by using the four identified factors to create subscales of the ADBQ and test their relationships. Questions pertaining to anger and aggression while driving were included in the Anger/Aggressive Behavior Scale ($\alpha = .76$). The items pertaining to the second factor were included in the Speeding/Minor Infractions Scale ($\alpha = .67$). The third factor that corresponded with items relating to overt expression were used to form the Overt Expression Scale ($\alpha = .61$). Finally using the items representing the fourth factor

Table 3. *Factor Labels and Exemplar Content*

	Factor Label	Exemplar Content
Factor 1	Anger/Aggression	Tailgating, getting revenge on other drivers
Factor 2	Speeding/Minor Infractions	Willingness to speed and break laws
Factor 3	Overt Expression	Sticking out tongue, giving the “finger”
Factor 4	Judgment of Others	Impatient drivers anger you

Table 4. *Factor Correlation Matrix*

Factor	1	2	3	4
1	1.000	.448	.611	-.077
2	.448	1.000	.593	.208
3	.611	.593	1.000	.057
4	-.077	.208	.057	1.000

Table 5. *Means for Scales and Comparison of Means by Gender*

Scale	Overall Sample		Means by Gender	
	M	SD	Males	Females
Aggressive Driving Behavior Questionnaire	55.21	12.43	52.83	56.82
Anger/Aggressive Behavior Subscale	14.94	4.78	14.33	15.35
Speeding/Minor Infraction Behavior Subscale	12.64	3.33	12.00	13.06
Overt Expression Subscale	15.94	4.62	15.24	16.41
Judgment of Other Drivers Subscale	11.69	2.72	11.26	11.98

were used to develop the Judgment of Other Driver Scale ($\alpha = .63$). Thus, relatively high coefficients for all four scales provide adequate support that the Aggressive Driving Behavior Questionnaire is highly reliable.

Predictive Validity

The remaining findings were based on Pearson correlations between the participant's scores on the ADBQ and other variables. For each participant, the observed responses were summed for all 20 items to create a combined ADBQ score. The results showed that the combined ADBQ scores were correlated with self-reported biographical and driver history data. Combined ADBQ scores were found to be correlated with the number of minutes spent texting ($r = .158, p = .007$), motor vehicle accidents where the participant was deemed at fault ($r = .120, p = .042$), driving due to stress ($r = .172, p = .008$), and driving because of stress ($r = .202, p = .001$).

Pearson correlations were also tested between the four subscales and the self-reported biographical and driver history data. Overt Expression Subscale responses correlated with the amount of hours spent driving in city roads ($r = .111, p = .031$), driving under stress ($r = .185, p = .002$), and driving because of stress ($r = .239, p < .001$). Anger/Aggressive Behavior Subscale correlated with the number of motor vehicle accidents the participant was deemed at fault ($r = .127, p = .016$), driving under stress ($r = .165, p = .005$), and driving because of stress ($r = .213, p < .001$). Speeding/Minor Infraction Behavior Subscale correlated with driving because of stress ($r = .148, p = .010$). Judgment of Other Drivers Subscale was not found to correlate with any self-reported biographical and driver history data.

On average, an independent samples t-test indicates that participants reported using ADBQ behaviors ($M = 2.76$, $SD = .62$) more frequently for females ($M = 2.84$, $SD = .58$), than males ($M = 2.64$, $SD = .66$), with $t_{(283)} = 2.68$, $p < .01$. When looking at the individual subscales, females reported using Anger/Aggressive behavior, Speeding/Minor Infraction behaviors, Overt Expression behaviors, and Judgment of Other Driver behaviors more frequently than males as a whole for all four subscales, with $t_{(283)} = 2.68$, $p < .01$ (See Table 5).

Although some gender differences were found, present findings may be influenced by factors such as sample size or the cancelling out between factors so further investigation is recommended.

Additional Analyses

A combined sample ($N = 780$) of undergraduate students from University of Central Florida ($N = 285$), Old Dominion University ($N = 230$), and Michigan Technological University ($N = 265$) were used to conduct an additional factor analysis to determine if the factor structure and internal consistency of the ADBQ is consistent with the present study. The principal axis factor analysis yielded four factors with Eigenvalues greater than 1 and the promax rotation method identified an inter-correlation between the four factors. Table 6 illustrates the Eigenvalues by factor and Figure 2 provides a Scree Plot to visually identify the four extracted factors. When evaluating the items that correspond to each factor, specific constructs were identified and support the present study. The four underlying factors identified include anger/aggression, speeding/minor infractions, overt expression, and judgment of other

drivers. The internal consistency of the ADBQ was found to be high with a Cronbach's alpha of .84 (.85 on standardized items). A one-way ANOVA was also conducted to compare all three university samples and overall ADBQ scores. The results indicate no significant difference in overall scores for the University of Central Florida sample ($M = 55.21$, $SD = 12.43$), the Old Dominion University sample ($M = 56.08$, $SD = 10.91$), and the Michigan Technological University sample ($M = 54.93$, $SD = 12.48$) with a $F_{(2, 767)} = .624$, $p = .536$.

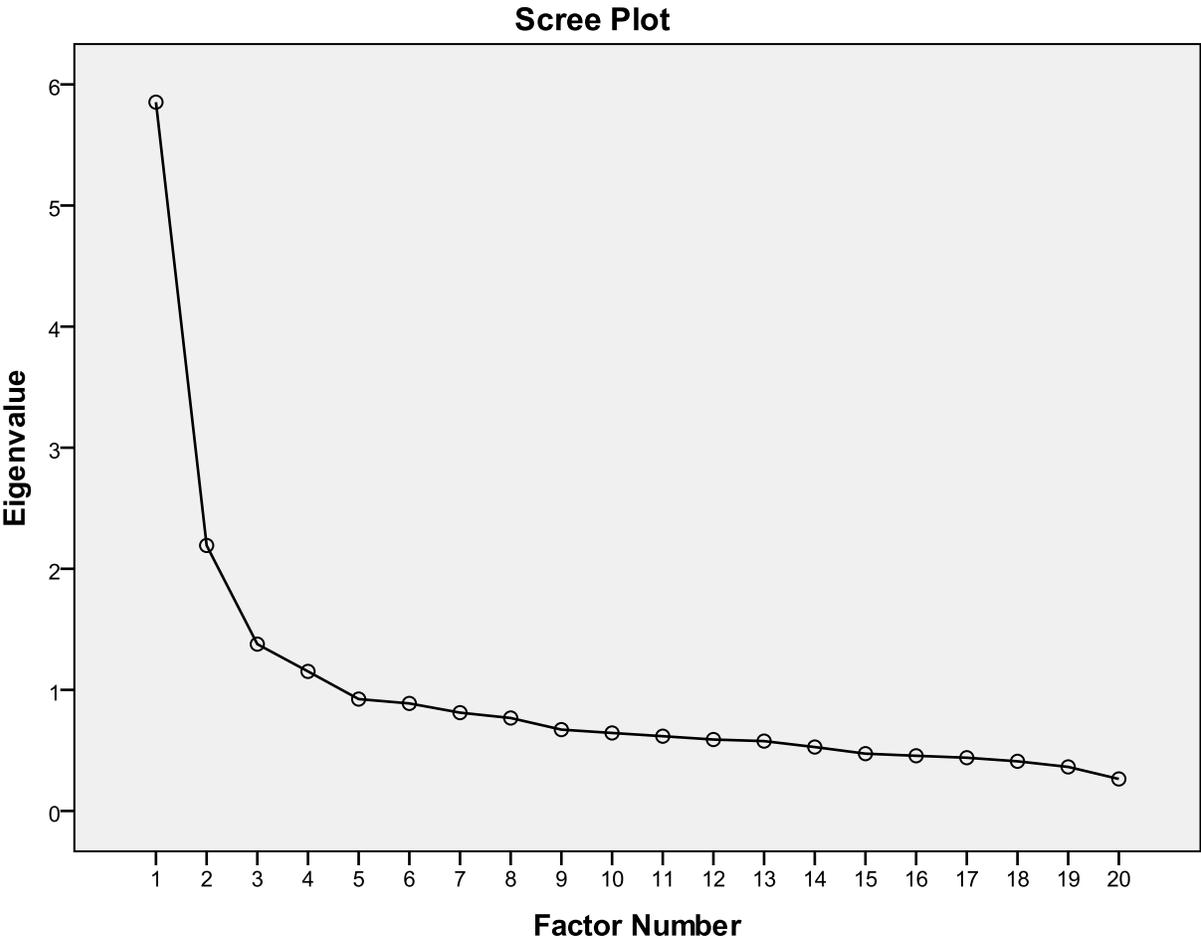
The findings of the combined sample from the three universities provide additional support that the ADBQ is highly reliable ($\alpha = .84$), as well as, provides evidence that the four factors identified in the present study provide an overall measure of aggressive driving behavior.

Table 6. *Eigenvalues by Factor and Rotation Loadings
for Combined Samples*

Factor	Initial Eigenvalues			Rotation Sums of Squared Loadings ^a
	Total	% of Variance	Cumulative %	Total
1	5.853	29.267	29.267	3.989
2	2.192	10.962	40.229	2.886
3	1.378	6.888	47.117	4.301
4	1.152	5.762	52.879	3.358
5	.924	4.619	57.498	
6	.888	4.440	61.938	
7	.812	4.059	65.997	
8	.768	3.838	69.834	
9	.672	3.358	73.193	
10	.644	3.220	76.413	
11	.617	3.086	79.499	
12	.590	2.949	82.448	
13	.577	2.884	85.332	
14	.528	2.638	87.970	
15	.473	2.365	90.336	
16	.456	2.278	92.613	
17	.440	2.198	94.811	
18	.410	2.050	96.861	
19	.364	1.818	98.679	
20	.264	1.321	100.000	

Extraction Method: Principal Axis Factoring.

Figure 2. Scree Plot of the 20 Items on the Aggressive Driving Behavior Questionnaire for the Combined Samples



DISCUSSION

The aim of this investigation was to examine the factor structure, construct and predictive validity and internal consistency of the Aggressive Driving Behavior Questionnaire (ADBQ). Overall, the present findings from this study indicate that the ADBQ has fair psychometric properties and provides additional support to the findings by Brill, Mouloua & Shirkey (2009, 2011).

The principal axis factor analysis yielded four underlying factors of aggressive driving behavior, with Eigenvalues greater than 1. The four factors included anger and aggression, speeding and minor infractions, overt expression, and judgment of other drivers.

In the previous study, the factor analysis initially extracted six factors (Brill & Mouloua, 2011), which differs with the present findings. However, when examining the items loading of these factors, the initial Eigenvalues for the two missing factors were .949 and .825, which although slightly lower the cut-off of 1 were not extracted. As Figure 1 illustrates the Scree Plot of the factor analysis clearly identifies four factors before the line with the remaining items begins to plateau in a flat line. Further investigation of these factors is recommended for consistency. These findings could indicate some geographical differences in relation to the constructs that represent particular aggressive driving behaviors, so future investigation is recommended.

Based on the evidence of predictive validity, particularly the relationship between ADBQ scores and the number of self-reported motor vehicle accidents, the ADBQ is useful in predicting a person's likelihood for engaging in aggressive driving behavior.

Further investigation is important in determining the extent to which the ADBQ predicts actual aggressive driving behavior in regards to real-world performance. The ADBQ has been administered in a simulated driving environment and has found significant evidence of predictive validity (Brill, Mouloua, & Shirkey 2009), however, the ADBQ has yet to be tested in a real life setting. If the validity of the ADBQ is upheld in actual driving environments, then it could be adopted by law enforcement and used as a training tool for educators to assist at-risk drivers.

The present study also found high internal consistency (Cronbach's $\alpha = .86$), which is consistent with the previous study by Brill and Mouloua (2011). These findings have demonstrated promise for the reliability of the ADBQ and future research should consider alternative measures of reliability to provide additional support.

The questionnaire was administered to a sample of 285 undergraduate students at the University of Central Florida. Data previously gathered at two other university, Old Dominion University and Michigan Technological University, where a sample of 495 undergraduates students at two different geographical regions were obtained, which could provide usefulness for future analyses to determine aggressive driving behavior differences between geographic regions and in determining the questionnaire's factor structure. In addition to investigating geographical differences, identifying gender and cultural differences in regards to aggressive driving could assist educators in tailoring to drivers who exhibit specific aggressive driving tendencies.

Research literature concerning aggressive driving behavior is becoming more abundant, and many researchers have developed measures that could be used in

conjunction with the ADBQ. Some of the other theoretical implications include expanding on the literature provided on aggressive driving behavior and offer an alternative measure to the existing questionnaires on aggressive driving behavior. The ADBQ can provide support of identifying specific constructs that represent distinct aggressive driver behaviors, help researchers in understanding the complexity of the aggressive driving phenomenon and assist in identifying major mediators and moderators of aggressive driving behavior for future research.

If the ADBQ is successfully implemented, at-risk drivers will have access to specific resources to target their aggressive driving behaviors. Aggressive driving related motor vehicle accidents will decrease, and the annual cost, property damage, human fatality should be expected to decrease. An important practical implication to consider is that public awareness about aggressive driving will increase as the ADBQ is implemented across more geographic regions; this would also lead to judicial and law enforcement regulations to be enforced more strictly and across states and other countries as well.

The ADBQ has demonstrated promise as a useful measure for both research and clinical implementation. The ADBQ measures specific and observable behaviors that allow it to be a practical utility as a self-assessment tool. The goals of the present study were to assess the ADBQ's internal consistency, predictive and construct validity, and factor structure. Overall the data suggest that the ADBQ has high internal consistency, a factor structure comprised of four underlying factors that represent

specific aspects of aggressive driver behavior, and is useful in predicting the likelihood of engaging in aggressive driving behavior.

Although the psychometric properties of the ADBQ are good, some possible limitations are that participants vary in age, gender, ethnicity, academic ability, socioeconomic status, life experience, work experience, and cognitive behaviors so this causes an inability to generalize the results across cultures and geographic regions. Further investigation is recommended in order to eliminate some of these limitations.

Future investigators should compare ADBQ data in relation to the different environmental and psychological factors. The ADBQ should be studied across various geographic regions and across cultures to determine if there are any similarities and differences. Finally, further evaluation of the psychometric properties of the ADBQ, using alternative analysis methods should be considered.

APPENDIX A:
AGGRESSIVE DRIVING BEHAVIOR QUESTIONNAIRE (ADBQ)

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

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

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

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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?

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

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

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

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

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

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

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

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

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

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

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

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

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

14. When another driver anger you while on the road, you attempt to get revenge on them.

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

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

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

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

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

18. You take chances and run through red lights.

Never	Hardly at all	Occasionally	Often	Quite frequently	Nearly all the time
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.

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

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

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

APPENDIX B:
DEMOGRAPHICS AND DRIVING HISTORY QUESTIONNAIRE

Please provide the following information:

1. Sex: _____
2. Age: _____
3. Approximate number of hours you spend driving in a typical week: _____
4. Approximate number of miles you drive in a typical week: _____
5. Approximate number of minutes you spend texting while driving in a typical day: _____
6. How many of the hours you drive each week are on:
Rural roads and highways? _____
Stop and go city roads? _____
7. Number of points currently on the your driver's license: _____
8. Please specify how these points were obtained (e.g., if 5 points: 3 for an accident and 2 for speeding):

9. How many accidents have you been involved in, in your lifetime, where you are the driver? _____
10. For how many of those accidents were you deemed at fault? _____
11. Where you under the influence of a substance when any of a substance when any of these accidents occurred? _____
12. Have you ever been arrested for a violent offense? _____
13. Approximate vehicle value:

14. How often is your car taken in for repairs? _____
15. How often do you drive in the car under stress? _____
16. How often do you drive in the car just because of stress? _____

APPENDIX C:
DESCRIPTION OF THE STUDY

Psychometric Properties of the Aggressive Driving Behavior Questionnaire (ADBQ)

The purpose for this study is to examine the Aggressive Driving Behavior Questionnaire and determine its usefulness as a measure of aggressive driving behavior.

If you wish to obtain copies of the results of this study or have any questions or concerns, please feel free to contact the principal investigator, Dr. Mustapha Mouloua of the UCF Psychology Department by phone at 407-823-2910 or email at Mustapha.Mouloua@ucf.edu.

Thank you for your participation!

Information regarding your rights as a research volunteer may be obtained from:

Institute Review Board, IRB Coordinator
University of Central Florida
Office of Research and Commercialization
12201 Research Parkway, Suite 501
Orlando, FL 32826-3246
Telephone: 407-823-2091

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