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Personal Beliefs About the Effectiveness of a Primary Seat Belt Law in Virginia Versus North Carolina

Rochelle A. Rushlow

Old Dominion University, rrush003@odu.edu

PERSONAL BELIEFS ABOUT THE EFFECTIVENESS OF A PRIMARY SEAT BELT LAW IN VIRGINIA VERSUS NORTH CAROLINA

by

Rochelle A. Rushlow

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Approved by:

Bryan E. Porter (Director)

James F. Paulson (Member)

Barbara A. Winstead (Member)

ABSTRACT

PERSONAL BELIEFS ABOUT THE EFFECTIVENESS OF A PRIMARY SEAT BELT LAW IN VIRGINIA VERSUS NORTH CAROLINA

Rochelle A. Rushlow
Old Dominion University, 2020
Director: Dr. Bryan E. Porter

Seat belt law strength (primary versus secondary) affects the ability of law enforcement to enforce consistent seat belt use, especially in secondary seat belt law states. Certain demographics correlate with seat belt law effectiveness beliefs and overall seat belt use. The current study used an overall omnibus model to determine the strength of the relationship among demographics and beliefs in the effectiveness of primary seat belt laws. A survey was deployed to Mechanical Turk (MTurk) users who were Virginia or North Carolina residents, held a valid United States driver's license, and were at least 18 years old. Three hundred twenty-four participants were analyzed using ANCOVA and regression techniques to address hypotheses concerning primary law effectiveness beliefs and self-reported seat belt use as a driver, and the role demographics such as gender, self-rated driving behaviors as measured by the Driver Behavior Questionnaire (DBQ), education level, health insurance status, population density, and state of residence correlate with these beliefs. Education level and the sum of the DBQ Errors subscale were the two significant contributors in the omnibus model for how effective one believed a primary seat belt law would be in increasing overall seat belt use. This study helped further identify demographics that contribute to an understanding of a traffic culture model hypothesized by Özkan and Lajunen (2011).

This thesis is dedicated to those families that have lost someone

in a transportation related incident.

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CHAPTER I

INTRODUCTION

The World Health Organization (WHO) has cited traffic crashes and fatalities as a world public health threat (WHO, 2015). According to WHO (2015), the road traffic fatality rate in 2012 was 17.4 per 100,000 population. Traffic-related crashes affect 1.25 million people per year (Nordfjaern, Şimşekoğlu, Zavareh, Hezaveh, Mamdoohi, & Rundmo, 2014; WHO, 2015). In the United States, 35,092 died from traffic related injuries in 2015 (Insurance Institute for Highway Safety Highway Loss Data Institute [IIHS HLDI], 2016). Of those deaths, 22,543 had known restraint use; 9,925 (44%) of those were unrestrained. Wearing seat belts is expected to reduce the risk of death in a traffic crash and would likely have significantly reduced fatalities among those who were unrestrained. Interventions to increase seat belt use can be difficult given the culture of the area, resources, or combinations of both (Birru, Rudisill, Fabio, & Zhu, 2016).

Reasons to Wear a Seat Belt

Wearing seat belts is the best method to enhance and maintain personal safety while driving (Brijs, Daniels, Brijs, & Wets, 2011; Porter, 2011). It can be a safety mechanism and a reassurance to drivers and passengers. Lap-shoulder belts are 45% effective in reducing passenger car fatalities and 60% effective in light trucks (Dinh-Zarr, Zaza, & Sosin, 2001). Lap-shoulder belts reduce serious injury to head, chest, and extremities by 50% to 83%. Lap belts alone are less effective than the lap-shoulder belt combination and range from 17% to 58% in reducing fatality risk. Use rates are the percentage of people observed driving in an area who are wearing a seat belt in the proper manner (Porter, 2011). Seat belt use rates tend to increase with police enforcement, which was identified in a comprehensive review to be the best practice for increasing use (Dinh-Zarr et al., 2001). Dinh-Zarr et al. (2001) and WHO (2015) indicated that having a stronger belt-use law increases use and reduces deaths.

Reasons for Not Wearing a Seat Belt

Researchers have been interested in learning why people do not wear seat belts to better understand how to create interventions to increase use. For non-use, social desirability, fatalism, and previous non seat belt usage behavior affects future seat belt use (Vivoda & Eby, 2011). Social desirability affects seat belt usage behavior because depending on what area one lives in, the more likely one is to adhere to the dominant behavior (i.e. not wearing a seat belt) to fit in with the social group. This in turn affects their likelihood of not wearing a seat belt. If a large majority of the population does not wear a seat belt, the less likely others are to wear a seat belt even if they believe in the benefits. A fatalistic belief, a cultural belief that fate drives one's life, also affects non seat belt use. Previous non seat belt usage behavior predicts future behavior. The more one did not wear a seat belt in the past, the more likely use will be similar in the future.

Discomfort, unnecessary constraint, and no perceived benefit to reducing injury in a crash are other reasons for non-use (Şimşekoğlu & Lajunen, 2008). Having a poor attitude towards belt use predicted low belt use but having a positive attitude about belt use did not increase belt use. This would appear to indicate that other factors are at play in predicting belt use, besides knowing about safety benefits. Several researchers and most peers explain that seat belts are necessary to avoid fines and save one's life. Some drivers insist that they should not have to the wear a seat belt if they do not want to. This idea points back to the foundation of freedom that the United States is based on. Many drivers believe that they have a right to choose whether they can put their own safety at risk (Atchley, Shi, & Yamamoto, 2014).

Seat Belt Use Legislation

Seat belt use across individual states within the United States varies dramatically based on primary versus secondary laws. Enforcement strength affects the likelihood of individual seat belt use (Ash, Edwards, & Porter, 2014; Demimer, Durat, & Haşimoğlu, 2012; WHO, 2015). As mentioned previously, seat-belt use increases with enforcement – which is considered a best practice intervention (Dinh-Zarr, Zaza, & Sosin, 2001). Enforcement is reliant upon the strength of the law.

Primary laws are those in which one can receive a ticket when committing only that offense; secondary laws are those in which one cannot receive a ticket for that offense unless another law is also broken (Lv, Lord, Zhang, & Chen, 2015; Porter, 2011). Primary laws were implemented in several states after a secondary law was in place for many years. The National Highway Traffic Safety Administration (NHTSA) studied state differences in seat-belt use, finding Virginia to be a low seat belt use state, while North Carolina was a high seat belt use state (NHTSA, 2008). The key legislative difference between the two is a primary belt use law. After a primary law was enacted in North Carolina, the seat belt rate increased, and serious injuries decreased (NHTSA, 2008). Virginia and North Carolina were the focus for this thesis (more below). In general, overall, high belt use states have primary seat belt laws, whereas low belt use states have secondary laws. Primary law states average 85% use; secondary law states average 75% use (*The Washington Post*, 2010).

However, few studies assess perceptions of the law's effectiveness (Perkins, Helgerson, & Harwell, 2009). The current study assessed how primary law effectiveness beliefs differ between primary and secondary law states and how beliefs differed by certain demographics.

Traffic Culture

The demographics of interest for this study contribute to an area's "traffic culture." Before reviewing variables of interest to this study, a background of traffic culture is warranted.

Traffic safety culture is an aspect of an emerging theoretical framework that traffic researchers, governmental organizations, and law enforcers are beginning to attend to (Özkan & Lajunen, 2011). Atchley et al. (2014) indicated that traffic safety culture among states varies due to traffic laws being historically and currently enforced at the state and local level versus the federal level. Traffic psychology, which is a relatively young field, has just recently and seriously begun to consider culture as a predictor of driver behavior differences (Nordjærn, Şimşekoğlu, & Rundmo, 2014). Culture has been hard to operationalize and define for building a testable theory. Safety culture pertains to a country's trends, beliefs, and procedures about behaviors to protect one's own safety and the safety of others in society or willingness to engage in risky behaviors (Atchley et al., 2014). Edwards, Freeman, Soole, and Watson (2014) explain traffic safety culture is the interaction of the beliefs and shared attitudes of people with the structure and systems of communities that reside within a state or region.

American traffic safety culture has four characteristics (AAA, 2007). These four characteristics are complacency and indifference towards traffic injuries and fatalities; concern for safe vehicles, roads, and drivers on roadways; strategies that are used to deter unfavorable behavior tend to be lacking scientific support; and the concept of safety culture is variable at state, local, and individual levels. First, complacency and indifference towards traffic injuries and fatalities is such that Americans accept traffic fatalities occur in great numbers. The death rate from traffic crashes is relatively stable (NHTSA, 2016). Therefore, it is not thought of as a problem because stability indicates that the problem is under control (AAA, 2007).

The second characteristic is concern for safe vehicles, roads, and drivers on roadways. Over the past several decades, more stringent laws designed to increase driver and front passenger seat belt use have been implemented (WHO, 2015). By enforcing more stringent laws, traffic culture has changed such that unfavorable driving behaviors are likely decreasing among high risk groups such as young males and aggressive drivers (WHO, 2015). People that are non-compliant can expect to be punished for their behavior.

Third, strategies that are used to deter unfavorable behavior tend to be lacking scientific support (AAA, 2007; WHO, 2015). Many of these strategies rely on characterization of human behavior that does not consider the complex nuances of behavior. Drivers may behave differently depending on a road hazard. For example, one driver may run a red light if no one is coming through while another driver stops at all red lights and only proceeds when the light is green (Baratian-Ghorghi, Zhou, & Franco-Watkins, 2017).

The last characteristic is that the concept of safety culture is variable at state, local, and individual levels (Atchley et al., 2014). For example, rural residents tend to be more independent, conservative, and less willing to accept new ideas than urban residents, which may explain the lower seat belt use in rural areas (AAA, 2007). In fact, overall, those in rural areas tend to have lower seat belt use than urban residents (Pickrell & Li, 2016).

Before continuing, it is worth taking time to differentiate between climate and culture. First, traffic climate can be defined by attitudes about the traffic environment (Gehlert, Hagemeister, & Özkan, 2014). This can be a general attitude about drivers in an environment in a place or time. Traffic culture is composed of all the factors that directly or indirectly influence traffic safety in a country. This includes vehicles, infrastructure, and attitudes, skills, and behaviors of drivers (Özkan & Lajunen, 2011). An intervention, typically designed because of a traffic climate, targets a safety behavior that results from group values, attitudes, and behaviors towards a health behavior (Özkan & Lajunen, 2011). Furthermore, traffic climate tends to use a quantitative approach in assessment, while traffic culture tends to use a qualitative approach. Unlike traffic culture, traffic climate is shaped by interactions within a traffic environment. For example, changing a seat belt enforcement law from secondary to primary changes the traffic climate; potentially increasing the likelihood that penalties occur for those caught not wearing a seat belt. However, the traffic culture belief that seat belts are unnecessary is unlikely to change if that is the prevailing belief. This is an example of a driver interacting properly in a different traffic climate but still adhering to their traffic culture beliefs. Therefore, culture and climate are not necessarily the same.

Traffic Culture Model

Traffic culture, more than climate, is a focus in this study. Therefore, more information on traffic culture and its levels of influence are warranted. Traffic culture consists of all factors that affect driver behavior, from the individual-level to large-system level (Özkan & Lajunen, 2011). Özkan and Lajunen (2011) described the structural levels of society (micro, meso, macro, and magna) and what these levels consider that relates to traffic culture.

Previous studies have considered national (magna) (Molnar, Eby, Dasgupta, Yang, Nair & Pollock, 2012; Ash et al., 2014) and state (macro) level work (Perkins et al., 2009) while others have focused on demographic variables within an area of a county or a certain city (meso) (Demirer et al., 2012). The author will focus on individual (micro), regional (meso), and state (macro) level variables. Each of these levels are defined and interwoven with the relevant hypotheses listed below.

Micro. The micro level includes individual characteristics of drivers in the environment (Özkan & Lajunen, 2011). This includes demographic variables, individual thoughts, beliefs, and feelings while driving and about driving concepts, as well as the interaction with other individuals in the road environment. Demographics collected in the study included gender, education level, and health insurance status. Additional individual characteristics collected were primary law effectiveness beliefs, self-reported seat belt use, and self-reported driving behaviors.

Before reviewing the micro-level variables, it must be noted that this current study was based, in part, on replicating Perkins et al. (2009). Specifically, the current hypotheses were based on Perkins et al.'s (2009) results to determine if similar findings would occur. Although it was not a direct replication because the methodology differed, the questions asked and content of the overall survey was similar to those used by Perkins et al. (2009). They used data from a Behavioral Risk Factor Surveillance System Survey (BRSSS). This was a telephone population and state-based CDC survey. Attitudes towards health risk and protective behaviors related to risk and injury were assessed (Becks & Shultz, 2009; Perkins et al., 2009). The current study used a Qualtrics designed survey deployed via Mechanical Turk (MTurk) to licensed Virginia and North Carolina drivers assessing self-reported driver behaviors, self-reported seat belt use, and primary seat belt law effectiveness beliefs.

Moving now to a direct discussion of the variables in question, Demirer, Durat, and Haşimoğlu (2012) studied the differences in seat belt use among drivers with different education levels. Drivers completed an 18-question survey about their seat belt usage habits. Those with a higher education level had higher seat belt use and more positive beliefs towards seat belt protection than those with a lower education level. Seat belt use was higher amongst those with a higher education level. Perkins et al. (2009) did not directly test the same question but did investigate education's relationship with support of a primary law. Specifically, they compared those with less than 12 years of education in Montana (less than a high school diploma) with those with at least 12 years of education (high school diploma or higher). Odds ratios indicated that those with less than 12 years of education were more likely to support the primary law versus those with at least 12 years of education. Because few studies have looked at education level in relation to seat belt law effectiveness belief, it is important to investigate this relationship. The author tested the relationship explored by Perkins et al. (2009). Exploratory Question 1 was: **How will education level affect how likely one is to believe in primary seat belt law effectiveness?**

Individuals with health insurance have a higher likelihood of obtaining health care than those without insurance. Those with insurance were more likely to support a primary seat belt law versus those without insurance (Perkins et al., 2009). Those states with higher levels of healthier individuals were more likely to support a primary law (Ash et al., 2014). Since those with health insurance supported the primary law at a higher rate than those without health insurance (Perkins et al., 2009), Hypothesis 1 was: **Those that currently have health insurance will be more likely to believe in the effectiveness of a primary seat belt law versus those without health insurance.**

NHTSA (2008) found that those drivers in primary law states were exposed to a higher amount of enforcement campaigns and higher fines for non-seat belt use than secondary law states. Campaigns use evidence and videos to show the risks associated with not wearing a seat belt. While similar advertisements are used throughout the United States, primary law states use them more than secondary law states. The higher enforcement in primary seat belt law states has led to an increased belief in the effectiveness of seat belts in primary law states versus secondary law states (NHTSA, 2008). Therefore, this comparison served to determine whether there was a significant difference in primary law effectiveness belief between primary law state residents and secondary law state residents.

Driving behaviors are learned and are based on a combination of parental modeling, taught behaviors, and traffic culture. Peers affect learned driving behaviors more than parents do (Birru et al., 2016). Driving behaviors are individualistic in nature and were a covariate in the study. Therefore, driver behavior is a micro level behavior. Driver errors can cause crashes and other issues that threaten drivers' own and others' safety. These unsafe behaviors are called: slips and lapses (errors of action), mistakes (errors of intention), and violations (deliberate infringements) in driver behavior (Cordazzo, Scialfa, Bubric, & Ross, 2014). Many drivers believe that they are excellent drivers at all times which is a statistical impossibility (WHO, 2015). Therefore, many drivers do not actively seek to improve their driving skills. Many believe that there is no room to improve and that other drivers are the problem. This cognitive dissonance leads truly bad drivers to blame others for their mistakes so that they can feel more confident about their driving abilities. Unsafe drivers are more likely to break traffic safety laws and therefore may be more likely to dispute their importance. Since no studies were found to have investigated the relationship between driver behavior and seat belt law effectiveness belief, Exploratory Question 2 was: **Will those drivers who engage in more errors or violations be less likely to believe in primary seat belt law effectiveness than those who are safer drivers?**

Throughout the United States, women are more likely than men to wear a seat belt, and do so more often (Ash et al., 2014; Molnar et al., 2012; Strine, Beck, Bolen, Okoro, Dhingra, & Ballus, 2010). Women tend to take fewer risks and be more concerned about their general safety and well-being than men. In addition, women tend to overestimate their crash risk and injury likelihood while driving while men tend to underestimate their risk (Peltzer, 2011).

Research suggests there could be brain development differences influencing these behaviors, but more research needs to be done to support this. For example, certain areas of men's brains develop at a different rate than the same areas in women's brains; the brain regions affected are responsible for decision making necessary to reduce risk (Glendon, 2011). These regions include the prefrontal cortex, corpus callosum, amygdala, and the hippocampus among other structures. The prefrontal cortex is important for planning and assessing risks and consequences. The corpus callosum integrates sensory, memory storage and retrieval, language, and auditory functions as it connects the left and right hemispheres. The amygdala and hippocampus are associated with survival assessment and emotion modulation. All of these functions are vital to the proper operation of a vehicle and ensuring proper safety assessment in case of a vehicular incident. Young boys in the United States are socialized to be more aggressive and take more risks than girls (Dayton & Malone, 2017). This childhood development impacts them throughout life. Therefore, since women are less likely to be socialized in this manner as children they may be more likely to be taught to drive safely than male drivers. Since several previous studies (Ash et al., 2014; Molnar et al., 2012; Strine, Beck, Bolen, Okoro, Dhingra, & Ballus, 2010) have indicated that women wear seat belts more than men, Hypothesis 2 was: **Women will report wearing seat belts at a higher rate than men.**

Meso. The meso level describes community and organizational factors within a region in a state or country (Özkan & Lajunen, 2011). For example, the driving culture of an urban city may significantly differ from one that is rural. Further considerations at the meso level include typical time of day for busy roadways, the circumstances and reasons behind why drivers are on the roadways at a certain time, and what type of cars they drive. Nonprofessional and young drivers commit more errors and violations, speed more, and are more aggressive than other drivers (Özkan & Lajunen, 2011). By understanding the makeup of the drivers on the roadways of a city, county, or region, it may be possible to determine the likelihood of dangerous driving behaviors. Within a region, there are behaviors that are culturally and behaviorally inappropriate to promoting a safe driving environment. Within a country or community, culture and values influence appropriate traffic safety behaviors. Therefore, such behaviors may be engrained when learning to drive and are not easily changed over time (Özkan & Lajunen, 2011). Cultural ideals and customs affect learned driving behaviors and laws are made because of these accepted ideals.

Urban versus rural differences are important here, too, as a meso level. Birru et al. (2016) investigated seat belt usage differences between two geographic regions of the United States, Appalachia (a rural region) and non-Appalachia. The Appalachia region includes West Virginia and parts of 12 other states in the Eastern United States: Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina, Tennessee, and Virginia (ARC, n.d.). Forty-two percent of the Appalachian population is rural while the national average is twenty percent. Per Birru et al. (2016), seat belt usage rates were lower in Appalachian (81.60%) versus non-Appalachian states (86.90%). Birru et al. (2016) explained that peer influence, lack of enforcement, and lower education level may contribute to lower seat belt usage in Appalachia. The Appalachian region has a unique culture compared to the rest of the United States. Despite abundant natural resources, the residents have greater economic poverty and health issues as compared to the non-Appalachian region. Because many Appalachia communities are isolated, law enforcement may not be as prevalent as in non-Appalachia areas.

This reduced risk of being caught in Appalachia may also contribute to the low seat belt rate. However, for both Appalachian and non-Appalachian states, there are urban, suburban, and rural areas.

There are urban, suburban, and rural regions with the United States that taken at the meso level may have seat-belt use differences. Rural areas are similar in seat belt beliefs to the Appalachian areas of the United States due to rural areas in general having fewer jobs, fewer educational opportunities, and lower cost of living which is related to the lower income level typical of rural areas. Therefore, those residing in rural areas tend to have lower seat belt use and lower primary law effectiveness belief than those residing in urban areas (Perkins et al., 2009). The finding above by Perkins et al. (2009) led to Hypothesis 3: **Those residing in rural areas will report lower seat belt use and lower primary law effectiveness belief than those residing in suburban and urban areas.**

Several factors affect driver interaction within their environment and safety law beliefs. All the factors described above uniquely contribute to traffic culture and driver beliefs. Traffic psychologists, intervention designers, public health organizations, and the public will benefit by knowing what factors contribute most to influencing one's traffic law beliefs and whether such influences could be controlled to improve driver behavior. No previous studies have assessed how driver characteristics, demographics, and other variables interact. Therefore, the following omnibus test was conducted to determine how these factors contribute to self-reported seat belt use and primary law effectiveness belief. Exploratory Question 3 was: **In an overall omnibus model, self-reported driver behavior characteristics, as collected by both subscales of the DBQ, as compared to education level, gender, health insurance status, self-reported**

population density, and state residency will be the best predictor of how effective one believes a primary seat belt law is.

Macro. The macro level includes national factors such as laws and other social norms and economic forces. NHTSA (2016) cited an increase in traffic deaths and initiatives are being implemented to decrease these deaths. The macro level characteristic considered in this study is seat belt law status. Seat belt use positively correlates with primary law effectiveness belief. Therefore, the more one uses a belt the more likely one is to believe in primary law effectiveness. Perkins et al. (2009) specifically found this pattern in Montana, which is a secondary law state. There are fifteen states with secondary seat belt laws (GHSA, 2012; GHSA, 2017). Since Virginia is a secondary law state, it was believed that a positive correlation would be found between primary law effectiveness belief and seat belt use. However, those residing in a primary law state (North Carolina) had an overall higher primary seat belt law effectiveness belief versus secondary law states. Residents of primary law states tend to see more campaigning and targeted enforcement of seat belt use (NHTSA, 2008). Enforcement zones likely increase use and translate to the positive correlation between seat belt use and primary law effectiveness beliefs. In sum, seat belt use positively correlates with increased primary seat belt law effectiveness belief, and that rate is likely to be higher in primary law states versus secondary law states. Therefore, comparing Virginia, a secondary enforcement state, to North Carolina, a primary enforcement state is part of this study.

Magna. The magna level includes eco-cultural and sociopolitical level factors. These include economic, demographic, and latitude (location or place of residence) variables at the international level. Magna level characteristics were not considered in this study. The full traffic culture conceptual framework is shown in Figure 1 below.

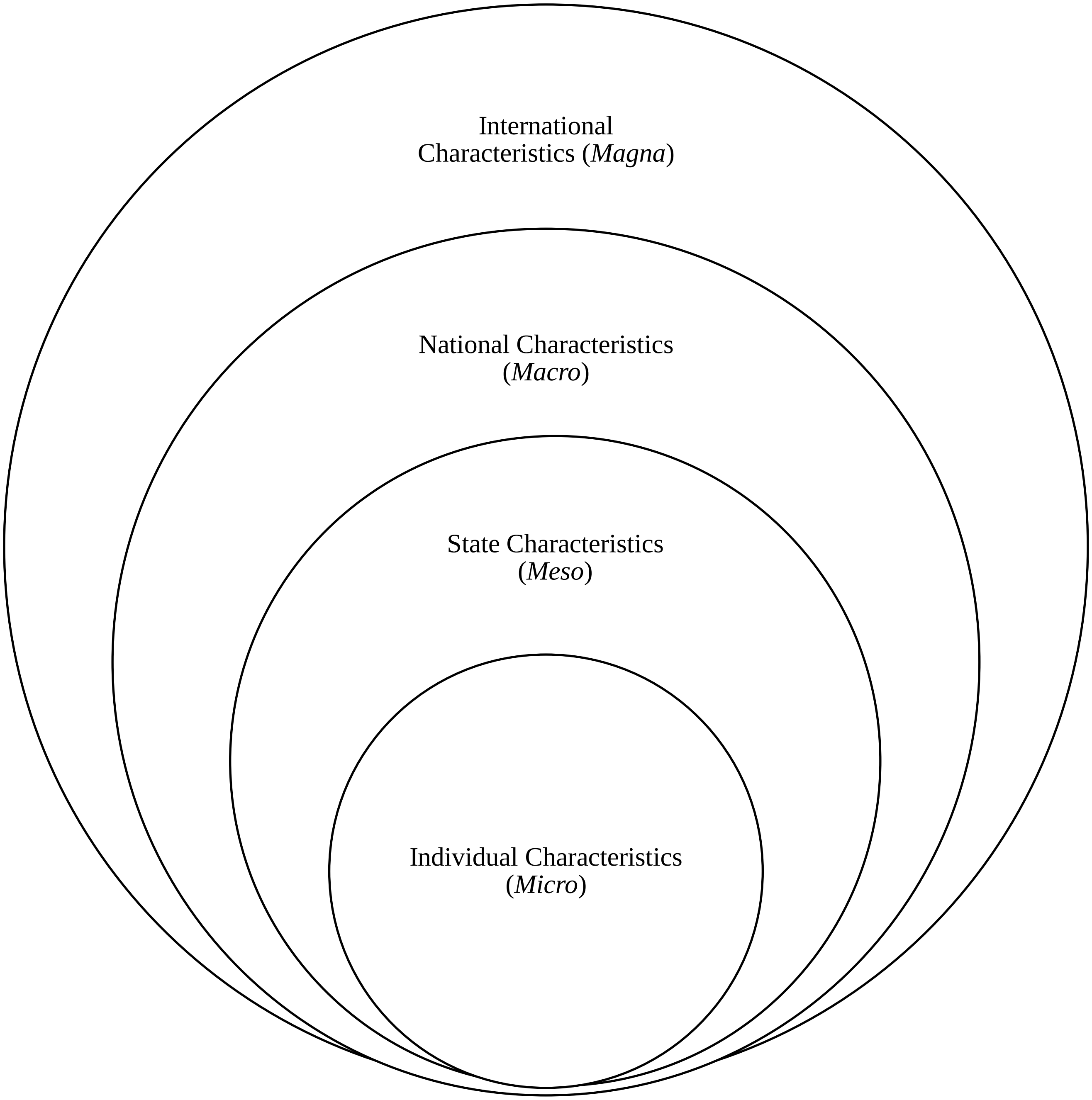

Figure 1. Stacked Venn diagram of Traffic Culture Nested Model. Based on a figure shown in Özkan, T., & Lajunen, T. (2011). Chapter 14: Person and Environment: Traffic Culture. In B. Porter (ed.). Handbook of Traffic Psychology (pp. 179-191). San Diego, CA: Academic Press. Adapted with permission from the publisher (Appendix A).

This study investigated demographics, traffic culture, and primary law effectiveness belief within North Carolina and Virginia. Licensed Virginia and North Carolina drivers completed exclusionary questions, a driver behavior measure, seat belt items, and demographic items via an online Qualtrics survey disseminated via Mechanical Turk.

Hypotheses

The present study investigated the following exploratory questions and hypotheses:

Exploratory Question 1: **How will education level affect how likely one is to believe in primary seat belt law effectiveness?**

Hypothesis 1: **Those that currently have health insurance will be more likely to believe in the effectiveness of a primary seat belt law versus those without health insurance.**

Exploratory Question 2: **Will those drivers who engage in more errors or violations be less likely to believe in primary seat belt law effectiveness than those who are safer drivers?**

Hypothesis 2: **Women will report wearing seat belts at a higher rate than men.**

Hypothesis 3: **Those residing in rural areas will report lower seat belt use and lower primary law effectiveness belief than those residing in suburban and urban areas.**

Exploratory Question 3: **In an overall omnibus model, self-reported driver behavior characteristics, as collected by both subscales of the DBQ, as compared to education level, gender, health insurance status, self-reported population density, and state residency, will be the best predictor of how effective one believes a primary seat belt law is.**

CHAPTER II

METHOD

The current study used a self-report, Internet study with Qualtrics as the platform. The survey was disseminated via Mechanical Turk (MTurk) and maintained participant anonymity. Participation eligibility was limited to North Carolina and Virginia residents who were at least 18 years old and held a valid United States driver's license.

Setting

Virginia and North Carolina were compared due to their similar population size, income, ethnic diversity, and percentage of those with a high school diploma or higher (Molnar et al., 2012). The current population of Virginia is 8.41 million and 10.15 million in North Carolina (United States Census Bureau, 2015). As of 2012, the average income in Virginia was $58,378 versus $43,867 for North Carolina. Some governmental workers with high salaries live in Virginia which may explain this disparity. Ethnic diversity is 70.0% White for Virginia and 71.0% White for North Carolina. Those with a high school diploma or higher was 81.5% in Virginia and 78.1% in North Carolina. As of the 2010 Census, the urban percentage in Virginia was 75.45% and 66.09% in North Carolina. In comparison to other primary law states bordering Virginia, North Carolina was the closest to being demographically similar to Virginia. Therefore, Virginia (secondary law state) and North Carolina (primary law state) were selected because they are demographically similar bordering states that have different seat belt laws.

Participants

MTurk. MTurk is a crowd sourcing platform to collect responses from a diverse population throughout the world (Peer, Brandimarte, Samat, & Acquisti, 2017). Sampling was limited to North Carolina and Virginia. The use of MTurk is debated in the literature and such issues are discussed below. Reasons for using MTurk versus other crowd sourcing platforms or university sampling are also provided.

Payment to participants was at the researcher's discretion. Each participant was paid $1.00 for survey completion. Participants who provided poor data, did not meet exclusionary criteria, or did not follow instructions, did not have to be paid. However, MTurk has a couple of issues that make this platform less appealing to certain researchers (Peer, Brandimarte, Samat, & Acquisti, 2017). First, several participants are professional survey takers. This means that only a certain number of MTurk users are active and complete surveys. It has been argued that a population of 7,000 completes surveys and not 500,000 as MTurk claims. Active users' complete surveys before less active users can see them. A strength is that researchers can cap participation at a certain number and obtain that number quickly. However, such speed can mean that the diversity of the sample will be low and largely compromised of professional survey takers.

Demographically, MTurk is largely comprised of American or Indian females, with an average age of 32, and an income of around $30,000 a year (Shawver, Griffith, Adams, Evans, Benchoff, & Sargent, 2015). This sample composition has led researchers to consider alternate data collection platforms such as CrowdFlower and Prolific Academic (de Winter, Kyriakidis, Dodou, & Happee, 2015; Peer, Brandimarte, Samat, & Acquisti, 2017).

Although MTurk has limitations compared to competitors, it was used because it is widely known, customization and screening was done within the Qualtrics survey link, and payment was not automatic but given based on data quality. A university sample tends to have limited age range, limited geographical variability, and be largely female, which made it not desirable for this study. Male and female participants, residents of Virginia and North Carolina, and education level variability were required for this study. Therefore, MTurk was a better source of variability versus a university sample.

Sampling. G*Power is a free program that allows one to calculate sample size based on power, alpha level, and desired effect size for a variety of statistical tests (Heinrich-Heine-Universität Düsseldorf, 2016). A G*Power analysis for the most involved factorial ANOVA model indicated that 160 participants were sufficient. A medium effect size of $f = 0.25$, equivalent to Cohen's *d* of 0.5 (Cohen, 1992), and power of 0.80 was assumed.

Similar studies that used demographics to study seat belt law beliefs ranged from 200 to over 140,000 participants. This range was due to the resources available and methodology used (Beck & Shults, 2009; Birru et al., 2016; Brijs et al., 2011; Demirer, Durat, & Haşimoğlu, 2012; Gehlert et al., 2014; Perkins et al., 2009). For example, the CDC and NHTSA have a larger research budget and can acquire larger samples. Brijs et al.'s (2011) study on a seat belt campaign to evaluate the psychology behind seat belt use, which had a sample size of 575, was closest to the proposed study. Therefore, to follow G*Power predictions and to ensure enough participants were collected in relation to the advanced model and to the actual budget of the researcher, 200 participants was the goal for this study.

Measures

Participants first read the informed consent form (Appendix B). Consenting participants then completed exclusionary questions (Appendix C). Participants then completed the following measures (order of measures randomly presented): Driver Behavior Questionnaire (DBQ; Appendix D) and seat belt beliefs (Appendix E). Lastly, demographic questions were completed (Appendix F). Measures are discussed in the following order below: criterion, predictors, and covariates. Seat belt use and law effectiveness beliefs were the criteria, demographic variables and state of residence (i.e., also law status) were the predictors. The Driver Behavior Questionnaire (DBQ) subscales (Violations and Errors) were predictors for Exploratory Questions Two and Three. The DBQ Violations subscale was used as a covariate for Exploratory Question One, and for Hypotheses One, Two, and Three.

Seat Belt Items. Fourteen self-designed items assessed seat belt use and law effectiveness beliefs. A five-point Likert scale, 1 (*never*) to 5 (*always*), collected self-reported seat belt use. Reasons why one would not wear a seat belt were asked. Current beliefs about law type in a participant's state, the type of enforcement participants believe would be most effective in increasing use and providing a reason for that response were asked. Beliefs about appropriate enforcement for someone not wearing a belt and why that type of enforcement would be effective were also asked. Definitions for primary and secondary law enforcement were provided to facilitate response. Two additional measures of percentage one uses a seat belt, using a sliding scale of 0 to 100, were collected by asking participants the approximate percentage of the time that they wear a seat belt as a driver and as a passenger. Two other measures, using a sliding scale of 0 to 100, assessed participant primary law effectiveness beliefs in increasing seat belt use overall and their own seat belt use. Another question asked participants to provide a reason that would convince them to consistently wear a seat belt. Previous studies on seat belt use and primary law effectiveness belief have used similar Likert scales and items successfully in their surveys (Beck & Shultz, 2009; Demirer et al., 2012; Perkins et al., 2009). Two of the items were attention checks to ensure participants were reading the questions.

Predictor variables included demographics and both subscales (Errors and Violations) of the Driver Behavior Questionnaire (DBQ).

Demographics. Those demographics not used for exclusionary purposes as described above were completed after the random order completion of the DBQ and seat belt items. These demographics included biological sex, gender, ethnicity/race, age, issuing state of current driver's license, length of time had driver's license, year and state of first driving test, where one was originally from, current city and state of residence, self-reported population density, education level, income level, and health insurance status. Participants also provided additional driving exposure data such as hours and mileage driven per week and road environment that they typically drove in, which road environment they preferred and why, traffic violation info for the past five years, and car crash info (first car crash and most recent). State residency indicated whether a resident lived in a primary seat belt law state (North Carolina) or a secondary seat belt law state (Virginia).

Driver Behavior Questionnaire (DBQ). Cordazzo et al. (2014), adapting earlier versions of the DBQ (Kline, Kline, Fozard, Kosnik, Schieber, & Sekuler, 1992; Lajunen, Parker, & Summala, 2004; Özkan, Lajunen, & Summala, 2006; Parker, Reason, Manstead, & Stradling, 1995; Parker, McDonald, Rabbitt, & Sutcliffe, 2000; Reason, Manstead, Stradling, Baxter, & Campbell, 1990), developed a 36-item North American DBQ to measure slips and lapses (errors of action), mistakes (errors of intention), and violations (deliberate infringements) in driver behavior. An example item for slips and lapses is, "Miss your exit on a highway and have to make a detour." An example item for mistakes is, "Hit something when backing up that you did not see." An example item for violations is, "Check your speedometer and discover that you are traveling faster than the posted speed limit." This scale measures how often drivers commit the behaviors indicated by the statements on a six-point Likert scale: 0 (*never*), 1 (*very rarely*), 2 (*occasionally*), 3 (*often*), 4 (*nearly all the time*) and 5 (*always*).

Because participants were residents of North Carolina or Virginia, this North American version of driving behaviors and context was appropriate to test for the desired driver behaviors. A total of 82 items were considered for the scale. Of the 82 items, 19 were kept from the original Reason et al. (1990) DBQ and 46 were modified for North American context and clarity. These researchers also designed an additional 27 items to include other driving safety related behaviors not captured by earlier versions. Items that were omitted included those that were not related to driving safety, "Lock yourself out of the car with the keys still inside" or behaviors that are uncommon in North America, "Forget which gear you are currently in and have to check with your hand." This gave a total of 105 items to be reviewed by 20 psychologists and used for pilot testing the instrument. These experts provided feedback and five items were added while six items were removed for lack of clarity.

The scale has a two-component solution that accounts for a total variance of 27.06%. The first component was errors and was a combination of slips/lapse and mistakes. As a single scale, this error component has a Cronbach's alpha of 0.86 and an average inter-item correlation average of 0.22. As a single scale, the second component of violations has a Cronbach's alpha of 0.74 and an inter-item correlation average of 0.20. When assessing scale reliability, Cronbach's alpha must be 0.70 or above while inter-item correlation must be low to ensure that multiple items do not assess the same thing (Furr & Bacharach, 2014). This instrument and its previous versions were used to assess risky driving behaviors and provide a reliable assessment of violations, mistakes, and errors. Validity information is currently limited for this instrument.

However, DBQ component scores and self-reported collisions are associated which suggests criterion-based validity for the North American version of the DBQ. The correlations are small for the overall instrument and adding such information does not effectively predict a driver's collision risk. A higher score on the violations component is a significant predictor of self-reported collisions. In the present study, only the Violations subscale of the DBQ was used to control for individual differences in driver behavior. This was due to the high correlation between the Violations and Errors subscales of the DBQ. Since not wearing a seat belt is a law violation, the Violations subscale of the DBQ best measured the constructs in this study.

Procedures

Potential participants read an information sheet (Appendix B). The information sheet clearly stated that confidential information including IP addresses would be collected to indicate whether or not participants completed the survey in Virginia or North Carolina. Participants then completed exclusionary criterion questions to determine eligibility (Appendix C). These exclusionary questions included: Are you 18 years old or older?; Do you live in the United States?; Do you live in either North Carolina or Virginia?; Do you hold a valid United States driver's license?; and Is your license currently suspended or revoked? Ineligible participants were taken to the end of the survey and thanked for their interest in the study. Eligible participants then completed the Driver Behavior Questionnaire (DBQ; Cordazzo et al., 2014; Appendix D) and the seat belt items (Appendix E) in a random order. Attention checks were built into the seat belt items, DBQ, and demographic sections. These checks assessed whether participants were reading the questions (e.g., If you are reading this, select primary). Participants then completed additional demographic information (Appendix F). Participants were thanked for their time and participation upon completion. If the data were determined to be of good quality, participants received $1.00 compensation. Good quality meant that participants answered all items and did not fail more than two of the six attention checks. Participants could withdraw at any time. However, given the setup in MTurk and the methods used to maintain participant identity separation from the data, it was not possible to stop or retrieve a payment to participants for poor data once payment had been provided to them.

CHAPTER III

RESULTS

Data cleaning removed participants who did not fit the exclusionary criteria and those who did not complete the survey. Geographic data from MTurk filtered out those participants whose geographic data indicated that the survey was completed in neither Virginia (VA) nor North Carolina (NC). Participants who did not have locator information for either state or stated that they did not live in VA or NC were also excluded. The coordinates collected by Qualtrics were placed on a Google Map by participant number to determine where the survey was completed. Those who did not have GPS coordinates in either VA or NC, those who missed any DBQ ratings, those who failed two of the six attention checks, and those who did not answer questions required for hypotheses (education, gender, overall seat belt law effectiveness sliding scale question, self-reported belt use as a driver sliding scale question, state residency, health insurance, or the population density question) and those that did not answer any exclusionary questions were excluded from the analysis. Because 422 participants were collected and only 200 were needed per the power analyses, the author was able to be conservative and rigid when evaluating participant eligibility. Analyses were conducted using the most recent SPSS version that was available to the researcher.

Demographics

Four hundred twenty-two participants were collected via Amazon’s Mechanical Turk. Data cleaning, as described above, left 324 participants for analysis. Fifty-eight of the 98 excluded participants were either from other US States, other countries, or had no GPS coordinates; 30 participants were excluded for missing any DBQ ratings, leaving 10 participants who were excluded for additional reasons as listed above. Table 1 below lists the demographics of the participants.

Next, the author assessed the data for normality. Skewness and kurtosis were examined for all variables via the skewness and kurtosis option in SPSS descriptive variable section (SPSS Inc., 2009). To determine if skewness and kurtosis were outside of the acceptable range, a z-score was calculated for each continuous variable to be used in the analyses. If the skewness statistic divided by the standard error of skewness or kurtosis statistic divided by the standard error for kurtosis was above a z-score of 3, indicating that the variable was either skewed or kurtotic outside the acceptable range, a transformation was conducted on those variables (Tabachnick & Fidell, 2013). Variables requiring transformation after assessing for normality via SPSS were: the DBQ scale errors subscale component score, the DBQ violations subscale component score, the sliding scale question for "How effective do you believe a primary law would be in increasing overall seat belt use?" and the sliding scale question for "As a driver, approximately what percentage of the time do you wear a seat belt?" The skewness for the DBQ Errors subscale score was positive, the skewness for the DBQ Violations subscale score was positive, and the skewness of the effectiveness belief percentage was negative. The following transformations were conducted via SPSS on the variables described above: Inverse, log 10, square root, reflect, reflect and inverse, reflect and log 10, and reflect and square root. Inverse transformations are conducted by taking 1 divided by the appropriate variable, log 10 and square root perform those functions on the appropriate variable, and reflect transformations require using the highest score of the variable, adding one to the value, and then subtracting the original value of the variable. The transformations where reflection and another function were done were conducted the same way as the inverse, square root, and log 10 transformations except the transformed reflect variable was used instead. Skewness and kurtosis were examined for all transformed variables via the skewness and kurtosis option in SPSS descriptive variable section (SPSS Inc., 2009). Those transformations with the lowest z-score for skewness and kurtosis were used for analysis.

The transformed variables were used in analyses, as were the raw data to determine if there were resulting differences in outcomes. There were no meaningful differences in results when using transformed or raw data; therefore, the raw data were retained and are reported from this point forward.

Unfortunately, the skewness for percentage of time that one wore a belt as a driver was very negative. Based upon visual inspection of the distribution of the percentage of time one wore a belt as a driver, this variable needed to be recoded into a dichotomous one. This variable was recoded as follows: those that did not always wear a seat belt as a driver (less than 100%) were recoded as 0 and those that wore a seat belt as a driver at all times (answered 100%) were recoded as 1.

The previously described continuous self-reported seat belt use as a driver variable that was changed into a dichotomous variable was maintained in all analyses involving self-reported seat belt use. Specifically, the dichotomous variable was the outcome variable used in a logistic regression analysis for Hypothesis 2 which dealt with gender and self-reported seat belt use as a driver. It was used in a logistic regression for Hypothesis 3 which analyzed self-reported seat belt use a driver as it related the state residency, population density, and their interaction with DBQ Violations subscale as a covariate.

The DBQ Violations subscale component score was used as a covariate in the relevant analyses as described below. Both Violations and Errors were intended to be used as covariates;

however those scales' high correlations rendered using both redundant. The Violations subscale was chosen over the Errors subscale because seat belt non-use is a legal issue and therefore those not wearing a seat belt are violating the law. According to Table 2 below, 43.69% of the variance in Errors subscale was accounted by the Violations subscale of the DBQ. Table 2 below illustrates the Pearson correlations between all variables used in the following analyses.

Table 1. *Descriptive Statistics*

	N (%)	*M*	*SD*
Age	324		
18-25	46 (14.19)		
26-34	114 (35.19)		
35-44	77 (23.77)		
45-54	46 (14.19)		
55-64	32 (9.88)		
65 and over	9 (2.78)		
Sex	324		
Male	112 (34.57)		
Female	212 (65.43)		
Residency	324		
Virginia	149 (45.99)		
North Carolina	175 (54.01)		
Income	324		
Less than $25,000	85 (26.23)		
$25,001-$50,000	105 (32.41)		
$50,001-$75,000	70 (21.61)		
$75,001-$100,000	30 (9.26)		

Table 1. *Continued.*

	N (%)	*M*	*SD*
More than $100,000	34 (10.49)		
Ethnicity	324		
Asian	8 (2.47)		
Black	41 (12.65)		
Indian	2 (0.62)		
Middle Eastern	1 (0.31)		
Native American	4 (1.24)		
White (Hispanic or Latino)	20 (6.17)		
White (Not Hispanic or Latino)	236 (72.84)		
Biracial	7 (2.16)		
More than Two Ethnicities	5 (1.54)		
Education	324		
Associate's Degree or Less	145 (44.75)		
Bachelor's Degree or Higher	179 (55.25)		
Seat Belt Law Beliefs			
Average Primary Seat Belt Law Effectiveness Percentage Belief Percentage in Increasing Seat Belt Use Overall	324	71.42	23.34

Table 1. *Continued.*

	N (%)	*M*	*SD*
Average Primary Seat Belt Law Effectiveness Belief Percentage in Increasing Their Own Seat Belt Use	305	68.48	38.91
Seat Belt Usage			
Number of People That Said That They Always Wear Their Seat Belt as a Driver	199 (61.80)		
Number of People That Said That They Always Wear Their Seat Belt as a Passenger	179 (55.59)		
Traffic Violations			
Number of People with Traffic Violations within the Past Five Years	64 (19.75)		

Table 2. *Pearson Correlation Matrix*

	1	2	3	4	5	6	7	8
1. Seat Belt Law Effectiveness Percentage	---							
2. Self-Reported Seat Belt Use as a Driver	.040	---						
3. Education Level	-.142*	.031	---					
4. Health Insurance Status	-.011	-.072	-.239**	---				
5. State Residency	-.094	-.142*	-.029	-.013	---			
6. Gender	-.041	.003	-.041	.016	-.032	---		
7. Errors	-.116*	-.235**	.135*	-.016	.099	-.052	---	
8. Violations	-.018	-.277**	.114*	-.051	.108	-.196**	.661**	---

Note. The following variables were measured dichotomously: Self-reported seat belt use as a driver (0 was did not always wear seat belt as a driver and 1 was always wore seat belt as a driver), Education level (0 was Associate's degree or less and 1 was Bachelor's degree or higher), health insurance status (0 was Yes and 1 was No) state residency (0 was North Carolina (NC) and 1 was Virginia (VA)), and Gender (0 was male and 1 was female). Errors and Violations are subscales of the Driving Behavior Questionnaire (DBQ). Reported Pearson's r's are raw and not corrected for alpha inflation.
* $p < .05$. ** $p < .01$.

*Exploratory Question 1***:** How will education level affect how likely one is to believe in primary seat belt law effectiveness?

Primary seat belt law effectiveness belief was compared for those with a lower level of education versus those with a higher level of education using the Violations component score of the DBQ as a covariate in ANCOVA. The sliding scale question, "How effective do you believe a primary law would be in increasing overall seat belt use?," measured as a percentage from 0 to 100, was the dependent variable for this analysis. Education level was dichotomized for the analysis. Lower education was designated as Associate's degree or less (coded as 0) and higher education was designated as Bachelor's degree or higher (coded as 1).

The results indicated that the average percentage of primary law effectiveness belief in increasing overall seat belt use was 75.08% for those with an Associate's degree or less and was 68.45% for those with a Bachelor's degree or higher. Education level significantly predicted primary law effectiveness belief, $F(1, 321) = 6.46$, $p = .012$, $\eta^2 = .02$ (note: results showed heterogeneity of variance, but as mentioned above transformed data did not produce meaningful differences from raw data; the decision was made to keep and report the raw data for ease of interpretation). Based on the percentages above, and F-test, those with a lower level of education (Associate's degree or less) believed significantly more in the effectiveness of a primary seat belt law in increasing overall seat belt use versus those with a higher level of education (Bachelor's degree or higher). Table 3 below shows the univariate test results.

Table 3. *One-Way Analysis of Co-Variance of Primary Effectiveness Law Belief by Education with DBQ Violations Subscale as a Covariate*

Source	*df*	*SS*	*MS*	*F*	*p*	η_p^2
Sum of DBQ Violations	1	0.84	0.84	0.02	.968	<.001
Education Level	1	3469.03	3469.03	6.46	.012	.020
Error	321	172386.41	537.03			
Total	323	175914.75				

Note. DBQ stands for Driver Behavior Questionnaire.

Hypothesis 1. Those that currently have health insurance will be more likely to believe in the effectiveness of a primary seat belt law versus those without health insurance.

Primary seat belt law effectiveness belief was compared between those that currently have health insurance (coded as 0) versus those that currently do not have health insurance (coded as 1) using the Violations component score of the DBQ as a covariate using an ANCOVA. The sliding scale question, “How effective do you believe a primary law would be in increasing overall seat belt use?,” measured as a percentage from 0 to 100, was the dependent variable for this analysis.

The results indicated that the average percentage of primary law effectiveness belief in increasing overall seat belt use was 71.51% for those with health insurance versus 70.65% for those without health insurance. Health insurance status did not significantly affect primary law effectiveness belief, $F(1, 321) = 0.05$, $p = .826$, $\eta^2 = < .001$. The homogeneity of variance assumption was not violated. These results indicated that whether or not one has health insurance does not significantly relate to their belief in the effectiveness of a primary seat belt law in increasing overall seat belt use. Table 4 below shows the univariate test results.

Table 4. *One-Way Analysis of Co-Variance of Primary Effectiveness Law Belief by Insurance with DBQ Violations Subscale as a Covariate*

Source	*df*	*SS*	*MS*	*F*	*p*	η_p^2
Sum of DBQ Violations	1	63.29	63.29	0.12	.734	<.001
Health Insurance Status	1	26.48	26.48	0.05	.826	<.001
Error	321	175828.96	547.75			
Total	323	175914.75				

Exploratory Question 2. Will those drivers who engage in more errors or violations be less likely to believe in primary seat belt law effectiveness than those who are safer drivers?

A regression analysis was performed to determine how the DBQ subscale scores (Errors and Violations) on a continuous scale related to how likely one was to believe in primary law effectiveness. A reverse relationship was expected such that those with higher DBQ subscale scores were more likely to have lower primary law effectiveness belief than those with lower DBQ subscale scores. The analysis used the sliding scale question, “How effective do you believe a primary law would be in increasing overall seat belt use?” Higher DBQ subscale scores indicate higher likelihood of engaging in more errors or violations than those with lower DBQ subscale scores. DBQ Violations and Errors components were measured in self-reported frequency on a Likert scale.

The correlation between primary seat belt law effectiveness and the Errors subscale of the DBQ was significant while the correlation between primary seat belt law effectiveness

Violations subscale of the DBQ was not significant. This was reverse relationship between DBQ scores and primary seat belt law effectiveness belief as expected. A multiple linear regression was calculated to predict primary law effectiveness belief (DV) based on DBQ (IV) scores. A significant regression equation was found $F(2, 321) = 3.22$, $p = .041$, with an R^2 of .02.

As drivers scored higher on the DBQ Error subscale their primary law effectiveness belief in increasing overall seat belt use significantly decreased. Those drivers that committed more errors while driving were significantly less likely to believe in the effectiveness of a primary seat belt law in increasing overall seat belt use. This pattern was as expected. While drivers that scored higher on the DBQ Violations component subscale showed an increase in their primary law effectiveness belief in increasing overall seat belt use percentage, it was not significant. The direction of this difference was opposite to what was expected. It was expected that those drivers with fewer violations would believe more in the effectiveness of a primary seat belt law in increasing overall seat belt use. Table 5 below displays the regression results.

Table 5. *Regression Analysis for DBQ (Violations and Errors) Measuring Primary Seat Belt Law Effectiveness Belief*

Source	*B*	*β*	*t*	*p*
Sum of DBQ Errors	-.515	-.185	-2.52	.012
Sum of DBQ Violations	.613	.104	1.41	.159

$R^2 = .02$

Hypothesis 2. Women will report wearing seat belts at a higher rate than men.

A logistic regression model was used to determine how gender and one's score on the DBQ Violations subscale affected seat reported seat belt use as a driver. The analysis used the sliding scale question, "As a driver, approximately what percentage of the time do you wear a seat belt?" Due to the dichotomous distribution for this question as indicated above, this question was recoded for analysis: those that answered less than 100 (did not always wear belt; coded as 0) and those that answered 100 (always wore belt; coded as 1). Gender was male (coded as 0) versus female (coded as 1) for this analysis. The DBQ Violations subscale score significantly affected self-reported seat belt use as a driver. For every point increase on the DBQ Violations subscale score, a driver was .85 as likely to report always wearing a seat belt. Gender did not significantly affect the likelihood of a driver reporting that they always wore their belt. Table 6 below displays the logistic regression results.

Table 6. *A Logistic Regression Model of Self-Reported Seat Belt Use a Driver as Related to Gender and DBQ Violations Subscale*

Variable	Wald	OR	95% CI
Sum of DBQ Violations	23.29***	0.85	[0.80, 0.91]
Gender	0.97	1.29	[0.78, 2.14]
Female (1) vs. Male (0)			

Note: N = 322 drivers with complete data. Constant not shown in model.

****p* < .001

Hypothesis 3. Regardless of state residency, those residing in rural areas will report lower self-reported seat belt use as a driver and lower primary law effectiveness belief than those residing in suburban and urban areas.

Because self-reported seat belt use a driver was transformed into a dichotomous variable, a logistic regression model was used to determine how state residency, self-reported population density, and one's score on the DBQ Violations subscale affected how likely a driver was to state that they always wore their seat belt while driving. The analysis used the sliding scale question, "As a driver, approximately what percentage of the time do you wear a seat belt?" Due to the dichotomous distribution for this question as indicated above, this question was recoded for analysis: those that answered less than 100 (did not always wear belt; coded as 0) and those that answered 100 (always wore belt; coded as 1). State residency was North Carolina (coded as 1) versus Virginia (coded as 0) for this analysis. Population density was rural (coded as 1), suburban (coded as 2), and urban (coded as 3) for this analysis (particular vectors tested are noted in Table 7).

The DBQ Violations subscale score significantly affected self-reported seat belt use as a driver. For every point increase on the DBQ Violations subscale score, a driver was .86 as likely to report always wearing a seat belt. Neither state residency nor population density significantly affected the likelihood of a driver reporting that they always wore their belt. Neither did the interaction of state residency and population density. Table 7 below displays the logistic regression results.

Table 7. *A Logistic Regression Model of Self-Reported Seat Belt Use a Driver as Related to State Residency, Population Density, and DBQ Violations Subscale*

Variable	Wald	OR	95% CI
Sum of DBQ Violations	20.60***	0.86	[0.80, 0.92]
State Residency	2.55	2.64	[0.80, 8.67]
North Carolina (1) vs. Virginia (0)			
Population Density	0.33		
Rural (1) vs. Urban (0)	0.08	0.85	[0.27, 2.67]
Suburban (1) vs. Urban (0)	0.04	1.10	[0.44, 2.74]
State Residency by Population Density	1.28		
North Carolina (1) by Rural (1)	0.11	0.77	[0.16, 3.63]
North Carolina (1) by Suburban (2)	1.04	0.50	[0.13, 1.90]

Note: N = 321 drivers with complete data. Constant not shown in model.

***$p < .001$

A 2 (state: Virginia vs. North Carolina) x 3 (population density: rural vs. suburban vs. urban) ANCOVA was conducted to determine primary law effectiveness belief in increasing seat belt use overall among rural, suburban, and urban areas of Virginia versus North Carolina to determine where the differences were. The covariate used was the Violations subscale component score of the DBQ. This 2x3 ANCOVA indicated that there was not a significant state residency difference on primary seat belt law effectiveness belief, $F(1, 316) = 1.81$, $p = .180$, $\eta^2 = .006$, there was not a significant population density difference on primary seat belt law effectiveness belief, *F*(2, 316) = 1.16, $p = .316$, $\eta^2 = .007$, and there was not a significant state residency by population density interaction on primary seat belt law effectiveness belief *F*(2, 316) = .26, $p = .769$, $\eta^2 = .002$. The hypothesis was not supported. Table 8 below displays the raw means, standard deviations, and group sizes of primary seat belt law effectiveness belief percentages by state residency and population density. Table 9 below displays the adjusted means and standard errors of primary seat belt law effectiveness belief percentage by state and population density using the DBQ Violations subscale component scale as a covariate. Univariate test results are shown in Table 10.

Table 8. *Primary Seat Belt Law Effectiveness Belief Percentages in Increasing Overall Seat Belt Use by State and Population Density*

State Residency	*M*	*SD*	N
North Carolina	73.44	22.59	174
Rural	77.15	20.12	55
Suburban	70.81	24.25	89
Urban	74.33	21.37	30
Virginia	69.04	24.12	149
Rural	69.96	29.36	27
Suburban	67.91	23.25	96
Urban	72.27	21.84	26
Total	71.41	23.37	323
Rural	74.78	23.62	82
Suburban	69.30	23.71	185
Urban	73.43	21.42	56

Note: Means shown in the table above are raw.

Table 9. *Adjusted Primary Seat Belt Law Effectiveness Belief Percentages in Increasing Overall Seat Belt Use by State and Population Density*

State Residency	*M*	*SE*
North Carolina	74.11	1.96
Rural	77.12	3.16
Suburban	70.80	2.48
Urban	74.42	4.27
Virginia	70.06	2.29
Rural	69.92	4.51
Suburban	67.93	2.39
Urban	72.33	4.61

Note: Means shown in the table above are adjusted based on the Violations subscale component score being a covariate in the model.

Table 10. *Factorial Analysis of Co-Variance of Primary Law Effectiveness Belief by State Residency and Population Density*

Source	*df*	*SS*	*MS*	*F*	*p*	η_p^2
Sum of DBQ Violations	1	7.01	7.01	.01	.910	<.001
State Residency	1	986.24	986.24	1.81	.180	.006
Population Density	2	1263.37	631.69	1.16	.316	.007
State Residency by Population Density	2	287.09	143.54	.26	.769	.002
Error	316	172531.18	545.99			
Total	322	175908.06				

Exploratory Question 3. In an overall omnibus model, self-reported driver behavior characteristics, as collected by both subscales of the DBQ, as compared to education level, gender, health insurance status, self-reported population density, and state residency will be the best predictor of how effective one believes a primary seat belt law is.

An omnibus test was conducted via multiple regression to determine how individual characteristics affect primary seat belt law effectiveness**.** To demonstrate which demographic factors were most influential in affecting primary seat belt law effectiveness belief, a regression model was used to determine the change in variance explained in primary seat belt effectiveness belief. Factors considered in the model were based on the hypotheses above and included gender (self-identified Male or Female), education level (Associate's degree or less versus Bachelor's degree or higher), health insurance status (Yes or No), state residency (Virginia vs. North Carolina), population density (rural vs. suburban vs. urban), and driver behavior. Driver behavior, as collected by both subscales (Errors and Violations) of the DBQ, was predicted to be the best predictor of primary seat belt law effectiveness belief because how one drives tends to influence their law effectiveness beliefs.

Results indicated that the best predictor of primary seat belt law effectiveness was the sum of the DBQ Errors scale component with a standardized beta weight of -.158. The r squared change was .014 which indicated that when the sum of the DBQ errors component was added after all the other variables, it uniquely explained 1.40% of the variance in primary seat belt law effectiveness belief percentage. For education level, the standardized beta weight was -.147. The r squared change was .019 which indicated that when education level was added after all the other variables, it uniquely explained 1.90% of the variance in primary seat belt law effectiveness belief percentage. These results indicated that the hypothesized result was not supported. The author was correct about the DBQ Errors subscale being a significant contributor to the model but incorrect about the significance of the DBQ Violations subscale. The significant contributors to the omnibus model were: Education level (coded as 0 for Associate's degree or less, 1 for Bachelor's degree or higher) and the sum of the DBQ Errors subscale with change in r squared values of .019 and .014, respectively. Based on p values, no other variables were significant contributors to the model. Based on standardized beta weights, driving behaviors as measured by the Errors subscale of the DBQ was the best predictor for how effective one believes a primary seat belt law would be in increasing overall seat belt use. Table 13 below shows the contribution of all variables to the omnibus model.

Table 11. *Omnibus Model of Primary Seat Belt Law Effectiveness Percentage Changes by Demographic Variable*

Variable	Standardized Beta	R Square Change	*p*
Education Level	-.147	.019	.012*
Gender	-.037	.001	.511
Health Insurance Status	-.044	.002	.437
Population Density	.001	<.001	.983
State Residency	-.096	.009	.087
Sum DBQ Errors	-.158	.014	.034*
Sum DBQ Violations	.104	.006	.170

Note. The following variables were measured dichotomously: Education level (0 was Associate's degree or less and 1 was Bachelor's degree or higher), Gender (0 was male and 1 was female health insurance status (0 was Yes and 1 was No), and state residency (0 was North Carolina (NC) and 1 was Virginia (VA)). Population density was self-report and measured with three levels: Rural, suburban and urban. Sum of DBQ Errors and Sum DBQ Violations were based on the total sub score of the respective subscale of the Driver Behavior Questionnaire (Cordazzo et al., 2014). Standardized Beta is the final beta when all variables are in the model. R squared change is when the respective variable is entered last in the model.
*$p < .05$

Certain demographics are robust predictors of primary seat belt law effectiveness belief or for self-reported seat belt use. For primary seat belt law effectiveness, education level was a significant predictor while health insurance status, state residency, gender, and population density were not. The significant predictors for primary seat belt law effectiveness belief percentage in increasing overall seat belt use was education level and the sum of DBQ Errors scale for the overall omnibus model. For self-reported seat belt use as a driver, DBQ Violations was a significant predictor, while gender, state residency, and self-reported population density were not. The summary of hypotheses results is shown below in Table 12.

Table 12. *Summary of Hypotheses Results*

Hypothesis	Test, Result	Supported?
EQ1: Education	ANCOVA, Significant	Yes
H1: Health Insurance	ANCOVA, Not significant	No
EQ2: DBQ Errors and Violations	Regression, Significant	Partially, Errors-Yes, Violations-No
H2: Driver Belt Use and Gender	Logistic regression, Not significant	No
H3: Population and State Differences on Self-Reported Seat Belt Use as a Driver and Law Effectiveness Beliefs	Regression for seat belt, only Sum of DBQ Violations was significant	No
Rural lowest on both measures.	ANCOVA for law effectiveness, Not significant	No
EQ3: Omnibus Model Both subscales of DBQ predicted to be significant	Two significant predictors, Education and DBQ Errors	Partially, DBQ Errors-Yes Violations-No

Note: EQ = Exploratory Question, H = Hypothesis.

CHAPTER IV

DISCUSSION

The purpose of this study was to determine how demographics such as education (Associate's or less versus Bachelor's or higher), health insurance status (Yes or No), driving behaviors (measured by the Errors and Violations subscales of the Driver Behavior Questionnaire (DBQ)), population density of where one lives (rural, suburban, and urban), and the type of seat belt enforcement law state one lives in (primary North Carolina versus secondary Virginia) correlated with primary seat belt law effectiveness belief. A further purpose was to determine how population density, state residency, and gender correlated with self-reported seat belt use as a driver. The work was completed to further the traffic culture framework hypothesized by Özkan and Lajunen (2011) and add to findings from Perkins et al. (2009). Per Özkan and Lajunen, individual (micro), regional (meso), and state (macro) characteristics are an integral part of traffic culture. Understanding the importance of the variables and levels investigated in this study can help guide future studies to understand law beliefs and interventions designed to increase seat belt use.

Education level and the sum of the Errors component of the Driver Behavior Questionnaire (DBQ) (Cordazzo et al., 2014) were the two significant predictors of primary seat belt law effectiveness belief found in this study. Education level was inversely related to primary law effectiveness belief percentage; beliefs in effectiveness increased as education level decreased. The author will spend time explaining each major finding and lack of findings below.

Education Level

Education was significantly related to how effective one believed a primary seat belt law would be in increasing overall seat belt use. Participants with a lower education level (Associate's or less) believed more in the effectiveness of a primary law in increasing overall seat belt use compared to those with higher levels of education (Bachelor's or higher). This result concurred with Perkins et al. (2009). The current study dichotomized its sample at the Associate's degree level to allow approximations of equal sample size in the two groups, which psychometrically is more desired for analytic and interpretative assumptions (Cohen, 1992; Tabachnick & Fidell, 2013). In addition, education levels were distributed roughly equivalently in both states of interest.

Law makers could interpret the finding as indicating that education about the importance of the law is sufficient during the earlier education years but tends to wane during college. This could be due to their parents telling their children seat belts are safe, their viewing of safety videos during elementary and middle school years, and stressed importance of safety behavior during early formative years. However, if one decides to proceed with obtaining a higher education level, these adults now have far more independence, less influence from their parents, as well as time and access to resources that can help develop independent thinking. This finding adds to the literature that the public believes that a primary law is effective in increasing overall seat belt use, this primary law in turn helps to reduce fatalities. Policymakers may want to proceed by developing a more stringent law to reduce fatalities while educators can ensure that seat belt safety curriculum is developed for use at each education level. In addition, these results help add to the literature that the public believes that a primary seat belt law is effective in increasing seat belt use overall.

Health Insurance Status

The current study used health insurance status to assess health. Health insurance is a good proxy to measure health because those with health insurance have the ability to take better care of their health issues than those without health insurance. In addition, those with health insurance typically support laws that have a direct impact on public health (i.e. seat belt law status). However, health insurance status had no significant relationship with how effective one believed a primary seat belt law would be in increasing overall seat belt use. The groups mean differences, even if not statistically significant, were in the same direction as Perkins et al. (2009). Specifically, they found that a higher percentage of individuals with health insurance supported a primary law versus those without health insurance. This finding remains to be validated in future work.

In the meantime, the author can offer several factors that may have affected the power of this analysis. The sample size of those with health insurance (N = 290) versus those without health insurance (N = 34) was certainly a factor. In one way, it is good that majority of participants had insurance; however the disparate sample sizes may have affected the analysis model's power to test this hypothesis. Interestingly, Perkins also had a large sample size difference between those with health insurance versus those without health insurance, leading to the question about the effect found in Montana versus what was found 10 years later in Virginia and North Carolina. What other factors played a role here, such as state of residence and income level would need further consideration in additional work on the topic.

Another measurement that could be useful in assessing a state's overall health would be McDaniel's (2006) state health scores. While not used in the current study (there were only two states in this sample, and McDaniel's work is best used for a larger sample of states), these scores were used by Ash et al. (2014) to measure differences between states on positive health behaviors. Health is an important part of culture and must be considered as part of the traffic culture framework (Ash et al., 2014; Özkan & Lajunen, 2011).

Gender

The author found no significant gender difference in self-reported seat belt use as a driver. Such a result appears counterintuitive to what is typically observed. Several previous studies have found a significant difference between genders on seat belt use (Ash et al., 2014; Molnar et al., 2012; Strine et al., 2010). Due to the coding of the self-reported seat belt as a driver variable into a dichotomous one, it is likely that the variance between the genders was reduced. Since 61.61% of men always wear their seat belt as a driver while 61.90% of women do; there was a 0.29% difference between the genders. Due to this, it is unlikely a significant difference could have been found between the genders.

Several previous studies have found a significant difference between genders on seat belt use (Ash et al., 2014; Molnar et al., 2012; Strine et al., 2010). Given the findings of the present study are counter-indicated by several previous studies, future studies exploring this relationship must attempt to replicate this current finding. This study alone must not be used to indicate or illustrate a non-significant relationship between the genders on seat belt use.

State of Residence

Most participants regardless of state residency believed that a primary seat belt law was effective in increasing overall seat belt use. In addition, those residing in a primary law state (North Carolina) had a significantly higher rate of belief in the effectiveness of a primary law versus those living in a secondary law state (Virginia). This indicates that those that live in a primary law state find the law to be more effective in increasing overall seat belt use than those residing in secondary seat belt law states. This is likely due to greater enforcement and fines for not wearing a seat belt and a traffic culture that enforces seat belt use in primary seat belt law states (NHTSA, 2008; Özkan & Lajunen, 2011). The maximum fine for first offense in the primary law enforcement state North Carolina is $25.50 plus $135.50 in court costs; while the fine is $25 in secondary law enforcement state Virginia (GHSA, 2017). All drivers violating this law in North Carolina are assessed the court costs and must pay the total amount of $161 (North Carolina Department of Public Safety, 2019). However, these court costs may be dropped if they decide to go to court. The traffic culture of a primary law state more strongly enforces seat belt use compared to secondary states. The law strength is the important difference between these states and the current study demonstrates that a primary seat belt law is believed to be more effective at increasing seat belt use overall than a secondary seat belt law (NHTSA, 2008).

Population Density and State of Residence: Impact on Self-Reported Seat Belt Use

In contrast to previous research (ARC, n.d; Birru et al., 2016; Perkins et al., 2009), self-reported seat belt use in this study was not significantly associated with neither self-reported population density nor state of residence (limited to Virginia vs. North Carolina). Self-reported population density and state residency did not significantly increase the likelihood that one reported always wearing their seat belt as a driver. This is likely an artifact of categorizing the self-reported seat belt use as a driver variable into a categorical dichotomous one. This categorization was done due to the original distribution of the variable exhibiting dichotomy. One possible explanation is the dichotomization of the self-reported seat belt use as a driver variable rendered insufficient variance remaining to be explained by state residency or population density.

Population Density and State of Residence: Impact on Effectiveness

Based on previous research, belief in effectiveness of a primary seat belt law was expected to be associated with population density of where one lives (ARC, n.d.; Birru et al., 2016; Perkins et al., 2009). It was expected that those residing in rural areas would have the lowest effectiveness belief. However, suburban areas had the lowest percentage belief in the effectiveness of a primary seat belt in increasing overall seat belt use, but there were no significant differences among the population density levels. This null finding is likely due to the relatively uniform percentage belief amongst states and population levels as shown in Table 9 above. Based on these percentages, most people believe that a law has positive effect on increasing belt use and negative effect on unsafe driving (NHTSA, 2008). Lawmakers could understand that this study adds to the evidence that many drivers in a secondary law state believe in the effectiveness of a primary law, allowing political support (and reasonable expectations for improved safety) in enacting a primary law.

Limitations

There were several limitations for this study. Effect sizes were small for all hypotheses. The small effects raised two questions. First, estimated power analyses were overly optimistic, and n-sizes were insufficient to test most effects. Second, the small effects themselves seem to challenge the importance of these issues (i.e., importance of traffic culture). However, other traffic culture studies that investigated similar topics have had similar effect sizes. Ash, Edwards, Porter (2014) had small to medium effect sizes, that ranged from .004 to .235, in all models using primary seat belt law enforcement status. Another study that correlated the DBQ with variables such as collisions, gender and age also had small effect sizes, which ranged from less than .001 to .25 (Cordazzo et al., 2014). Perkins et al. (2009), the study most similar to the author's study, used confidence intervals and odds ratios. The odds ratios in that study ranged from 0.85 to 4.59; while they ranged from 0.50 to 2.64 in the current study.

According to Borenstein, Hedges, Higgins, and Rothstein (2009), one can convert odds ratios to Cohen's d and then r squared. After conversion, the range of r-squared for Perkins et al.

(2009) was from .23 to .78. The current study used eta squared which is calculated the same way as r-squared and can be directly compared to each other (Maxwell & Delaney, 2004). In the current study, the effect size range for those analyses using the continuous primary seat belt law effectiveness belief variable was from .002 to .05, while it was .14 to .24 for those analyses that used the dichotomous self-reported seat belt use as a driver variable and these effect sizes are smaller as compared to Cordazzo et al. (2014) and Perkins et al. (2009). However, the larger difference in range from Perkins et al. (2009), the most similar study to the current one, may have resulted from using one rural state with a secondary law compared to two states with different law statuses in the current study. It is also plausible that the 10-year span between studies renders the comparison less sound as well due to history effects (Shadish, Cook, & Campbell, 2002).

Another limitation is that the author's study focused on self-reported survey data and participants may have answered in a favorable manner that is societally acceptable (i.e. reporting that they wear their seat belt more than they actually do). However, this was the only viable method to conduct the author's study. In addition, the survey was available online only to those with Internet access, a valid MTurk account, residency in Virginia or North Carolina, a valid driver's license, and being 18 years old or older. Residents of these states without Internet access were excluded, with the possibility the data and findings presented here not fully representing the typical Virginia or North Carolina driver. However, all limitations applied to both states, creating confidence that differences for the states was the result of more than the outcomes of any limitation.

Future Directions

Future studies should focus on updating findings of previous research and what has been found in this study by focusing on more states with secondary laws and pairs of demographically similar states with contrasting seat belt laws (primary versus secondary). This can further develop the traffic culture model and demonstrate the saliency of demographics used in previous studies and the current study. The study that researched a similar topic as the current study is ten years old and did not take multiple states into account (Perkins et al., 2009). In addition, the studies most similar to the author's focused on only one state or one demographic (Demimer et al., 2012; Perkins et al., 2009). Would a focus on a region of states with similar economies and demographics illustrate differences in belief better or in a similar way to a demographically similar pair of states did? Exploring this could further the macro level of the traffic culture model.

Future studies should further examine differences between genders on seat belt use. The null finding in the current study indicates that either gender is less discerning in differences for this topic, or the study's methods were insensitive to detecting differences. Previous literature points to a significant difference between genders on belt use (Ash et al., 2014; Molnar et al., 2012; Strine, Beck, Bolen, Okoro, Dhingra, & Ballus, 2010). This gender difference is salient with other types of behavior (i.e. speeding and drunk driving) and has been shown to be a factor in seat belt use. These next steps can help better explain the findings of this study and further the traffic culture model.

Further questions might include a focus on health-related factors such as the presence or absence of health-related behaviors. Do those that smoke, drink, speed, etc. have a lower or higher seat belt usage rate? Do these factors affect their law beliefs? Are there cultural links among multiple health behaviors? Seat belt use is a health-related behavior and exploring these avenues would be an excellent way to further this study.

Conclusions

Traffic safety culture is important because it provides a framework for issues that affect driver behavior, law beliefs, and law enforcement strength. Based on the omnibus model, 2.90% of the variance in primary seat belt law effectiveness belief can be attributed to education level (1.50%) and the sum of DBQ Errors (1.40%) which indicates that these demographics are significant contributors to how effective one believes a primary seat belt law would be in increasing overall seat belt use and are important demographics to target.

This study furthered data presented on traffic culture and on primary seat belt laws. Variables associated with traffic culture do correlate with seat-belt law beliefs, which allow the possibility that laws can be better designed for effectiveness and acceptance in the future by linking them to the cultures within which they will be enacted. However, much more additional work is required before the research community is ready to claim, with certainty, how best to create laws matched for maximum impact in a particular culture. This study further explains how and why demographics may affect law beliefs and helps show how driver's beliefs may influence how law strength and cultural beliefs correlated with behavior in a certain regional area.

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APPENDIX A. PERMISSION FOR FIGURE

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Book Pages: 189 to 189
Book Chapter number: 14
Book Chapter title: Person and Environment: Traffic Culture

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APPENDIX B. INFORMATION SHEET

Information Sheet
Old Dominion University
College of Sciences
Department of Psychology

Title of Research: Seat Belt Research
Principal Investigator: Bryan E. Porter, Ph.D.
Investigator: Rochelle Rushlow, Applied Psychological Sciences Master's Student

Description of Research: This study requests you to complete a survey dealing with traffic culture, driving behavior, and seat belt beliefs. This will take you approximately 30-45 minutes to complete.

Exclusionary Criteria: You must be at least 18-years-old, live in either Virginia or North Carolina, and hold a valid US driver's license.

Risks and Benefits: There are very few risks to completing this survey. As a participant, you may experience an increased self-awareness regarding your driving behavior as well as an increased understanding of seat belt laws. However, as a benefit, you may also find the survey interesting and you will gain an awareness about how certain psychological studies are conducted. Also, by taking part in this research, you are creating benefits for the Investigator as she completes her thesis regarding seat belt beliefs.

Costs and payments: Participation is entirely voluntary. You, as a survey taker on Mechanical Turk, will receive a $1.00 for satisfactory completion of the survey. Satisfactory completion involves full completion of the driving behavior survey, full completion of the seat belt usage and beliefs items survey, and completion of all the demographic items. All survey takers must be residents of either North Carolina or Virginia and geographic markers must indicate that the survey was taken in either Virginia or North Carolina. **Confidential information including your IP address will be collected to verify location.**

Withdrawal Privilege: You are free to participate in this study or to withdraw at any time. If you wish to withdraw, you may do so without penalty. You may also refuse to answer any question that makes you feel uncomfortable. The investigator also reserves the right to withdraw your participation at any time throughout the investigation.

Contact Information: If you have any further questions concerning this study, please contact Dr. Bryan Porter; (757) 683-3259; bporter@odu.edu.

THANK YOU FOR YOUR ASSISTANCE.

IF YOU AGREE TO THE ABOVE TERMS, CLICK NEXT TO CONTINUE.

APPENDIX C. EXCLUSIONARY DEMOGRPAHIC QUESTIONS

- Are you 18 years old or older?
  - (Choices) Yes, No (if no, exclude and go to end of survey)
- Do you live in the United States?
  - (Choices) Yes, No (If no, exclude and go to end of survey)
- Do you live in either Virginia or North Carolina?
  - (Choices) Yes, No (if no, exclude and go to end of survey)
- Do you hold a valid United States driver's license?
  - (Choices) Yes, No (if no, exclude and go to end of survey)
    - (Follow up) Is your license currently suspended or revoked?
      - (Choices) Yes, No (if yes, exclude and go to end of survey)

APPENDIX D. DRIVER BEHAVIOR QUESTIONNAIRE (DBQ) (CORDAZZO ET AL., 2014)

This version of the DBQ has two subscales: Errors and Violations. Errors are coded as E and Violations are coded as V at the end of each statement. This information (e.g. (E) and (V)) was not shown to participants.

Instructions given to survey takers: The following instrument asks about behaviors that may be done in a driving context. For each statement, select how often you do each of the following driving behaviors on the following scale: Never, Very Rarely, Occasionally, Often, Nearly all the time, Always.

1. Attempt to leave a parking space in the wrong gear. (E)
2. Check your speedometer and discover that you are traveling faster than the posted speed limit. (V)
3. Drive as fast along country roads at night on low beams as you would on high beams. (E)
4. Drive especially close or ‘flash’ the car in front of you to try and get them to go faster or get out of your way. (V)
5. Forget where you parked your car. (E)
6. Realize that the vehicle ahead has slowed, and have to slam on the brakes to avoid a collision because you were distracted or preoccupied. (E)
7. Switch on one thing, such as the headlights, when you meant to turn on something else, such as wipers. (E)
8. Turn left into the path of an oncoming vehicle that you hadn’t seen. (E)
9. Misjudge the space available in a parking lot and nearly (or actually) hit another vehicle. (E)
10. Realize you have no clear recollection of the road along which you have just been traveling. (E)
11. Miss your exit on a highway and have to make a detour. (E)
12. Try to pass in risky circumstances when stuck behind a slow-moving vehicle on a two-lane highway. (V)
13. Intending to drive to destination A, you realize you are actually en route to B, perhaps because destination B is your more usual destination. (E)
14. Take a chance and run a red light. (V)
15. Feel angered by another driver’s behavior and chase after him/her with the intention of giving him/her a piece of your mind. (V)
16. Deliberately disregard the speed limits late at night or very early in the morning. (V)
17. Forget that you have your high beams on until ‘flashed’ by other motorists. (E)
18. When turning right, nearly hit a cyclist who has come up behind you. (E)

Attention Check

- If you are reading this, select Never.
    - (Choices) Never, Very Rarely, Occasionally, Often, Nearly all the time, Always

19. In a line of cars turning left onto a main road, pay such close attention to the main stream of traffic that you nearly hit the car in front. (E)
20. Drive even though you realize you may be over the legal blood-alcohol limit. (V)
21. Fail to notice someone waiting at a crosswalk. (E)
22. Underestimate the speed of an oncoming vehicle when passing on a two-lane highway. (E)
23. Hit something when backing up that you did not see. (E)
24. Fail to notice someone stepping out from behind a bus or parked vehicle until it is nearly too late. (E)
25. Get into the wrong lane when approaching an intersection or roundabout. (E)
26. Fail to yield right-of-way to a bus signaling its intention to pull out. (V)
27. Ignore a yield sign and almost collide with traffic having right-of-way. (V)
28. Fail to check your mirrors before pulling out, changing lanes, turning, etc. (E)
29. On a two-lane road, attempt to pass a vehicle that you hadn't noticed was signaling its intention to turn left. (E)
30. Drive the wrong direction down a deserted one-way street. (V)
31. Disregard red lights or stop signs when driving late at night along empty roads. (V)
32. Drive while looking at a map or GPS device, changing the radio station, etc. (E)
33. Fail to notice pedestrians crossing when turning into a side-street from a main road. (E)
34. Get involved in unofficial 'races' with other drivers. (V)
35. Brake too hard on a slippery road or steer the wrong way in a skid. (E)
36. Misjudge the distance between oncoming vehicles when turning left and narrowly miss a collision. (E)

Attention Check

- If you are reading this, select Often.
    - (Choices) Never, Very Rarely, Occasionally, Often, Nearly all the time, Always

APPENDIX E. SEAT BELT USAGE AND BELIEFS ITEMS

- How often do you wear a seat belt?

1 (*never*) 2 3 4 5 (*often*)

- Provide a reason or situation for which you would not or have not worn a seat belt. (Fill-in)

The following definitions are provided to facilitate response to the following two questions.

> **Primary enforcement**: One can be pulled over and receive a ticket or fine for committing that behavior
>
> **Secondary enforcement**: One cannot be pulled over and receive a ticket or fine for committing that behavior unless another law is also being broken (e.g., running a red light, speeding, etc.)
>
> **No enforcement**: no action is taken against those who do not wear a seat belt while driving

- What do you believe the current seat belt enforcement law in your state is?
    - (Choices) Primary enforcement, Secondary enforcement, No enforcement
- What type of enforcement do you believe would be most effective?
    - (Choices) Primary enforcement, Secondary enforcement, No enforcement
- (Follow up) Explain why you believe that type of enforcement would be most effective in increasing seat belt use. (Fill in)
- If one does not wear a seat belt while driving and is pulled over, what do you believe the appropriate type of enforcement should be?
    - (Choices) Primary enforcement, Secondary enforcement, No enforcement, Other enforcement: Please be specific: (Fill in)

        - (Follow up) Explain why you believe that type of enforcement would be most effective in increasing seat belt use while driving. (Fill in)

Attention Check

- If you are reading this select No enforcement.
    - (Choices) Primary enforcement, Secondary enforcement, No enforcement
- How effective do you believe a primary law would be in increasing overall seat belt use?
    - Used a sliding scale for this (0 to 100) (Main Criterion)
- How effective do you think a primary law would be in increasing your own seat belt use?
    - Used a sliding scale for this (0 to 100)
- As a driver, approximately what percentage of the time do you wear a seat belt?
    - Used a sliding scale for this (0 to 100) - used as a second response for Likert scale above
- As a passenger, approximately what percentage of the time do you wear a seat belt?
    - Used a sliding scale for this (0 to 100) - used as a second response for Likert scale above
- What one thing, above all others, would convince you to consistently wear a seat belt? (Fill-in)

Attention Check

- If you are reading this, select primary.
    - (Choices) Prime, Secondary, Primary

APPENDIX F. DEMOGRAPHICS SURVEY

- What is your biological sex?
    - (Choices) Male, Female, Intersex
- What is your gender?
    - (Choices) Male, Female, Trans Man, Trans Woman, Agender, Genderqueer/Non-binary, Other gender identity. Specify if desired: (Fill in)
- What is your race/ethnicity?
    - (Choices) Alaskan Native, Asian, Black, Indian, Middle Eastern, Native American, Pacific Islander, White-Hispanic or Latino/a, White-NOT Hispanic or Latino/a, Biracial, More than two ethnicities, Other ethnic identity. Specify if desired (Fill in), Prefer not to self-identify
- How old are you?
    - Please type in age (whole numbers only).
        - Less than 18: Exclude and go to end of survey
- Which US State issued your current driver's license?
    - Please type in state name or use the state abbreviation (Example: VA is the abbreviation for Virginia) (Fill in)
- How long have you had your driver's license? **Round to nearest year.** (Fill in)
- During which year did you take your first driving test? **Type in four-digit year (Example: 2018)**.
    - In which US state did you take your first driver's test? Type out name or use state abbreviation (Example: VA is the abbreviation for Virginia). (Fill in)

- Where are you originally from (In which country or US state did you spend most of your childhood)? (Fill in)
- In which city do you currently reside? Type in. State will be asked for in following question. (Fill in)
- In which state do you currently reside?
    - (Choices) North Carolina, Virginia, Another US State
- How would you classify the place you live in?
    - (Choices) Rural, Suburban, Urban
- What is your highest completed level of education?
  - (Choices) Less than high school diploma, High school diploma or GED, Some college, Associate's degree, Bachelor's degree, Some graduate school, Master's degree, Doctoral degree, Other professional degree. Please specify (Fill in).
- What is your (excluding other family members) yearly gross income (before taxes)? (Choose one)
  - (Choices) Less than $25,000, $25,001-$50,000, $50,001-$75,000, $75,001-$100,000, More than $100,000
- What is the approximate mileage that you drive per week? **Round to the nearest mile.** (Fill in)
- What is the average number of hours that you drive per week? **Round to nearest whole hour.** (Fill in)

- In which type of road environment do you do drive the most?
    - (Choices) Mostly highway roads, Mostly city roads, Mostly rural roads, Mix of highway and city roads. Mix of highway and rural roads, Mix of city and rural roads, Mix of highway, city, and rural roads, Other: Please describe: (Fill in)
- What type of road environment do you feel most comfortable driving in?
    - (Choices) Highway roads, City roads, Rural roads
- Provide a reason why you feel most comfortable driving in the road environment selected in the previous question. (Fill in)

Attention Check

- If you are reading this, select More than $100,000.
    - (Choices) Less than $25,000, $25,001-$50,000, $50,001-$75,000, $75,001-$100,000, More than $100,000
- Within the past five years, have you had any traffic violations where you received a ticket or fine (excluding parking tickets)?
    - Traffic violations include but are not limited to: speeding, failure to yield, running a red light or stop sign, failure to wear a seat belt, drunk driving, texting, illegal passing, etc. (Choices) Yes or No (If no, survey will skip to attention check)
- How many tickets for speeding have you received within the past five years? (Fill in)
- How many tickets for red light running, running a stop sign, or failure to yield have you received within the past five years? (Fill in)
- How many tickets for not wearing a seat belt have you received within the past five years? (Fill in)

- How many tickets for drunk driving have you received within the past five years? (Fill in)
- How many tickets for texting have you received within the past five years? (Fill in)
- How many tickets for illegal passing have you received within the past five years? (Fill in)
- How many tickets for other traffic violations have you received within the past five years? (Fill in)
- What violation did you have in mind when answering the previous question? Please be specific. (Fill in)

Attention Check

- If you are reading this, select Urban.
    - (Choices) Rural, Suburban, Urban
- Have you ever been involved in a car crash? (If no, survey will skip to health insurance question)
    - How many crashes have you been involved in? If you have only been involved in one crash, fill in same information for all crash related questions. (Fill in)
        - When did the first crash occur? Provide four-digit year. (Fill in)
        - How old were you at the time? Type in age (whole numbers only). (Fill in)
    - When did the most recent crash occur? Provide four-digit year. (Fill in)
        - How old were you at the time? Type in age (whole numbers only). (Fill in)
    - How many crashes involved serious injuries requiring medical care? (Fill in)

    - How many crashes involved minor vehicle damage only (fender benders)? (Fill in)

- Do you have health insurance?
    - (Choices) Yes: Private, Yes: Through workplace, Yes: Medicaid or Medicare, Yes: Other, No

Attention Check

- If you are reading this, select City roads.
    - (Choices) Highway roads, City roads, Rural roads

VITA

Rochelle A. Rushlow was born and raised in Michigan. Before attending Old Dominion State University in Norfolk, Virginia she attended Saginaw Valley State University, where she earned a Bachelor of Arts in Psychology, magna cum laude, in 2014.

While at Old Dominion University, Rochelle conducted research for the Virginia Department of Motor Vehicles to collect seat belt usage data throughout the state of Virginia.

The address for the Department of Psychology at Old Dominion University is as follows: 5115 Hampton Boulevard 250 Mills Godwin Life Sciences Bldg. Norfolk, VA 23529.