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Impulsivity-like Traits and Risky Driving Behaviors among College Students

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Abstract

The present study examined the predictive effects of five impulsivity-like traits (Premeditation, Perseverance, Sensation Seeking, Negative Urgency, and Positive Urgency) on driving outcomes (driving errors, driving lapses, driving violations, cell phone driving, traffic citations, and traffic collisions). With a convenience sample of 266 college student drivers, we found that each of the impulsivity-like traits was related to multiple risky driving outcomes. Positive Urgency (tendency to act impulsively when experiencing negative affect) was the most robust predictor of risky driving outcomes. Positive Urgency is a relatively newly conceptualized impulsivity-like trait that was not examined in the driving literature previously, suggesting a strong need to further examine its role as a personality trait related to risky driving. These findings generally support the multidimensional assessment of impulsivity-like traits, and they specifically support the addition of Positive Urgency to a list of risk factors for risky driving behaviors.

Keywords

Impulsivity; Positive Urgency; Negative Urgency; Sensation Seeking; Premeditation; Perseverance; Risky Driving; College Students

1. Introduction

Understanding the factors that influence risky driving among young drivers has been the focus of traffic safety researchers for decades. According to the National Highway Traffic Safety Administration (NHTSA), in 2008, 23% of all traffic fatalities in the United States involved individuals between 16 and 24 years of age (NHTSA, 2009b). In addition, 37% of male drivers under the age of 25 who were involved in fatal crashes were speeding at the time of the crash. Safety belt use is also the lowest among those under 25 years old (NHTSA, 2009a). In fact, 59% of individuals involved in fatal crashes were unrestrained at

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the time of the crash (NHTSA, 2009a). These statistics demonstrate that young drivers are at elevated risk for fatal crashes compared to others. In the present study, we examine how five personality predispositions predict several types of risky driving behaviors and consequences of risky driving among college students: driving violations, driving errors, driving lapses, cell phone driving, traffic citations, and traffic collisions.

1.1. Impulsivity and Risky Driving

Although several studies have examined the relationship between 'impulsivity' and risky driving behaviors, the assessment of impulsivity is quite variable. In fact, one limitation with impulsivity research is that impulsivity is a very loose, heterogeneous construct (Dick et al., 2010). To overcome this limitation, Whiteside and Lynam (2001) administered several questionnaires designed to measure 'impulsivity' and used factor analytic methods to identify four distinct traits that are assessed by several questionnaires. Their primary factor reflected (lack of) Premeditation which is the tendency to actively think and plan prior to action. They also identified a (Negative) Urgency factor that reflects the tendency to act impulsively when experiencing negative affect. Their third factor represented Sensation Seeking, or the global tendency to seek excitement. Finally, their fourth factor represented (lack of) Perseverance, which reflects the tendency to persist on tasks until completion. They found that 20 subscales from various questionnaires loaded on one or more of these four factors. Extending this four factor model, Cyders et al. (2007) found that Urgency involves not only Negative Urgency (i.e., behaving impulsively when experiencing negative affect), but also Positive Urgency (i.e., behaving impulsively when experiencing positive affect), resulting in a five-factor model. According to these models, impulsive behavior can result from multiple, distinct traits that we will henceforth refer to as impulsivity-like traits.

The four- and five-factor models of impulsivity-like traits have received much attention in research on risky behaviors, including alcohol use and alcohol-related consequences (Cyders, Flory, Rainer, & Smith, 2008; Murphy & MacKillop, 2012), illicit drug use and risky sexual behaviors (Zapolski, Cyders, & Smith, 2009), bulimia symptoms (Fischer, Smith, & Cyders, 2008), and suicidal behaviors/nonsuicidal self-injury (Lynam, Miller, Miller, Bornovalova, & Lejuez, 2011). However, we have yet to see an examination of the relationship between the five impulsivity-like traits and driving behavior.

1.2. Premeditation and Risky Driving

Whiteside and Lynam (2001) found several subscales of impulsivity that load on the latent factor that they referred to as Premeditation. Using these factor analytic findings as a guide, we carefully combed the literature for studies that examined the relationships between any of the subscales identified by Whiteside and Lynam and driving outcomes. Specifically, we found five studies that used one of the these subscales and examined bivariate or multivariate relationships with driving outcomes: Control subscale from the Multidimensional Personality Questionnaire (MPQ; Tellegen, 1982), Deliberation subscale from the NEO-PI-R (Costa & McCrae, 1992), I-7 Impulsiveness scale (Eysenck, Pearson, Easting, & Allsop, 1985), the Impulsivity scale of the Personality Research Form (PRF; Jackson, 1984), and the Nonplanning and Motor Impulsivity subscales from the Barrett Impulsiveness Scale (BIS; Patton et al., 1995).

Caspi et al. (1997) found that MPQ Control subscale scores at 18 predicted whether individuals could be classified as having dangerous driving habits (drink-driving/riding or inconsistently wearing seat belts) at age 21. Thus, a lack of Premeditation was associated with riskier driving prospectively. In a study conducted in Canada, Hong and Paunonen (2009) found the NEO-PI-R Deliberation scale (i.e., higher Premeditation) was significantly negatively related to speeding in two out of three college student samples, which produced a significant averaged correlation ($r = -.20$). Using the Impulsivity subscale of the I-7, Lajunen and Parker (2001) found that "impulsivity" (lack of Premeditation) was not related to either anger or aggression while driving when controlling for general anger and aggressiveness. Using the PRF Impulsivity subscale with a sample of young men in British Columbia, Vavrik (1997) found no difference in "impulsivity" between drivers who had at least two at-fault accidents in the past 2 years and drivers who had no such incidents.

In a study of White Greek-Cypriots, Constantinou, Panayiotou, Konstantinou, Loutsiou-Ladd, and Kapardis (2011) used two subscales that load on the Premeditation factor (BIS Motor Impulsiveness and Nonplanning subscales) and examined their relationships with three subscales that they created from an exploratory factor analysis of questions from a modified version of the Driving Behavior Questionnaire (Kontoyiannis et al., 2002; Lajunen et al., 2004; Reason et al., 1990): aggressive violations, ordinary violations, and mistakes (i.e., errors and lapses). They found that motor impulsiveness was significantly positively correlated with ordinary violations, aggressive violations, and driving mistakes, and nonplanning was significantly positively correlated with aggressive violations and mistakes (but non-significantly positively correlated with ordinary violations). Thus, a lack of Premeditation was generally related to riskier driving in five out of six statistical tests. Constantinou et al. (2011) also examined a path model in which nonplanning was found to predict ordinary (i.e., non-aggressive) driving violations when controlling for sensitivity to reward, driving experience, and disinhibition (which loads on the Perseverance factor), but did not have a direct effect on traffic offenses.

Overall, it appears that individuals who are low in Premeditation are more likely to engage in risky driving, but there is some inconsistency with which Premeditation is related to some driving outcomes like aggressive driving (Constantinou et al., 2011; Lajunen & Parker, 2001). Based on the studies reviewed above, we were able to make the bivariate prediction that Premeditation would be correlated with less driving violations, driving errors, and driving lapses, but were unable to make specific hypotheses regarding cell phone driving, traffic violations, and traffic crashes. Although there is some evidence that Premeditation would not be related to traffic violations (Constantinou et al., 2011; Vavrik, 1997), we made a point in deriving our hypotheses to not predict null results given the difficulty of interpreting null results. For example, the group comparison approach with a sample of 100 young male drivers taken by Vavrik (1997) may not have had enough power to detect the relationship between Premeditation and traffic violations.

1.3. Negative Urgency and Risky Driving

Using Whiteside and Lynam's (2001) factor analysis, we found two studies with a relevant driving outcome that examined one of the scales that load on the Negative Urgency factor:

Attentional Impulsivity from the BIS-11 (Patton et al., 1995) and the Impulsivity subscale from the NEO-PI-R (Costa & McCrae, 1992; French translation: Rolland et al., 1998). In their sample of Greek-Cypriots, Constantinou et al. (2011) found that attentional impulsiveness was not significantly correlated with either ordinary or aggressive driving violations, but was weakly positively correlated with driving mistakes. It is important to note that this subscale had the weakest loading on the overall Negative Urgency factor identified by Whiteside and Lynam (2001). In a sample of Canadian men, Richer and Bergeron (2009) found that "impulsivity" was significantly positively correlated with driving under the influence of cannabis, driving under the influence of alcohol, risky driving (e.g., "I will weave in and out of slower traffic," "I will drive if I am only mildly intoxicated or buzzed;" Dula & Ballard, 2003), but was non-significantly positively correlated with aggressive driving ($r = .13$; e.g., "I would tailgate a driver who annoys me") and negative emotional driving ($r = .19$; "I drive when I am angry or upset"). We note the strength of these non-significant correlations because in the present study, we had sufficient power to detect correlations of these sizes.

Although two studies with very different samples from the present study, different measures of the Negative Urgency trait, and different measures of driving behaviors are not ideal for developing informed hypotheses, we believe these studies provide at least some support that Negative Urgency would be related to driving outcomes. Given the driving outcomes measured previously, we predicted that Negative Urgency would be positively related to driving violations as it overlaps with the "risky driving" subscale assessed by Richer and Bergeron (2009), as well as with driving errors and lapses as it overlaps with the "mistakes" subscale assessed by Constantinou et al. (2011). We were unable to make specific predictions regarding how Negative Urgency may relate to the other driving outcomes.

1.4. Sensation Seeking and Risky Driving

Sensation Seeking has long been examined as a predictor of risky driving behaviors. Jonah (1997) conducted a review of 40 studies that had been conducted between 1979 and 1997 and found a rather robust positive correlation between Sensation Seeking and risky driving, with most correlations ranging from .30 and .40. Jonah, Thiessen, and Au-Yeung (2001) found that Sensation Seeking was not only related to risky driving and aggressive driving, but it was associated with riskier driving in response to a safety enhancement. Specifically, individuals high in Sensation Seeking were more likely to report they would drive faster on highways, drive faster on wet roads, and drive after consuming alcohol if their vehicle had anti-lock brakes. These findings suggest that as safety enhancements are made, sensation seekers may find a way to increase their risk so that they experience an optimal level of risk or arousal (Zuckerman, 2007).

Sensation Seeking has been found to predict various types of risky driving including drink-driving (Fernandes et al., 2007), driving while fatigued (Thiffault & Bereron, 2003), and not wearing a seat belt (Jonah et al., 2001), to name a few. In a recent study conducted with young adult drivers in Australia, Fernandes, Hatfield, and Job (2010) found that Sensation Seeking (assessed with the Thrill and Adventure Seeking subscale of the Sensation Seeking Scale, Zuckerman, Buchsbaum, & Murphy, 1980) predicts speeding after controlling for a

large number of other variables (i.e., age, gender, driving anger, time urgency, authority rebellion, perceived relative risk, perceived personal risk, perceived costs, perceived benefits, and peer influence), but was unrelated to not wearing a seat belt, driving while fatigued, and drink-driving.

Zuckerman's (1994) Sensation Seeking Scale (SSS) is the most commonly used measure of Sensation Seeking in the driving literature. According to the results of Whiteside and Lynam (2001), at least two Sensation Seeking subscales from the SSS (Zuckerman, 1994) load on an impulsivity facet other than Sensation Seeking. Specifically, the SSS Boredom Susceptibility subscale loaded on the Perseverance factor, and the SSS Disinhibition subscale loaded on both the Sensation Seeking factor as well as the Perseverance factor. Whiteside and Lynam did not include the Thrill and Adventure seeking or Experience Seeking subscales from the SSS in their factor analysis. Based on item content, we assume that these subscales would almost certainly load on the Sensation Seeking factor. A similar assumption was made by Fischer, Smith, and Cyders (2008) who used the Whiteside and Lynam factor analysis to guide a meta-analysis of the relationships between the four original impulsivity factors and bulimic symptoms. In addition, many researchers in the driving literature use the SSS total score only, which further complicates the separation of Sensation Seeking and Perseverance into distinct impulsivity-related traits.

Although there are a number of complications in the Sensation Seeking literature such that Sensation Seeking scales may measure other impulsivity-like traits and researchers may collapse across these distinct traits, the meta-analytic work of Jonah (1997) and other studies reviewed above suggest that Sensation Seeking would be positively related to risky driving outcomes. In the present study, we predict that Sensation Seeking would be positively related to driving violations, driving errors, and driving lapses.

1.5. Perseverance and Risky Driving

We found two studies that assessed a subscale that loaded onto the Perseverance factor (Whiteside & Lynam, 2001) and relevant driving outcomes; both studies used the SSS Disinhibition subscale (Zuckerman, 1994). It is important to note that Whiteside and Lynam's (2001) factor analysis showed that this subscale loaded on both Perseverance and Sensation Seeking factors. In a sample of American college students, Dahlen and White (2006) found SSS Disinhibition to be positively correlated with risky driving (e.g., passing unsafely, Deffenbacher et al., 2000) and aggressive driving (e.g., making an angry gesture at another driver), but it was not significantly correlated with other driving outcomes (moving violations, losses of concentration while driving, losses of vehicular control, 'close calls', minor accidents, and major accidents). In their sample of Greek-Cypriots, Constantinou et al. (2011) found that disinhibition was positively correlated with ordinary violations, aggressive violations, and driving mistakes. Although there seems to be a lack of relationships with certain outcomes, these two studies suggest that a lack of Perseverance would be associated with at least more self-reported driving violations, driving errors, and driving lapses.

1.6. Positive Urgency and Risky Driving

Whiteside and Lynam (2001) did not find a 'Positive Urgency' trait through factor analyzing previous impulsivity scales, presumably because previous impulsivity scales have not assessed this trait. Cyders et al. (2007) introduced the trait of Positive Urgency by showing that it loads on its own factor using both exploratory and confirmatory factor analytic approaches, and has incremental validity above and beyond the other impulsivity-like traits in predicting risky behaviors (e.g., college student drinking; Cyders, Flory, Rainer, & Smith, 2008). Thus, given its relatively new conceptualization, no study has yet to examine the predictive relationships between Positive Urgency and driving outcomes. Therefore, we consider our examination of these relationships as exploratory.

1.7. Integrating Multiple Facets of Impulsivity

Although no published study has applied the five-factor model of impulsivity-like traits to driving, one study reviewed above included multiple facets of impulsivity that presumably measure four of the five impulsivity-like traits. In their final model predicting ordinary driving violations, Constantinou et al. (2011) found that both the SSS Disinhibition subscale (indicator of low Perseverance/high Sensation Seeking) and BIS Nonplanning subscale (indicator of low Premeditation) were significant predictors of driving violations when controlling for each other, sensitivity to reward, and driving experience. Based on their description, it appears that SSS Thrill and Adventure Seeking (another potential indicator of Sensation Seeking; see Fischer et al., 2008) and BIS Attentional Impulsiveness (indicator of Negative Urgency) were unrelated to this outcome. Thus, there exists some evidence that low Perseverance and low Premeditation may predict driving outcomes above and beyond the influences of other impulsivity-like traits. However, as we do not believe that a single investigation with a rather different sample from the present study provides sufficient enough reason to make strong hypotheses regarding how the impulsivity-like traits would predict driving outcomes in a multivariate sense (i.e., controlling for the other facets), we consider our multivariate analyses as exploratory.

1.8. Purpose

Consistent with recent research that demonstrates the benefits of multidimensional assessment of impulsivity-like traits (Cyders et al., 2007; Whiteside & Lynam, 2001), the present study extends research using the five-factor model of impulsivity-like traits to the domain of risky driving behaviors. Specifically, we examine four risky driving behaviors and two presumed consequences of risky driving. Driving violations, driving errors, and driving lapses are subscales included on a widely used driving behavior measure (DBQ; Reason et al., 1990; Reimer et al., 2005). Given that this measure of driving does not assess the growing problem of using a cell phone while driving (Wilson & Stimpson, 2010), the second author developed a three-item measure of operating a cell phone while driving. Finally, two consequences of risky driving were examined: history of receiving a traffic citation and history of involvement in a traffic collision. Previous researchers (e.g., Fernandes, Hatfield, & Job, 2010) have noted the importance of examining driving outcomes comprehensively. Our specific hypotheses regarding the bivariate relationships between impulsivity-like traits and these driving outcomes are discussed above and summarized in Table 1. Due to the

paucity of research, we made no specific predictions regarding how the impulsivity-like traits may relate to cell phone driving, traffic citations, or traffic collisions. Further, we made no prediction regarding which of the traits would predict unique variance in outcomes when controlling for the other facets. Thus, we consider the multivariate analyses exploratory, a fact that we consider in our interpretation and discussion of the results.

2. Method

2.1. Participants and Procedure

A convenience sample of two hundred sixty-six college student drivers (60.5% women) participated in the present study. Participants were recruited from the psychology department participant pool at the participating southeastern university in exchange for course credit. The majority of participants were White (61.7%) or Black (24.1%) with 6.0% Asian/Pacific Islander, 1.9% Latino/a, 0.4% Native American, and 5.6% indicating 'Other'. Participants read a notification statement prior to their participation and provided their informed consent by clicking "Next" on the online survey. All procedures were approved by the human subjects committee at the participating university.

2.2. Measures

2.2.1. Impulsivity-like traits—Impulsivity-like-traits were assessed by the UPPS-P, which combines the 14-item Positive Urgency Measure (PUM; Cyders et al., 2007) with the 45-item Urgency Premeditation Perseverance Sensation seeking Impulsive Behavior Scale (UPPS, Whiteside & Lyman, 2001). All items are measured on a 4-point Likert-type scale ("Strongly Disagree", "Disagree", "Agree", and "Strongly Agree"). The UPPS assesses *Negative Urgency* (12 items), *Premeditation* (11 items), *Perseverance* (10 items), and *Sensation Seeking* (12 items); the PUM assesses *Positive Urgency* (14 items). Higher scores on *Premeditation* and *Perseverance* represent less 'impulsivity', whereas higher scores on *Positive Urgency*, *Negative Urgency*, and *Sensation Seeking* represent more 'impulsivity'. Cronbach's alphas for all multi-item inventories were greater than .79 and are depicted in Table 1.

2.2.2. Risky driving behaviors—A version of the Driving Behavior Questionnaire (Reason, Manstead, Stradling, Baxter, & Campbell, 1990) that was adapted to be more appropriate for North American drivers (Reimer et al., 2005) was used to assess self-reported risky driving behaviors. The DBQ contains 24 items and participants respond using a 6-point scale ("Never" to "Nearly All the Time"). The DBQ is comprised of three factors: errors, lapses, and violations. Errors are characterized by unintentional actions that could lead to dangerous situations, such as "failing to yield at a sign." Lapses are characterized by attention and memory failures, such as "realizing you cannot remember which road you were just driving on." Violations are intentional driving behaviors that are likely to create dangerous driving outcomes, such as "disregarding the speed limit on a residential road."

We also used three items on a 4-point scale (0 = *Never*, 4 = *Always*) to assess cell phone use while driving, or cell phone driving ("How often do you talk on a mobile phone while you are driving a motor vehicle?"; "How often do you send text messages on a cell phone while

you are driving a motor vehicle?"; "How often do you read text messages on a cell phone while you are driving a motor vehicle?"). We used single-items to assess driving consequences including receiving a traffic citation ("Have you ever received a traffic citation?"; 0 = "no," 1 = "yes") and involvement in a traffic collision ("Have you ever been involved in a traffic crash?"; 0 = "no," 1 = "yes").

Demographics: In a demographics questionnaire, we assessed gender, age, as well as three driving-related variables on ordinal response scales: driving frequency ("How often do you drive a vehicle on a weekly basis?"), driving exposure ("Approximately how many miles do you drive per week?") and driving experience ("How many years of driving experience do you have?).

3. Results

3.1. Descriptives

The majority of the sample reported driving every day (51.9%), with 25.6% driving 3–5 times a week, 8.6% driving 1–2 times a week, and 13.9% reporting that they 'rarely drive'.

Miles driven per week ranged greatly with drivers reporting 0 miles (7.9%), 1–24 miles (29.3%), 25–49 miles (15.0%), 50–99 miles (17.7%), 100–199 miles (14.3%), 200–299 miles (7.1%), or 300+ miles (7.1%) per week. Most participants had been driving for 3–5 years (50.4%), followed by 6–10 years (24.4%), 0–2 years (9.8%), 11–15 years (7.5%), and 16+ years (6.8%).

Nearly half of our sample had received at least one traffic citation (47.4 %) and nearly half had been involved in a traffic collision (42.5%). The vast majority of participants reported talking on a cell phone and driving (95.5%), sending text messages while driving (89.1%), or reading text messages while driving (92.9%) at least seldomly.

3.2. Bivariate Correlations

Descriptive statistics and correlations among all study variables are depicted in Table 2. Most of the correlations among impulsivity-like traits were modest, with the exception of one non-significant, small correlation (r = .05 between Sensation Seeking and Premeditation) and one strong correlation (r = .73 between Positive Urgency and Negative Urgency). Together, these results demonstrate limited conceptual and empirical overlap among the impulsivity-like traits. The driving behaviors assessed by the DBQ were relatively strongly correlated with each other (rs ranging from .56 to.70), modestly correlated with cell phone driving (rs ranging from .17 to.33), and uncorrelated with likelihood of received a traffic citation or being in a traffic collision (rs ranging from −.10 to .11). Cell phone driving and history of receiving a traffic citation were modestly related to history of being in a traffic collision (rs ranging from .18 to .30).

In a bivariate sense, Positive Urgency and Negative Urgency were positively correlated with most driving outcomes including driving errors, driving lapses, driving violations, and cell phone driving. None of the impulsivity-like traits were significantly correlated with history of receiving a traffic citation or history of being in a traffic collision. Premeditation was

significantly negatively correlated with driving errors, driving violations, and cell phone driving; Perseverance was significantly negatively correlated with driving errors, driving lapses, and driving violations. Sensation Seeking was positively correlated with driving violations and cell phone driving.

3.3. Path Analysis

Using Mplus 6 (Muthén & Muthén, 1998–2010), we examined a single fully saturated path model with each of the five impulsivity-like traits predicting each of six driving outcomes while controlling for gender, driving exposure, driving experience, and age, which produces the same results as a series of multiple regression analyses. Thus, we regressed the six correlated outcome variables on the nine correlated predictor variables. Given that the model had zero degrees of freedom, model fit statistics are not reported. The multi-item subscales (driving errors, driving lapses, driving violations, and cell phone driving) were approximately normally distributed, making standard regression appropriate. The two dichotomous outcomes (traffic citation, traffic collision) were modeled using logistic regression techniques. Table 3 summarizes the results from our path analysis.

When controlling for covariates (gender, driving exposure, driving experience, and age), and the other four impulsivity-like traits, it was clear that Positive Urgency had the strongest, most robust relationship with the most driving outcomes, as it had significant associations with driving errors, driving lapses, and driving violations; in fact, it was the unique predictor of driving errors and driving lapses. Negative Urgency positively related to driving violations and cell phone driving. When controlling for the demographic variables and the other impulsivity-like traits, Premeditation and Perseverance were not significantly related to any of the driving outcomes. Perplexingly, Positive Urgency was negatively related to the likelihood of ever having received a traffic citation. None of the impulsivity-like traits were significantly related to the likelihood of ever having been in a traffic collision.

4. Discussion

4.1. Summary of Findings

To our knowledge, the present study is the first to use the five-factor model of impulsivity-like traits to predict risky driving behaviors. Further supporting the multidimensional assessment of impulsivity-like traits (Cyders et al., 2007; Whiteside & Lynam, 2001), we found that these traits were differentially related to risky driving behaviors. A careful examination of the literature revealed that four of the five impulsivity-like traits had been examined as predictors or correlates of driving outcomes previously. However, given its relatively new conceptualization, no study has yet to examine the predictive relationships between Positive Urgency and driving outcomes.

Based on previous literature, we made empirically-based predictions regarding the relationship between four of the five impulsivity-like an three of the six driving-related outcomes: driving errors, driving lapses, and driving violations. Nine of the 12 predictions were upheld with correlational analyses (see Table 1). Given that no previous research used the UPPS-P (Cyders et al., 2007; Whiteside & Lynam, 2001), which is a validated measure

of the five impulsivity-like traits, we were unable to develop specific hypotheses regarding which factor(s) would offer unique prediction of driving outcomes. Positive Urgency emerged as the most robust predictor of driving outcomes. When controlling for other impulsivity-like traits, Positive Urgency emerged as the unique predictor of two outcomes (driving errors and driving lapses), and it predicted driving violations along with Negative Urgency. Negative Urgency also predicted cell phone driving.

Although Positive Urgency also had a significant negative predictive effect on receiving a traffic citation, we do not wish to overinterpret this finding for a few reasons. First, Positive Urgency was positively related to four types of risky driving, so it is unlikely that a risk factor for risky driving would also be a protective factor for negative consequences from risky driving. Second, there were no significant zero-order correlations with the traffic citation outcome, thus this finding that Positive Urgency was negatively related and Sensation Seeking was positively related to this outcome is a case of statistical suppression (i.e., the direct effect of a predictor on an outcome exceeds the total effect of the predictor on the outcome). Third, there were no specific hypotheses of whether these factors would have a significant effect on this outcome; thus, significant findings with this outcome need to be interpreted cautiously regardless of the direction of the effect. For these reasons, we have decided not to discuss this finding further, which we believe is based on statistical artifact.

4.2. Theoretical Implications

Based on a conceptualization of impulsivity that has gained some prominence in some fields of risky behavior research (e.g., alcohol use, Cyders et al., 2007), the present study was the first to test whether this five-factor model of impulsivity-like traits can add some clarity to previous findings in the risky driving literature. We used the five-factor model of impulsivity-like traits to comb through the risky driving literature to determine whether we could find reason to develop differential prediction of distinct driving outcomes based on distinct impulsivity-like traits. However, our literature search was unable to inform whether certain impulsivity-like traits would relate to only certain forms of risky driving. Within each impulsivity-like trait, the hypotheses that we were able to derive were consistent in direction and were not specific to any particular outcome. For example, prior to reviewing the literature, we reasoned that Premeditation may be particularly related to driving lapses because the prevention of such lapses would require the kind of planning associated with those high in Premeditation; however, we anticipated that Sensation Seeking would not necessarily be predictive of such lapses, as a predisposition to seek excitement does not necessarily suggest that one would have non-excitement-seeking-related driving errors. We reasoned that sensation seekers engage in willful driving violations, as they find these behaviors to be enjoyable, whereas those higher in Negative Urgency who have trouble controlling their urges may find themselves engaging in unsafe driving unwittingly. However, when we reviewed the literature, we were not able to detect patterns to expect differential prediction among these outcomes. Of course, although using the five-factor model as a guiding framework in reviewing previous studies is not essentially problematic, the scales used in previous research were not specifically developed to discern between these five factors. In this way, the present study was able to assess the relative importance of each of these impulsivity-like traits on driving outcomes in a way that a literature review was not.

When examining our results, we did find some support for our own differential prediction hypotheses that were not necessarily directed by the previous literature. For example, with Sensation Seeking, we did find that it was related to only certain unsafe driving behaviors. Specifically, it was only related to those that could be conceptualized as meeting an underlying need to optimize one's level of risk or arousal (driving violations and cell phone driving), but was unrelated to driving behaviors that may more likely reflect deficits in cognitive control or executive functioning (i.e., driving errors and driving lapses). However, these significant bivariate relationships between Sensation Seeking and driving violations/cell phone driving fell to non-significance when controlling for the other impulsivity-like traits. The driving literature has focused on Sensation Seeking as an important risk factor for risky driving for decades and much research has confirmed it as a robust predictor of risky driving outcomes (see Jonah, 1997, for a meta-analysis). Although preliminary, the present study suggests that this role could be exaggerated by failing to consider other related, yet distinct, impulsivity-like traits.

The potential exaggeration of the importance of Sensation Seeking in predisposing individuals to risky driving is complemented with a realization that Positive Urgency may be a more central predictor of risky driving that has been entirely ignored in the driving literature. For a few reasons, we must be careful not to overstate the likelihood that Positive Urgency is an important antecedent to risky driving. To our knowledge, the present study is the only study that has examined Positive Urgency as a predictor of driving outcomes, specifically. Thus, we were not able to develop *a priori* predictions as to how it may relate to the different driving outcomes; therefore, analyses with this predictor are considered exploratory and require replication in a unique sample before stronger conclusions can be made.

As Negative Urgency also emerged as a significant predictor of two risky driving behaviors (driving violations and cell phone driving), our results suggest that the traits of behaving impulsively when experiencing extreme moods may be rather important in understanding risky driving. The Urgency traits are unique in that they seem to reflect an interaction of emotional and behavioral regulation. Because the Urgency items contain both emotional and behavioral regulation components, it is important that future research examine whether the predictive effects of Positive and Negative Urgency remain when controlling for other mood-related variables, which has been shown with other risky behaviors (Cyders & Coskunpinar, 2010).

4.3. Limitations

The most notable limitation of the present study is the cross-sectional design, which limits one's ability to examine 'predictors' given that the outcome variables concern past behavior as measured by retrospective self-reports. It is difficult to make causal inferences in personality research as stable, personality variables do not lend themselves to simple experimental manipulation; however, stronger causal inferences could be made from longitudinal research showing prospective prediction of risky driving behaviors from impulsivity-like traits, or the demonstration of parallel growth in impulsivity-like traits and risky driving behaviors using latent growth curve modeling (MacKinnon, 2008). Another

limitation of the present study was the modest sample size. Although our sample size was sufficiently large to detect sizeable main effects of our predictor variables on driving outcomes, we did not have sufficient power to detect certain potential interactive effects (i.e., moderation by demographic characteristics). A larger sample size would allow one to detect whether these traits relate to driving outcomes similarly across men and women, across different racial/ethnic groups, and across different age groups.

Assessing five different impulsivity-like traits is certainly an improvement over a unidimensional approach and examining six distinct driving outcomes is preferable to considering only one or two outcomes; however, future research would be enhanced by including both self-report and behavioral measures of impulsivity-like traits (e.g., Balloon Analogue Risk Task, Lejuez et al., 2002; Stroop task, Houben & Wiers, 2009) as well as driving outcomes (e.g., speeding on a driving simulator, Dahlen & White, 2006). Another limitation of the present study is that we did not examine potential mediators of the relationships between impulsivity-like traits and risky driving outcomes. Given that personality traits are presumed to be rather stable over time, it is important to identify more proximal mediators of these effects that are amenable to change. Further limitations derive from the convenience sampling method used in the present study, which resulted in an oversampling of women, and a sample of almost exclusively young, undergraduate psychology students. This sampling method limits the generalizability of these findings.

4.4. Conclusion

The present study examined the predictive effects of five impulsivity-like traits on driving outcomes. Our results support distinguishing between separate impulsivity-like traits as they have distinct relationships with driving outcomes. Notably, the one impulsivity-like trait that has not been examined with risky driving outcomes, Positive Urgency, was the most robust predictor of risky driving behaviors. These findings suggest that the tendency to behave impulsively when experiencing positive affect is an underappreciated risk factor for risky driving. On the other hand, when controlling for impulsivity-like traits, Sensation Seeking was largely unrelated to driving outcomes, suggesting that the role of Sensation Seeking on risky driving behaviors may need to be reevaluated.

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Table 1

Summarizes the predicted direction of correlations between impulsivity-like traits and driving outcomes

	Driving Errors	Driving Lapses	Driving Violations	Cell Phone Driving	Traffic Citation	Traffic Collision
Premeditation	**Negative**	**Negative**	**Negative**	?	?	?
Negative Urgency	**Positive**	**Positive**	**Positive**	?	?	?
Sensation Seeking	*Positive*	*Positive*	**Positive**	?	?	?
Perseverance	**Negative**	*Negative*	**Negative**	?	?	?
Positive Urgency	?	?	?	?	?	?

Note. Hypotheses that were confirmed based on correlational analyses are in boldtype face, whereas disconfirmed hypotheses are italicized. ? = no specific hypothesis made.

Table 2

Descriptive statistics and correlations of all study variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	*M*	*SD*
1. Perseverance	(.83)														3.05	0.45
2. Premeditation	**.44**	(.86)													2.99	0.37
3. Sensation Seeking	.05	**−.24**	(.87)												2.67	0.54
4. Positive Urgency	**−.48**	**−.45**	**.21**	(.93)											1.89	0.51
5. Negative Urgency	**−.45**	**−.44**	**.15**	**.73**	(.89)										2.26	0.52
6. Driving Errors	**−.21**	**−.24**	.06	**.44**	**.29**	(.85)									1.84	0.65
7. Driving Lapses	**−.16**	−.11	.01	**.30**	**.28**	**.69**	(.79)								2.17	0.67
8. Driving Violations	**−.13**	**−.21**	**.17**	**.35**	**.33**	**.70**	**.56**	(.85)							2.36	0.72
9. Cell Phone Driving	−.02	**−.14**	**.17**	**.15**	**.21**	**.27**	**.17**	**.33**	(.83)						2.91	0.88
10. Traffic Citation (0=no, 1=yes)	.02	−.01	.08	−.09	−.00	−.07	−.10	.04	.11	−----					0.47	0.50
11. Traffic Collision (0=no, 1=yes)	.01	.05	.04	.04	.10	.03	.08	.11	**.18**	**.30**	−----				0.42	0.50
12. Gender (0=women, 1=men)	−.09	−.07	**.22**	**.16**	−.01	.11	.04	**.13**	−.04	.02	−.04	−----			0.39	0.49
13. Driving Exposure	.11	.10	−.05	−.08	−.05	**−.13**	**−.13**	−.01	−.02	**.21**	**.15**	−.05	−----		3.52	1.71
14. Driving Experience	.09	.03	−.10	−.08	−.03	**−.16**	−.06	−.11	−.01	**.34**	**.31**	−.08	**.30**	−----	2.51	1.01
15. Age	.06	.06	**−.23**	−.12	−.04	**−.14**	−.01	−.12	**−.15**	**.25**	**.20**	−.08	**.25**	**.81**	22.75	6.32

Note. Significant effects ($p < .05$) are in boldtype face for emphasis. Cronbach's alphas are in parentheses along the diagonal. Higher scores on *Premeditation* and *Perseverance* represent less 'impulsivity', whereas higher scores on *Positive Urgency, Negative Urgency*, and *Sensation Seeking* represent more 'impulsivity'

Table 3

Path analysis predicting driving outcomes from impulsivity-like traits controlling for gender and age

	Driving Errors		Driving Lapses		Driving Violations		Cell Phone Driving		Traffic Citation		Traffic Collision	
	β	*p*	Β	*p*	β	*p*	β	*p*	β	*p*	β	*p*
Perseverance	.04	.589	−.00	.978	.09	.227	.07	.357	−.09	.300	−.02	.823
Premeditation	−.06	.366	.06	.378	−.07	.344	−.05	.516	.00	.963	.13	.114
Sensation Seeking	−.07	.286	−.03	.605	.06	.332	.10	.147	.14	.074	.08	.271
Positive Urgency	**.44**	<.001	**.21**	.023	**.19**	.041	−.04	.701	−**.26**	.014	.00	.972
Negative Urgency	−.04	.618	.15	.096	**.18**	.045	**.23**	.012	.14	.167	.16	.137
Gender	.04	.484	.01	.904	.10	.110	−.06	.329	.07	.354	−.02	.779
Driving Exposure	−.07	.246	−.11	.065	.04	.530	.03	.668	.13	.071	.08	.238
Driving Experience	−.12	.213	.11	.300	−.05	.606	.25	.014	**.41**	.001	**.41**	.001
Age	.01	.950	.12	.256	−.04	.674	−**.33**	.001	−.07	.607	−.12	.349

Note. Significant effects ($p < .05$) are in boldtype face for emphasis. Gender was dummy-coded (0 = women, 1 = men).