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Prosociality and Risk: How Risky Decision-Making in Young Adults Relates to Altruistic Tendencies, Empathic Concern, and Prosocial Peer Affiliation

Sarah J. Beard
University of North Florida

Prosociality and Risk: How Risky Decision-Making in Young Adults Relates to Altruistic Tendencies, Empathic Concern, and Prosocial Peer Affiliation

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Sarah Jean Beard

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This Thesis titled "Prosociality and Risk: How Risky Decision-Making in Young Adults Relates to Altruistic Tendencies, Empathic Concern, and Prosocial Peer Affiliation" is approved:

Dr. Jennifer Wolff
Committee Chairperson

Dr. Susan Perez
Committee Member

Accepted for the Department of Psychology:

Dr. Lori Lange
Chair of the Department of Psychology

Accepted for the College of Arts and Sciences:

Dr. George Rainbolt
Dean of the College of Arts and Sciences

Accepted for the University:

Dr. John Kantner
Dean of the Graduate School

DEDICATION

This thesis is dedicated to my family and friends, who have supported me at every step of my growing career. A special thank you to my mother Linda McMillan, my uncle Thomas McMillan, my significant other Jason Grotuss, and my best friend Kathryn Passaretti.

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ABSTRACT

Adolescence involves an increase in risky decisions, such as reckless driving and illicit substance use, but prosocial characteristics and peer affiliation have yet to be investigated as protective factors. The present study assessed altruistic tendencies, prosocial peer affiliation (PPA), and empathic concern as predictors and moderators of risk-taking, including both self-reported health risks and riskiness in a behavioral task. Young adults from ages 20 to 25 ($M = 22.55$, $SD = 1.38$) completed a battery of behavioral tasks (including the Balloon Analogue Risk Task and the Dictator Game) and questionnaires on Amazon MTurk, measuring risk-taking (drunk driving, texting while driving, binge drinking, illicit substance use, and tobacco use), altruistic tendencies, PPA, empathic concern, reward sensitivity, and self-regulation. Results indicated that drunk driving and texting while driving were negatively associated with all three prosocial characteristics, and binge drinking was related to PPA and empathic concern. Moderating effects included interactions between altruistic tendencies and reward sensitivity on drunk driving, altruistic tendencies and self-regulation on drunk driving, PPA and reward sensitivity on binge drinking, and empathic concern and self-regulation on binge drinking. Mediating effects, however, were not found. Overall, prosocial characteristics seemed to buffer against reward sensitivity and strengthen self-regulation in several models. The discussion centers on how prosocial individuals might be less prone to risk-taking, and how affiliating with positive peers can offset the effects of heightened reward sensitivity during this crucial developmental period.

Keywords: adolescent decision-making, risk behaviors, prosocial behaviors, prosociality, altruism, empathy, peer affiliation, peer influence, positive peers, prosocial peers

Prosociality and Risk: How Risky Decision-Making in Young Adults Relates to Altruistic Tendencies, Empathic Concern, and Prosocial Peer Affiliation

Adolescence is a developmental period characterized by heightened risk-taking (Casey & Jones, 2010; Shulman et al., 2016; Steinberg, 2010; Telzer, 2016). Compared to younger children and older adults, adolescents (ages 12 to 17) and young adults (ages 18 to 25) are more likely to engage in risk-taking such as reckless driving, drug abuse, unprotected sex, and both minor and serious antisocial behavior (Arnett, 2005; Defoe, Dubas, Figner, & Van Aken, 2015; Telzer, Ichien, & Qu, 2015). Further, mortality rates increase approximately 300% during adolescence, and health risk behaviors are thought to account for 200% of that increase (Bjork & Pardini, 2015; Dahl, 2004). Substance abuse poses a particularly salient public health cost, as an estimated three-quarters of all deaths among 18- to 24-year-olds are the result of substance-related injuries, such as poisoning, motor vehicle crashes, and violence. The "dual-systems" model posits that risk-taking results from a neurodevelopmental imbalance, in which there is greater activation of brain systems underlying socioemotional reward processing, with less activation of cognitive control (Shulman et al., 2016). Peers are key to this reward saliency, as crime statistics show that teenagers are often in groups when committing crimes, using illicit substances, and driving dangerously (Buckley & Chapman, 2016; Schriber & Guyer, 2016; Simons-Morton et al., 2011). The present study assesses prosocial characteristics and peers in young adulthood, incorporating the rewarding nature of peers within a neurobiological context.

Despite increased scientific attention, gaps remain in the understanding of mechanisms involved in adolescent risk-taking, and how they vary by individuals. Specifically, prosocial behaviors (i.e. actions intended to benefit others; Eisenberg, Miller, Shell, McNalley, & Shea,

1991) and prosocial peer affiliation have only recently been investigated in adolescent risk-taking (Van Hoorn, Fuligni, Crone, & Galván, 2016). Thus far, these studies have found that having prosocial friends predicts healthy behaviors, and protects against unhealthy ones (Carlo et al., 2014; Prinstein, Boergers, & Spirito, 2001). The present thesis addresses an important deficit in the literature: the effects of altruistic tendencies, empathic concern, and prosocial peer affiliation on risk-taking (both self-reported and behavioral) in young adults.

Neurobiological Models of Risk-Taking

The prevalence of risk-taking in adolescence is theorized to stem from a developmental imbalance between two systems in the brain, as explained by the heuristic "dual-systems model," in which one system contributes to reward-processing and the other to cognitive control (Casey, Jones, & Hare, 2008; Shulman et al., 2016; Steinberg, 2010). Reward-related brain circuitry develops in early- to mid-adolescence, while control-related circuitry develops later, often into the late twenties. The reward areas of the adolescent brain are associated with impulsivity and sensation seeking (or the need for varied, novel, and complex sensations and the willingness to take risks for those experiences; Fergus & Zimmerman, 2005), whereas regulatory areas modulate planning and self-regulation (or the ability to regulate one's emotions and impulsive behaviors to achieve goals; Moilanen, 2015). Whereas both systems develop and contribute to decision-making in adolescents, the reward-related areas experience a faster rate of functional maturation than the control-related areas (Spear, 2013; Van Leijenhorst et al., 2010). This differential development of two systems plays a role in the risk-taking that is characteristic of adolescence (Squeglia & Cservenka, 2017; Van Hoorn, Van Dijk, Güroğlu, & Crone, 2016).

In the dual-systems model, the “socioemotional” system that promotes reward-seeking behaviors is localized in the limbic and paralimbic areas of the brain, including the ventral striatum (VS) which contains the nucleus accumbens (NAc), the amygdala, orbitofrontal cortex (OFC), ventromedial prefrontal cortex (vmPFC), and superior temporal sulcus (STS; Geier, 2013; Steinberg, 2010; Telzer, 2016). Specifically, increased dopaminergic neurotransmission in mesocortical pathways plays a prominent role in adolescents' heightened reward responses. The “cognitive control” system involves the lateral prefrontal cortex (lPFC), anterior cingulate cortex (ACC, also called “preSMA”), anterior insular cortex (AIC), inferior frontal junction (IFJ), and posterior parietal cortex (PPC). The distributed networks that support cognitive control continue to mature into the mid- or late-twenties, with early adolescents demonstrating less activation (i.e. hypoactivity) and less coupling between the two systems, lacking the top-down regulation of reward systems that adults demonstrate (Van Duijvenvoorde, Achterberg, Braams, Peters, & Crone, 2016). Puberty catalyzes an increase in dopaminergic activity within the socioemotional system, leading to sharp increases in reward-seeking, which precedes maturation of the cognitive control system (Schriber & Guyer, 2016; Telzer, 2016). The temporal gap between the arousal of the socioemotional system and the full maturation of the cognitive control system creates a period of heightened vulnerability to risk-taking during adolescence.

The dual-systems approach has been used to explain normative neurodevelopment in adolescence, which includes both healthy risk-taking (e.g. exploratory behaviors that promote learning), and unhealthy risk-taking (e.g. use of illicit substances; Blalock & Reyna, 2016; Do, Moreira, & Telzer, 2016; Welborn et al., 2016). One behavioral study demonstrated that, when paired with a peer observer, adolescents engaged in more exploratory behavior, learned faster from both positive and negative outcomes, and performed better on the Iowa Gambling Task than those tested alone (Silva et al., 2015). Since adolescence is a period when peer groups become more salient (Schriber & Guyer, 2016), examining positive effects of social reward valuation is key (Pfeifer et al., 2013; Van Hoorn, Van Dijk, et al., 2016). Accordingly, the present thesis incorporates not only individual differences in altruism and empathy, but characteristics of the young adult's peer group, particularly prosociality.

Indeed, the same neural activation that promotes dangerous risks also contributes to positive exploratory behaviors (Humphreys et al., 2015), even prosocial behaviors. Previous research has identified overlap in brain activity between risk-taking and prosociality, noting that helping others (and watching others experience positive outcomes) engages the VS and vmPFC of the mesolimbic reward system (Do et al., 2016). In two studies, teenage and adult participants actually exhibited greater VS and vmPFC activity when making costly donations than when gaining a reward for oneself (Telzer, Fuligni, Lieberman, & Galván, 2013; Zaki & Mitchell, 2011). In addition to reward activation, prosocial behaviors activate the "social brain" network, including the medial prefrontal cortex (mPFC), temporoparietal junction (TPJ), and STS (Rodrigo, Padrón, de Vega, & Ferstl, 2014; Van Hoorn, Van Dijk, Meuwese, Rieffe, & Crone, 2014). To my knowledge, no studies have directly tested if prosociality activates cognitive control in the brain; however, the TPJ has been linked to self-control (Soutschek, Ruff, Strombach, Kalenscher, & Tobler, 2016), and behavioral studies have linked self-regulation in early childhood to greater prosociality later in life (Padilla-Walker, 2014; Weller, Moholy, Bossard, & Levin, 2015). Thus, it is possible that prosocial behaviors are both rewarding (activating the VS) and regulatory (activating the PFC and TPJ), which could in turn predict lower levels of risk-taking. The present thesis incorporates a behavioral approach, but working within this neurobiological model. Additionally, cognitive theories should be acknowledged.

Cognitive Models of Risk-Taking

Conversely, another approach to explaining adolescent risk-taking focuses on cognitive changes in mental representations that occur during adolescence (Reyna, Wilhelms, McCormick, & Weldon, 2015). Fuzzy-trace theory (FTT), a dual-process model of memory and decision-making, posits that humans encode external information as both “verbatim” and “gist” representations (Blalock & Reyna, 2016; Reyna et al., 2011). Children and younger adolescents tend to focus on “verbatim” traces of information, or exact calculations of risk probabilities (trading off risks and rewards), while older adults tend to focus on “gist” traces of information, or holistic categories of risk outcomes (viewing the “big picture”). Further, adolescent decision-making stems from a “developmental reversal” in risk assessment and decision-making tendencies, in that advanced cognition (i.e. that of adults vs. children) typically operates on gist representations, predicting that processing fewer dimensions of information in a simpler all-or-none fashion is more likely to guide healthy decision-making (Reyna, Weldon, & McCormick, 2015). Verbatim decision-making can lead adolescents to take calculated risks, in which the potential reward is more valuable than a negative outcome, whereas adults will avoid the risk if there is any categorical chance of a negative outcome. For example, a teenager understands that unprotected sex has a quantifiable risk of pregnancy or sexually-transmitted infections, but the reward of an exciting sexual encounter is perceived as more valuable; on the other hand, an older adult is more likely to avoid the encounter because of negative outcomes (Reyna et al., 2015).

According to this model, adolescent risk-taking actually demonstrates hyperrationality, as they more precisely trade off the costs and benefits of reward and risk, compensating for the magnitude of the risk with the magnitude of the reward (Reyna et al., 2015). Although their decisions are rational in the classical sense, in that the perceived reward is greater than the perceived risk, safer decisions are made through the intuitive thinking more characteristic of gist processing. Additionally, self-regulation is thought to rely more on intuitive decision-making than analytic decision-making (Bromberg, Wiehler, & Peters, 2015). It is possible that reliance on more intuitive decision processes actually coincides with maturation of cognitive control systems in the brain, presenting a clearer picture of the discrepancy between adolescent and adult risks (Reyna et al., 2015); however, no studies to date have tested this directly. Although the present thesis does not focus on FTT specifically, it is important to acknowledge individual differences in information processing (e.g. self-regulation).

Individual Differences in Risk-Taking

Risk-taking is normative and highly social in this developmental period, but it is also influenced by individual differences in neurodevelopment and personality (Guyer, McClure-Tone, Shiffrin, Pine, & Nelson, 2009; Steinberg, 2008). One potential individual difference is engagement in prosocial behaviors, as recent research has demonstrated that individual prosocial behaviors are protective factor against later antisocial behaviors (Carlo et al., 2014), and prosocial peers are a protective against illicit substance use and violent behaviors (Choukas-Bradley, Giletta, Cohen, & Prinstein, 2015; Prinstein et al., 2001; Spoth, Redmond, & Hockaday, 1996). No research to my knowledge, however, has directly assessed prosocial tendencies and empathy as predictors of various risk behaviors, like binge drinking and reckless driving, as well as moderating effects between previously-identified neurobiological correlates (e.g. reward sensitivity, or a tendency to be strongly motivated by potential pleasurable outcomes) and risk-taking. Since desire for peer approval is so salient in adolescence, and many risk behaviors endanger not only individuals but others around them (Do et al., 2016; Schriber & Guyer, 2016; Steinberg, 2008), then adolescents with higher prosocial characteristics might be less prone to risk-taking. Similarly, affiliation with prosocial peers might buffer against reward sensitivity.

Reward sensitivity. Previous research has identified several self-reported variables that are thought to reflect individual differences in brain development and activation, such as reward sensitivity, which contributes to risk-taking. The present study used reward sensitivity to assess socioemotional reward processing. Substance use has been linked to heightened reward sensitivity, sensation seeking, impulsivity, nonconventionality, stress and affect coping, and extraversion; and to lowered self-regulation, self efficacy, and future orientation (Arnett, 2005; Baer, 2002; Kong, Singh, Camenga, Cavallo, & Krishnan-Sarin, 2013; Reid & Carey, 2015; Stone, Becker, Huber, & Catalano, 2012; Wood, Dawe, & Gullo, 2013). Additionally, substance use is related to descriptive norms from peers (perceptions of others' level and frequency of use), injunctive norms (perceptions of others' approval of use), and anxiety. Neurodevelopmental changes in reward sensitivity are associated with increased sensation seeking in adolescents as a whole, but there are also individual differences in this construct (Carver & White, 1994; Richards et al., 2016; Torrubia, Ávila, Moltó, & Caseras, 2001).

Self-regulation. Individual differences in cognitive control variables (i.e. self-regulation, future orientation) also contribute to variation in risk-taking, and accordingly, the present study used self-regulation to assess cognitive control. Self-regulation, defined earlier as the ability to regulate one's attention, affect, and activity in accordance with internal and external demands, determines multiple areas of psychosocial adjustment (Crockett, Raffaelli, & Shen, 2006; Gardner, Dishion, & Connell, 2008; Moilanen, 2015). Poor self-regulation has been linked to greater endorsement of risky activities, including binge drinking (Magar, Phillips, & Hosie, 2008), as well as frequency of getting drunk and daily drinking (Reid & Carey, 2015). Additionally, there is evidence that adolescents who are more prosocial are also more self-regulated (Carlo, Crockett, Wolff, & Beal, 2012; Hardy, Dollahite, Johnson, & Christensen, 2015; Padilla-Walker, Carlo, & Nielson, 2015), described in the following section. Future orientation, referring to a group of affective, attitudinal, cognitive, and motivational constructs, entails the ability to imagine one's future life circumstances and the extent to which one thinks about the future (Cauffman & Steinberg, 2000; Monahan, Steinberg, Cauffman, & Mulvey, 2009; Shulman, Harden, Chein, & Steinberg, 2016). Low future orientation is correlated with delinquency and antisocial behaviors (Cauffman & Steinberg, 2000; Monahan, King, Shulman, Cauffman, & Chassin, 2015; Seginer, 2009). Overall, cognitive control is key to risk-taking (Geier, 2013) and may be related to prosociality (Welborn et al., 2015), which leads the present study to test moderating effects of prosocial characteristics on self-regulation and risk-taking.

Prosocial behaviors and tendencies. Prosocial behaviors (i.e. engaging in acts such as volunteering) and tendencies (i.e. personality characteristics such as altruism and empathy) are generally associated with indicators of health, psychological wellbeing, and social competence in both adolescents and adults (Carlo, Crockett, Wilkinson, & Beal, 2011; Eisenberg & Fabes, 1990; Eisenberg et al., 1991; Padilla-Walker et al., 2015). In adolescence, prosocial behaviors can include volunteering, donating, and giving more generally (Carlo et al., 2014), as well as mentoring troubled peers at school, valuing good grades, and discouraging substance use (Prinstein et al., 2001; Smith, Steinberg, Strang, & Chein, 2015; Van Hoorn et al., 2016). Research thus far has found that youth who engage in high levels of prosocial behaviors are less likely to present antisocial problem behaviors, such as delinquency and aggression (Durkin & Barber, 2002; Stone et al., 2012). Additionally, VS activity in response to prosocial rewards (e.g. giving money to a family member instead of themselves) has been linked to declines in risk behaviors and depressive symptoms, even one year later (Telzer et al., 2013). This finding suggests that adolescents experience reward not only after unhealthy types of risk-taking, but also prosocial behaviors, which identifies prosociality as a protective factor within the dual-systems model. If reward-related areas of the brain (e.g. the VS) are crucial to risk-taking, as in the dual-systems model (Shulman et al., 2016; Steinberg, 2010), then activating these areas with prosocial rewards could redirect the propensity toward risk-taking toward healthier behaviors, such as volunteering with friends.

Empathy is the ability to understand and to share another's emotional state, which is an important social skill underlying various capabilities and behaviors (Eisenberg & Fabes, 1990; Eisenberg & Miller, 1987). Empathy may foster positive social behavior, as well as inhibit harmful behavior towards others (Espelage, Green, & Polanin, 2012; Nickerson & Mele-Taylor, 2014). Adolescents' development of empathy is driven by both personality characteristics and social environment, reflecting implicit learning and modeling of others' behavior (Crone & Dahl, 2012; Eisenberg & Miller, 1987). For example, popular adolescents (those frequently liked and seldom disliked by peers) generally score highly on measures of empathic concern and perspective-taking (Choukas-Bradley et al., 2015; de Water, Cillessen, & Scheres, 2014; Van

Rijsewijk, Kornelis, Pattiselanno, Steglich, & Veenstra, 2016). Moreover, rejection from a peer group has been associated with greater risk-taking in adolescence (Peake, Dishion, Stormshak, Moore, & Pfeifer, 2013; Pfeifer et al., 2013). Whereas no studies to my knowledge have directly measured empathy and risk-taking, there is evidence that empathic concern relates to decreased risky driving (Buckley & Chapman, 2016; Machin & Sankey, 2008), and that prosocial beliefs reduce engagement in fighting (Fergus & Zimmerman, 2005). Greater concern for others might predict lower risk-taking, since many risks also involve peers' well-being (e.g. reckless driving).

Generally, adolescents show an increase in other-oriented thoughts over self-oriented thoughts (Crone & Dahl, 2012; Güroglu, Van den Bos, & Crone, 2014; Rodrigo et al., 2014; Van Hoorn et al., 2016). Studies using social decision-making games, such as the Ultimatum Game and the Trust Game, have found that self-oriented thoughts decrease while other-oriented thoughts increase with age, suggesting that adolescence is a special transition phase (especially ages 12-16). The Ultimatum Game entails receiving a sum of money and deciding how to divide the money between oneself and another, similar to the Dictator Game, in which one chooses between two options with differing values (some choices reflecting more prosociality, and selfishness). Similarly, in the Trust Game, the second player chooses how much investment to reciprocate back to the first player (Achtziger, Alós-Ferrer, & Wagner, 2015; Brocklebank, Lewis, & Bates, 2011; Güroglu et al., 2014). Children and young adolescents (ages 9-13) demonstrate less understanding of others' intentions during decision-making; but with increased age comes greater perspective-taking. Further, one meta-analysis found that brain regions involved in social cognition (e.g. the TPJ, insula, and anterior mPFC), involved in judging fairness and reciprocating trust, are also activated during these decision-making games (Güroglu et al., 2014). Taken together, the salience of peer approval and acceptance during adolescence might reveal a link between empathy and decreased risk-taking. Adolescence is a developmental period where peers become crucial to identity and decision-making, as many behaviors are influenced by peer attitudes and behaviors (Welborn et al., 2015).

Peer Pressure: The Good and the Bad

In adolescence, peers become more important to identity development, as a newfound sense of independence and freedom is balanced with a need for social support beyond the family (Albert et al., 2013; Albert & Steinberg, 2011; Arnett, 2005). Adolescents are more likely to take risks when being observed by peers than when alone (Gardner & Steinberg, 2005), and peers' behavior is a strong predictor of an individual's behavior (Prinstein & Dodge, 2008; Studer et al., 2014). The tendency for modeling peers has been attributed to a mixture of social learning processes, opportunity effects, and social homophily (i.e. seeking out friends who are similar; Brechwald & Prinstein, 2011; Espelage, Holt, & Henkel, 2003), along with neural sensitivity to peer observation (Albert et al., 2013; Chein, Albert, O'Brien, Uckert, & Steinberg, 2011).

Regarding prosociality, younger adolescents who have a high proportion of prosocial friends are less likely to pursue substance use and delinquency (Barry & Wentzel, 2006; Han & Margolin, 2015; Prinstein et al., 2001), suggesting that affiliating with positive peers can be protective against risk-taking (Spoth et al., 1996). Further, peer disapproval of substance use is a predictor of reduced substance use in eighth graders (Sawyer & Stevenson, 2008). In young adults, peer involvement in positive activities is negatively associated with alcohol use (Baer, 2002; Stone et al., 2012; Studer et al., 2014). Thus, the rewarding nature of peers extends beyond deviant peers and dangerous risk-taking to positive peers and healthy behaviors.

The pattern of brain development outlined in the dual-systems model is also modified by social context, as adolescents tend to display increased reward sensitivity when being observed by same-age peers (Chein et al., 2011; Smith, Chein, & Steinberg, 2014), and decreased risk-taking when being observed by their mother (Telzer et al., 2015) as well as other older adults (Silva, Chein, & Steinberg, 2016). When being observed by same-age peers, adolescents were twice as likely to take risks in a driving simulator than when alone (Gardner & Steinberg, 2005). Notably, young adults showed a similar pattern, but with less strong of an effect. The increase in risk-taking occurs even in the presence of neutral observers, who are not promoting any attitudes about risk (e.g. encouraging riskiness; Smith et al., 2015). Peer presence motivates adolescents to process reward differently, preferring a rewarding risk with potential social benefit over a safer choice. Indeed, adolescents are more likely to prefer immediate over delayed rewards with peer presence (Weigard, Chein, Albert, Smith, & Steinberg, 2014), and are more likely to pursue rewards even when negative outcomes are likely (O'Brien, Albert, Chein, & Steinberg, 2011; Smith et al., 2014). Peer observation activates brain areas associated with reward processing, such as the VS and OFC, more so than cognitive control areas like the dlPFC and ACC (Albert et al., 2013; Chein et al., 2011). Additionally, when teenagers decide both for themselves and for an imagined peer, there is increased activity in mentalizing and Theory of Mind areas of the brain, such as the TPJ and middle temporal gyrus (Rodrigo et al., 2014). Older adults' brains are also active in these areas during such tasks, but adolescents have a higher rate of activity.

Beyond neutral peer presence, most studies on risk-taking have focused on deviant peer affiliation and not prosocial peer affiliation (Gardner et al., 2008; Prinstein et al., 2001; Van Hoorn et al., 2016). Deviant peer group affiliation is certainly concerning, as delinquent peers can influence others to engage in antisocial behaviors, referred to as “deviancy training,” (Dishion & Tipsord, 2011). Deviant peer association has been linked to an array of negative outcomes, including higher rates of substance use (Monahan, Rhew, Hawkins, & Brown, 2014), delinquency and antisocial behavior (Monahan et al., 2009), and depressive symptoms (Criss, Morris, Ponce-Garcia, Cui, & Silk, 2016). Indeed, peer substance use is one of the strongest predictors of adolescent substance use (Engels & Scholte, 2013; Oxford, Oxford, Harachi, Catalano, & Abbott, 2001). Differential association theory (Catalano, Kosterman, Hawkins, Newcomb, & Abbott, 1996; Michael & Ben-Zur, 2007) proposes that through interactions with others, individuals learn values and attitudes for themselves. Adolescents may encounter opportunities for interaction with prosocial others, or those engaged in problem behavior, which then creates greater opportunity to be involved in that same behavior, due to learned values, attitudes, techniques, and motives.

Peers also directly influence the mitigation of others’ behaviors, such as discouraging reckless driving and substance use (Buckley & Chapman, 2016; Buckley & Foss, 2012; Machin & Sankey, 2008). One study found that, when aware of reckless driving (in a laboratory driving simulator), adolescent passengers were more likely to verbally discourage the driver and promote safer driving practices (Simons-Morton et al., 2011). Following discouragement, the driver adopted less risky methods, conforming to the peer’s attitudes and striving for social acceptance. Thus, peers can have a positive influence on each other’s risky behaviors, along with indirectly modeling prosocial behaviors (Van Hoorn, Fuligni, et al., 2016). While not yet tested, it is possible that reward-related incentivization of prosocial behaviors might rely on the same neurobiological processes as deviant risk behaviors.

The Present Study

The present study investigates individual differences in prosocial characteristics (altruistic tendencies, prosocial peer affiliation, and empathic concern) as they relate to risk behaviors (both self-reported and behavioral) in young adulthood. Research thus far is limited, but has found support for the protective effects of prosociality. For example, prosocial adolescents and young adults are less prone to risk-taking, affiliation with prosocial peers is linked to lower levels of illicit substance use and delinquency, and there is overlap in brain activation between risk-taking and prosocial tasks (Do et al., 2016; Prinstein et al., 2001; Spoth et al., 1996; Telzer et al., 2013; Welborn et al., 2015). The current thesis used two types of measures, including personality questionnaires (e.g. the Prosocial Tendencies Measure or PTM; Carlo & Randall, 2002) and behavioral tasks (e.g. the Dictator Game; Brocklebank, Lewis, & Bates, 2011) together in the risky decision paradigm, which is a novel approach. Certain prosocial tendencies can be characterized as an individual difference (i.e. an individual's motivation to act altruistically), but engagement in prosocial behaviors is malleable, as teenagers could participate in volunteering as part of an after-school program that targets intervention in risky decision-making.

Research hypotheses center on how prosocial characteristics (altruistic tendencies, prosocial peer affiliation [PPA], and empathic concern) directly relate to variation in risky decisions in young adults, and also potentially moderate other decision-making factors that influence risk-taking in adolescence. Reporting high levels of prosociality is hypothesized to correspond with lower risk-taking scores, while also modifying the strength of the relation between neurobiological variables (self-regulation and reward sensitivity) and risk variables. Prosocial characteristics might have protective effects against socioemotional variables like reward sensitivity, and additive effects with cognitive control variables like self-regulation. For example, a young adult who reports high reward sensitivity but also high PPA is predicted to reported lower levels of risk-taking than a young adult who reports low PPA.

The first research hypothesis was that high levels of prosocial characteristics would be negatively associated with self-reported risk behaviors (lifetime illicit substance use, and past 30 days tobacco use, binge drinking, drunk driving, and texting while driving), as well as behavioral risk-taking (scores on the Balloon Analogue Risk Task, or BART; Lejuez, Aklin, Daughters, Zvolensky, & Kahler, 2007). The second research hypothesis was that prosocial characteristics would moderate relationships between neurobiological correlates (reward sensitivity and self-regulation) and risk behaviors, reducing the effects of reward sensitivity and increasing the effects of self-regulation. For example, when empathic concern is high and reward sensitivity is low, risk-taking is expected to be lowest, whereas it would be highest in participants with low empathic concern and high reward sensitivity. With a buffering effect, however, risk-taking was expected to be lower when empathic concern is high, even if reward sensitivity was also high (i.e. demonstrating a protective effect of empathic concern). For self-regulation, when both altruistic tendencies and self-regulation are high, risk-taking was expected to be lowest, whereas with low altruistic tendencies and low self-regulation risk-taking would be highest. Further, if self-regulation is low and altruistic tendencies are high, young adults were predicted to report lower levels of risk-taking than if altruistic tendencies were also low.

Lastly, the third research hypothesis was that empathic concern will mediate the connections between other prosocial characteristics (altruistic tendencies and PPA) and "social risks," or risk behaviors that directly endanger the lives of other people (e.g. drunk driving and texting while driving). Further, any relations found between altruistic tendencies or PPA and social risk outcomes would no longer be significant when controlling for empathic concern. The relation between PPA and these two outcomes was expected to be fully explained by empathic concern, in that having prosocial friends is predictive of lower drunk driving only when the individual also feels an emotional attachment to others. For example, a young adult with high amounts of prosocial friends and also high empathic concern was expected to report lower texting while driving, whereas for a young adult with low empathic concern, having prosocial friends would not predict texting while driving. Additionally, the influence of friends' behaviors on texting while driving and drunk driving depends on that individual's prosocial characteristics. Since individuals tend to choose friends who are similar to themselves (i.e. social homophily; Brechwald & Prinstein, 2011; Espelage et al., 2003), social risks are hypothesized to be the result of combined peer and individual influences.

Method

Participants

One-hundred participants (*N* = 100) completed a battery of questionnaires and behavioral tasks. Due to a technical error, however, 49 participants (59.8%) did not respond to questions about demographics, so 40.2% of the sample is represented in analyses. Thus, the final sample consisted of 51 participants, all residing in the Southeastern United States (including Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, or West Virginia), with ages ranging from 20 years to 25 years of age (*M* = 22.55, *SD* = 1.38). Further, 4 participants were aged 20 (8.2%), 10 aged 21 (20.4%), 7 aged 22 (14.3%), 12 aged 23 (24.5%), 15 aged 24 (30.6%), and 2 aged 25 (2%). Twenty-five participants identified as Male (51.02%), 20 as Female (40.82%), and 4 as Other or Prefer Not to Say (8.16%). Descriptive statistics for demographic variables are presented in Table 1 (Appendix A).

Procedure

Participants completed the battery of questionnaires and behavioral tasks online, through the survey portal on Amazon Mechanical Turk. The study first presented all questionnaires in random order (block randomization), and then each Inquisit task in non-random order at the end of the study. The study required approximately one hour of time. After completing the study, participants read an electronic version of a debriefing script explaining the study and goals.

Materials

Measures are listed below, beginning with demographic questions. Reliability for survey scales was assessed using Cronbach's alpha test, and validity for the novel scale, the Prosocial Peer Affiliation Scale (PPAS), was assessed with a principle components analysis (PCA) to determine factor structure, and several correlational analyses to establish convergent and discriminant validity. Reliability results are presented in Table 2 (Appendix B), and validity for the PPAS is presented in Table 3. Most scales had good internal consistency, with alpha values above .70, a widely-accepted cutoff (Nunnally, 1978). Some items, however, were dropped to improve reliability. Descriptive statistics for all quantitative predictor variables are presented in Table 4 (Appendix C), and quantitative outcome variables in Table 5.

Demographics. Demographic information was collected through Qualtrics, containing questions about age, sex, gender, ethnicity, race, education level, household income, employment status, marital status, region of residence, parents' education (separately for mother and father, if applicable), parents' marital status, and neighborhood type (suburban, urban, and rural). For descriptive statistics (Table 1), the following variables were recoded.

Sex was recoded into Female, Male and Other. Ethnicity was recoded into White/Caucasian, Black/African American, Asian, Hispanic/Latino, and Other. Further, gender and ethnicity were dummy-coded. Neighborhood was recoded into Suburban and Other. Education was recoded into High School Diploma or GED, and College Degree. Mother's and Father's Education were recoded into Less Than High School, High School Diploma or GED, Bachelor's Degree, and Graduate Degree. Employment was recoded into Student, Employed, and Unemployed. Marital Status was recoded into Single, and Married or In a Relationship. Lastly, Income was recoded into $30,000 or Less, $30,000 to $70,000, and More Than $70,000.

Risky decision-making. Risk behaviors were assessed through a behavioral computer task as well as questionnaire responses on real-world risk-taking tendencies.

Behavioral risk-taking. The behavioral task was the Balloon Analogue Risk Task (BART; Lejuez et al., 2007). The BART is a measure of risk aversion, which presents several trials containing an image of a balloon and a meter for earned points. On each trial, one click causes incremental inflation of the balloon and money added to the meter, up until a threshold where the balloon over-inflates and explodes. When this explosion threshold is met (random per trial), all accrued money is lost.

The score used from this measure was adjusted mean number of pumps per trial, in which the adjusted score includes only non-exploded balloons, so that the participant's behavior was not constrained by the explosion point of the balloon. Higher mean pumps per non-exploded balloon indicates greater risk-taking. For the present study, BART mean pumps had a slight positive skew (Shapiro-Wilk's $W = .97$, $p = .04$, indicating a non-normal distribution), so the data were square-root transformed, which produced a normal distribution ($W = .98$, $p = .08$).

Self-reported risk-taking. Health risks were assessed through the CDC State and Local Youth Risk Behavior Survey (YRBS; Shulman, Harden, Chein, & Steinberg, 2015), which asks questions about substance use, reckless driving (e.g. texting while driving, seatbelt use), sexual activity, delinquency, and other general health behaviors such as nutrition. Substance use questions measured the frequency (both lifetime and during the past 30 days) of using tobacco (e.g., "During the past 30 days, how many cigarettes did you smoke per day?"), marijuana (e.g. "During the past 30 days, how many times did you use marijuana?"), illicit drugs (e.g. "During your life, how many times have you used any form of cocaine, including powder, crack, or freebase?"), and alcohol, further divided into frequency of drinking (e.g. "During the past 30 days, on how many days did you have at least one drink of alcohol?"), binge drinking (e.g.

"During the past 30 days, on how many days did you have 5 or more drinks of alcohol in a row, that is, within a couple of hours?"), and drunk driving (e.g. "During the past 30 days, how many times did you drive a car or other vehicle when you had been drinking alcohol?"). Sexual activity was measured in a similar format, with questions about whether or not the participant ever had sex, their number of total lifetime sexual partners, and their use of condoms and other forms of birth control (e.g. "The last time you had sexual intercourse, did you or your partner use a condom?"). Delinquent behaviors include frequency of fighting (e.g. "During the past 12 months, how many times were you in a physical fight?") and carrying weapons.

For illicit substance use variables, most values were strongly positively skewed, with the majority of participants reporting no use in their lifetime. Due to low counts, each variable was recoded into dichotomous groups (0 = Never, 1 = At Least Once), and then a new variable named "Substance Use (Any Kind)" was created to reflect if participants had ever engaged in any type of drug use. Following this, 23 (25.27%) participants had reported using at least one drug in their lifetime. Descriptive statistics for dichotomous illicit substance use variables are presented in Table 6.

Altruistic tendencies. Altruistic tendencies were measured with a behavioral task, as well as a self-report questionnaire.

Dictator game. The Dictator Game (Brocklebank et al., 2011) measured prosocial orientation through several trials in which two options are presented, each with different point-value outcomes for Player A (the participant) and Player B (another "peer" who is actually a computer-programmed virtual opponent). The choices involved receiving points both for yourself and for the opponent player, with different opportunities to be altruistic or selfish. For example, one trial could present 2 options, A1 and A2: if the player chooses A1, then they receive 400 points and the opponent also receives 400; if the player chooses A2, then they receive 400 points and the opponent receives 600 points. Choice A2 entails non-costly giving, in which Player A does not sacrifice points but chooses to give more points to Player B. The resulting points are computed into a "Prosocial Orientation Score," or POS, in which a higher score indicates greater prosociality.

A total POS was computed for each participant. The method for this computation followed that of Brockelbank et al. (2011), with minor modifications. In the original paper, the authors assigned one point for each decision in which the greatest payoff was achieved for both players, which was labeled the more prosocial choice. In the present study, however, assigned points for each decision ranged from 2 to -2, to reflect a wider range of motivations behind different types of prosocial decisions. Instead of assigning one point for the greatest payoff, the scheme was as follows: two points were assigned for any instance where Player B (the study participant) engaged in costly or extreme prosociality (e.g. choosing to receive 375 points and give 750, instead of choosing 400 and 400 in the second option), one point was assigned for non-costly prosociality (e.g. choosing to receive 400 and give 600 instead of 400 and 400), one point was deducted for non-costly spitefulness (e.g. choosing to receive 200 and give 0 instead of receiving 400 and giving 400), and two points were deducted for costly spitefulness (e.g. choosing to receive 0 and give 0, instead of receiving 600 and giving 800). This range of points was aggregated into a sum score, and then added to a constant of 10 to remove negative values (i.e. a POS score of -6 was converted to +4). The POS scores, however, had a non-normal negatively-skewed distribution (Shapiro-Wilk's $W = .95$, $p < .01$). The data were transformed using a square-root computation, which produced a normal distribution ($W = .97$, $p = .08$).

Prosocial tendencies measure. The Prosocial Tendencies Measure (PTM; Carlo & Randall, 2002) assessed the likelihood of engaging in prosocial behaviors, with 25 questions divided into six categories: public (e.g. "I can help others best when people are watching me"), anonymous (e.g. "I tend to help others in need when they do not know who helped them"), dire (e.g. "I tend to help people who are in real crisis or need"), emotional ("I respond to helping others best when the situation is highly emotional"), compliant (e.g. "When people ask me to help them, I don't hesitate"), and altruism (e.g. "I often help even if I don't think I will get anything out of helping"). Each question had responses ranging from 1 ("Does Not Describe Me At All") to 5 ("Describes Me Greatly"). The focus of the present study is the "altruism" subscale of this measure, assessing altruistic tendencies, which had good reliability ($\alpha = .74$; Table 2).

Empathic concern. The Interpersonal Reactivity Index (Davis, 1983) was used to measure empathy, consisting of perspective taking (e.g. "I try to look at everybody's side of a disagreement before I make a decision"), empathic concern (e.g. "I am often quite touched by things that I see happen") personal distress (e.g. "In emergency situations, I feel anxious and ill-at-ease"), and fantasy (e.g. "When I watch a good movie, I can very easily put myself in the place of a leading character"). The original scale contained dichotomous responses ("True" or "False"), but the current thesis used a modified response scale from 1 ("Strongly Disagree") to 5 ("Strongly Agree"), in order to capture more individual variation in responses, which can be more informative (Embretson & Reise, 2000). Analyses were conducted with the empathic concern subscale, which had high reliability ($\alpha = .88$).

Reward sensitivity. The Reward Responsiveness subscale of the Behavioral Activation Scale (Carver & White, 1994) was used to measure reward sensitivity, or the tendency to value potential rewards and divert more attention to them despite long-term goals. The four-item scale uses a response scale of 1 ("Strongly Agree") to 4 ("Strongly Disagree"), and one example question is, "When I see an opportunity for something I like, I get excited right away." The reliability of the scale was high at $\alpha = .90$.

Self-Regulation. The Adolescent Self-Regulation Inventory (Moilanen, 2007) was used to measure self-regulation, or the ability to regulate one's emotions and behaviors in order to achieve goals. This inventory contains 19 questions, with a response scale between 1 ("Strongly Disagree") to 5 ("Strongly Agree"). One example question is, "I usually keep track of my progress toward my goals." The reliability of the scale was $\alpha = .91$.

Prosocial peer affiliation (PPA). Characteristics of peer groups were documented with a novel questionnaire created for the present study, the Prosocial Peer Affiliation Scale (PPAS). The PPAS consists of 9 questions (Table 3; Appendix F), a combination from the Deviant Peer Group Affiliation Scale (DPGAS; Dishion, Patterson, Stoolmiller, & Skinner, 1991) and the PTM, with modified response options. The DPGAS contains 18 items about friends' negative behaviors (e.g. "How many of your friends smoked cigarettes?"), as well as four questions on positive behaviors (e.g. "How many of your friends did volunteer work?"). The PPAS, however, was modified to have responses on a scale of 1 ("Does not describe my friends at all") to 5 ("Describes my friends greatly"), and some questions were expanded to include motivation (e.g. "My friends do volunteer work because they believe it is a moral thing to do," and "My friends do volunteer work because it looks good on their resume,"). Another example item is "My friends mentor/tutor other kids at school." After dropping one item about fighting behaviors, the scale had good reliability (α = .88). Table 3 presents PCA results, and Table 4 presents means.

The PPAS was found to have two major factors, with all but one item (8 items) loading onto the first factor that explained 5.51% of the variance (using orthogonal rotation; Table 3). The second factor, which explained 12.89% of variance, was composed of the question about fighting ("My friends disapprove of fighting other people"). Following the exclusion of this item, a second PCA revealed one major factor that explained 55.35% of the variance. The Eigenvalue for the component was 4.43, and the Kaiser-Meyer-Olkin Measure of Sampling Adequacy value was.85, above the acceptable cutoff of .60 (Yamamoto & Jennrich, 2013). Additionally, Bartlett's test of sphericity was significant ($\chi^2(28) = 16.64$, $p < .01$). Extraction values were all above .60, and component correlations were all above .60 as well.

For convergent validity, the PPAS was compared to the positive items of the DPGAS, the PTM (all subscales but Public), and the empathic concern subscale of the Interpersonal Reactivity Index (IRI). The final PPAS scale used included all items except for Public prosociality, so the scale was compared to the PTM without the Public subscale, as this scale captures appearance-motivated prosociality. As predicted, scores on the PPAS were strongly positive correlated with positive items of the DPGAS ($r(25) = .70$, $p < .01$). There was also a strong, positive relation with Prosocial Tendencies (overall, all but Public; $r(25) = .51$, $p < .01$), as well as Empathic Concern ($r(26) = .74$, $p < .01$). The altruistic subscale of the PTM, however, was not significantly related ($r(25) = .27$, $p = .18$). Still, positive correlations with the DPGAS, PTM overall, and IRI suggest that the PPAS does measure prosociality of friend groups.

For discriminant validity, the PPAS was compared to the negative items of the DPGAS, and the Public subscale of the PTM. Scores on the PPAS were strongly negatively correlated with scores on the DPGAS ($r(23) = -.46$, $p = .02$), suggesting that the PPAS does indeed measure prosociality of friend groups. The relationship with Public prosociality, however, was not significant ($r(25) = -.12$, $p = .56$).

Data Analysis Plan

Prior to analysis, the data files from Qualtrics survey software and Inquisit task software were inspected, cleaned, and merged into a single SPSS file. Survey items were reverse-scored if needed, and mean scores were computed after assessing reliability. Mean scores were also computed for the BART and the Dictator Game. Descriptive statistics for all quantitative variables are presented in Tables 4 and Table 5.

Data analyses included bivariate correlations, partial correlations, moderated multiple regressions, mediated multiple regressions (using PROCESS, an add-on for SPSS), and binary logistic regressions. The risk-taking outcome variables (lifetime illicit substance use, and past 30 days tobacco use, binge drinking, drunk driving, and texting while driving) were regressed on influence variables (prosocial characteristics and neural correlates). Preliminary analyses included zero-order bivariate correlations, and main analyses included a series of multiple regressions, with centered independent variables and interaction terms.

To test for main effects (i.e. if a predictor is related to an outcome) and moderating effects (i.e. if a third variable changes the relation between another predictor and outcome), moderated multiple regression analyses were used, each involving three steps. The first step included the control demographic variables (age, dummy-coded sex, and dummy-coded ethnicity), the second step included two predictors (with predictors centered on the means), and the third step included the interaction term for the two predictors (with the product of the first predictor and the second predictor). Analyses also included binary logistic regressions with the same stepwise method for dichotomous outcomes, for illicit substance use (coded as 0 for never in one's lifetime, and 1 for at least once throughout lifetime) and tobacco use (never or at least once in the past 30 days). For mediation analyses, multiple regression was also used, with direct and indirect effects tested by using the PROCESS macro plug-in for SPSS (Hayes & Rockwood, 2016), including the use of bootstrapping with 1,000 resampled cases to estimate confidence intervals. Mediation was assessed through path coefficients, confidence intervals for indirect effects, and Sobel's Z-test (comparing the coefficients with and without the mediator present).

Following low response rate to demographic questions, the same series of regressions was run again without the first control step (i.e. step 1 included predictors, and step 2 included the interaction term). The purpose was to see if greater power from a larger sample size would reveal significant effects, as well as check for possible self-selection bias (i.e. if the participants who responded to the demographics were different from those who did not) by observing the patterns in remaining data. Overall, results from regressions without controls mirrored those with controls, supporting the idea that patterns did not differ between participants who completed the demographics survey and those who did not. Additionally, removing controls allowed for complete results for binary logistic regressions, as many with control variables reported blank outputs due to insufficient cases. Accordingly, the following results include multiple regressions with control variables included, and binary logistic regressions with no control variables. Results from these analyses are presented throughout Tables 9 through 20, and mentioned in the following "Main Effects and Moderating Effects by Outcome" section.

Results

Preliminary Results

Zero-order correlations among predictor variables are presented in Table 7 (Appendix D). Correlations among predictors and risk outcomes are presented in Table 8. For predictors, altruistic tendencies was positively associated with PPA and empathic concern, as predicted; but unexpectedly, neural correlates were not related to altruistic tendencies or PPA. Empathic concern, however, was negatively related to reward sensitivity.

For outcome variables, drunk driving and texting while driving were negatively associated with altruistic tendencies, PPA, and empathic concern. Binge drinking was also negatively associated with empathic concern. Tobacco use (mean number of days in the past 30 days) and illicit substance use (any instance in lifetime) were negatively associated with empathic concern. Lastly, the following variables were not included in main analyses, but reported in Table 8: marijuana use (mean number of days in the past 30 days) was negatively correlated with empathic concern, seatbelt use was positively correlated with PPA, and no correlations were found for age of first sexual intercourse and lifetime number of sexual partners.

Main Effects and Moderating Effects by Outcome

Regression analyses were used to test main effects and moderating effects. It was hypothesized that altruistic tendencies, PPA, and empathic concern would be negatively associated with risk-taking outcomes (main effects), and also that these variables would moderate relations between neural correlates (self-regulation and reward sensitivity) and risk-taking. The results are organized by outcome variable in the following sections.

Drunk driving. For main effects, drunk driving was negatively associated with altruistic tendencies (Tables 9 and 10; Appendix E), prosocial peer affiliation (Table 11), and empathic concern (Table 12), supporting the first research hypothesis. In other words, reporting high levels of these prosocial characteristics was predictive of lower levels of drunk driving.

For moderating effects, drunk driving was negatively related to the interaction terms containing altruistic tendencies and reward sensitivity (Table 9; Figure 1), as well as altruistic tendencies and self-regulation (Table 10; Figure 2), which partially supported the second research hypothesis. The interaction term with reward sensitivity and altruistic tendencies explained an additional 21% of variance beyond the two predictors alone (Table 9). As displayed in Figure 1, young adults with high altruistic tendencies (one standard deviation above the mean) reported lower levels of drunk driving, even when they also had high reward sensitivity. For low altruistic tendencies (one standard deviation below the mean), however, young adults were more likely to engage in drunk driving, especially when they also reported high reward sensitivity. The highest amount of drunk driving resulted from low altruistic tendencies and high reward sensitivity, whereas the lowest amount resulted from high altruistic tendencies and low reward sensitivity. In other words, altruistic tendencies buffered the relation between reward sensitivity and drunk driving. For self-regulation, young adults with high altruistic tendencies and high self-regulation reported the lowest levels of drunk driving (Table 10), as displayed in Figure 2. Even with low self-regulation, however, high altruistic tendencies appears to have a protective effect, as young adults with low self-regulation and high altruistic tendencies reported lower drunk driving than low self-regulation and low altruistic tendencies. Surprisingly, though, the highest drunk driving was actually found with low altruistic tendencies and *high* self-regulation, not low.

Texting while driving. For main effects, texting while driving was negatively related to altruistic tendencies (Tables 13 and 14), prosocial peer affiliation (Table 15), and empathic concern (Table 16). Moderating effects, however, were not found with texting while driving. The interaction term for altruistic tendencies and self-regulation approached significance (p = .09; see Table 13), particularly with the larger sample size from regressions without demographic controls (Table 14). Further, a negative beta value indicated a potential moderating effect, which could be revealed with a larger sample size. Several other models appeared to have the same pattern, but the relations were not statistically significant.

Binge drinking. For main effects, binge drinking was negatively associated with prosocial peer affiliation (Table 17), and empathic concern (Table 18), but not altruistic tendencies (although this approached significance at p = .06). Empathic concern predicted binge drinking when applied with both reward sensitivity (Table 18) and self-regulation.

For moderating effects, binge drinking was negatively related to the interaction terms between PPA and reward sensitivity (Table 17; Figure 3), as well as empathic concern and self-regulation (Table 18; Figure 4). Figure 3 displays the significant moderating effect of PPA between reward sensitivity and binge drinking, as young adults with high PPA reported lower frequencies of binge drinking; and surprisingly, the lowest binge drinking was found for high PPA and high reward sensitivity. Conversely, young adults with low PPA reported more binge drinking, but especially if they also reported high reward sensitivity. This pattern indicates a buffering effect of PPA on reward sensitivity, supporting the second research hypothesis.

Regarding self-regulation, a similar pattern emerged; but surprisingly, young adults with high self-regulation coupled with high empathic concern reported slightly higher levels of binge drinking than those with low self-regulation and high empathic concern (Figure 4). Overall, the lowest binge drinking was found with high empathic concern and *low* self-regulation.

Illicit substance use. The probability of reporting illicit substance use was higher for young adults with lower self-regulation (Table 19; Appendix F), and marginally higher for those with low empathic concern (p = .09); but no other main effects were significant, and no moderating effects were significant. Further, results with illicit substance use were not significant with altruistic tendencies or PPA. Young adults who reported high levels of self-regulation were approximately 33% less likely to report illicit substance use, and for high empathic concern they were 34% less likely (Table 19), but this relation was not statistically significant (p = .09).

Tobacco use. The probability of reporting tobacco use was six times higher for young adults with higher reward sensitivity (Table 20), and marginally higher for those with low PPA (p = .06). Further, young adults who scored high in reward sensitivity were approximately six times more likely to also report being a tobacco user (Table 20). For PPA, reporting high levels of PPA was associated with an approximate 26% chance of reporting tobacco use, being 74% less likely to use tobacco (Table 20), but this relation was not statistically significant (p = .06).

Mediating Effects

Empathic concern was hypothesized to mediate relations between social risk variables (drunk driving and texting while driving) and altruistic tendencies and prosocial peer affiliation. Supporting this prediction, drunk driving was significantly related to altruistic tendencies and empathic concern in zero-order correlations (Table 8), but when controlling for empathic concern, altruistic tendencies were no longer associated with drunk driving ($r(20) = -.32$, $p = .14$). When using the PROCESS macro, however, empathic concern did not appear to mediate the link between altruistic tendencies and drunk driving, as the direct effect of altruistic tendencies (involving empathic concern in the model) was not significant, Sobel's test was not significant, and the confidence interval for the indirect effect contained zero (Table 21; Appendix G), in sum indicating no mediation. Further, Figure 5 displays the relation between altruistic tendencies and drunk driving, in a conceptual mediation model with beta values reported (though not significant). The same pattern was found for PPA and drunk driving (Table 21 continued), and for both PPA and altruistic tendencies on texting while driving (Table 22).

Discussion

The present thesis tested if altruistic tendencies (scores on the Prosocial Tendencies Measure, and the behavioral Dictator Game), prosocial peer affiliation (PPA), and empathic concern predicted lower risk-taking (lifetime illicit substance use, and past 30 days tobacco use, binge drinking, drunk driving, and texting while driving, and Balloon Analogue Risk Task [BART] pumps), both directly and through moderating links with established neurobiologically-relevant variables (reward sensitivity and self-regulation). Results indicated partial support of the first research hypothesis, as several outcomes were negatively related to altruistic tendencies, PPA, and empathic concern. Outcomes related to all three predictors were drunk driving and texting while driving, whereas binge drinking was related to PPA and empathic concern. Contrary to the hypothesis, no main effects were identified for illicit substance use or tobacco use, although some models approached significance for PPA and tobacco use, and for empathic concern and illicit substance use. For the second research hypothesis, it was found that altruistic tendencies moderated the association between both neurobiological correlates and drunk driving, whereas PPA moderated the link between reward sensitivity and binge drinking, and empathic concern moderated the link between self-regulation and binge drinking. Lastly, the third research hypothesis was not supported, as empathic concern did not mediate links between other prosocial characteristics (altruistic tendencies, PPA) and social risks (drunk driving, texting while driving).

Results indicated partial support for the first hypothesis, finding that altruistic tendencies and PPA did negatively relate to two of the five self-reported risk outcomes (drunk driving and texting while driving), and empathic concern predicted three (drunk driving, texting while driving, and binge drinking), both in zero-order correlations and moderated regression analyses. Although altruistic tendencies and these specific health risk behaviors have not been studied together to my knowledge, previous research has suggested that younger adolescents who are more prosocial also tend to be more self-regulated, and that self-regulation is negatively related to risk-taking (Carlo et al., 2012; Gardner et al., 2008; Padilla-Walker, 2014; Padilla-Walker, Carlo, & Nielson, 2015). Additionally, Telzer et al. (2013) found that adolescents with greater ventral striatum (VS) activation to prosocial reward were less likely to engage in substance use and deviant behaviors one year later. Prosociality, both in the individual and in the peer group, might offset risk-taking both by bolstering self-control (i.e. mitigating an impulse to send a text while driving by imagining harm to others in the event of an accident) and by redirecting reward response (i.e. feeling a sense of pride after choosing to arrange a taxi for oneself and a friend instead of risking death, injury, and legal trouble by driving under the influence).

The same pattern was expected for all risk outcomes; however, altruistic tendencies and PPA were not related to use of illicit substances or tobacco. It is possible that prosociality is most important to risk-taking that directly involves other people, such as drunk driving, compared to risk-taking that does not necessarily affect other people directly, such as smoking cigarettes. Secondhand smoke is harmful to others, and illicit substance use can negatively impact families and friend groups, but these risks may not be assessed with the same severity and immediacy as drunk driving, texting while driving, and binge drinking in a social context. Still, previous research has identified prosocial characteristics as protective factors in smoking and substance use, particularly prosocial peers, so these results are surprising.

Regarding PPA, previous research has identified positive peer influence as a protective factor in illicit substance use; but the new measure developed for the present thesis (the PPAS) provides a nuanced assessment of friend characteristics and motivations for engaging in prosocial behaviors. Previous studies, using the DPGAS or other measures of “amounts” of positive peers, have found that younger adolescents who associate with prosocial friends were less likely to drink alcohol and smoke cigarettes (Prinstein et al., 2001; Prinstein & Dodge, 2008; Spoth et al., 1996; Van Hoorn et al., 2016). Further, deviant peer affiliation has been identified as a key risk factor, with much research focusing on the maladaptive outcomes of associating with friends who engage in substance use behaviors (Dishion et al., 1991; Dishion & Tipsord, 2011; Fergusson, Vitaro, Wanner, & Brendgen, 2007; Johnson & Hoffmann, 1997; Prinstein & Wang, 2005). Still, a limitation in previous research is that assessments capture amounts of friends (e.g. “How many of your friends smoke cigarettes?”), and not necessarily their typical behaviors or their motivation (e.g. from the PPAS, “My friends think that volunteer work is a good and moral thing to do”). The PPAS seemed to capture general variance in friend group behaviors, which is informative to peer influences on risk behaviors.

In the present study, however, illicit substance use and tobacco use were not related to PPA, nor any other prosocial characteristic. This result could be a result of the age of the sample (ages 20 to 25, as opposed to having 18-year-olds), or potentially of missing data. For example, use of heroin typically begins in a social context, such as a gathering with friends (Dishion & Owen, 2002; Neaigus et al., 2006; Nelson, Van Ryzin, & Dishion, 2015), but can transition into a more solitary activitiy as addiction begins with a later age (Stacy, Newcomb, & Bentler, 1992; Staff et al., 2010), meaning that in a 22-year-old the behavior is less affected by having friends who are altruistic and engage in positive behaviors. The protective effect may be greater with younger ages, such as 18, when many young adults are beginning a college education or a career. With drunk driving and texting while driving, however, PPA did appear to be protective, along with empathic concern. Empathy has been linked to lower reckless driving in younger adolescents (Buckley & Chapman, 2016; Buckley & Foss, 2012; Simons-Morton et al., 2014), but also adults in their twenties (Schwebel et al., 2007; Simons-Morton et al., 2011), in agreement with these results on texting while driving.

For moderating hypotheses, though many models tested were not significant, some key interactions did support predictions. For example, in models with reward sensitivity, altruistic tendencies buffered against reward sensitivity on drunk driving (i.e. those with high altruistic tendencies and high reward sensitivity were less likely to drive drunk than those with low altruistic tendencies and high reward sensitivity). Following the "dual-systems" model (Casey & Jones, 2010; Shulman et al., 2016; Steinberg, 2010), which proposes that heightened risk-seeking during adolescence and young adulthood results from increased activity in reward-related areas of the brain coupled with less activity in control-related areas, it was predicted that prosocial characteristics would buffer against socioemotional variables (e.g. reward sensitivity) and strengthen cognitive control variables (e.g. self-regulation). The finding that young adults who were highly altruistic were less likely to drive drunk, even if they were also highly responsive to potential rewards, supports this buffering prediction. Young adults who might be predisposed to drunk driving due to high reward sensitivity have a lower probability of engaging in the behavior if they also are highly altruistic. Reward sensitivity could motivate taking the risk of driving while under the influence, but concern for others' well-being could restrain that impulse. Further, peers seem to increase the salience of potential rewards (Albert et al., 2013; O'Brien et al., 2011; Sawyer & Stevenson, 2008; Silva et al., 2015), but if an adolescent is concerned with harming a peer (via higher empathy, altruism), rewards could become less important.

Regarding cognitive control, results were less supportive of hypotheses; but young adults who were highly altruistic and highly self-regulated did engage in less drunk driving than those who reported lower self-regulation. Further, the lowest levels of drunk driving were reported by young adults with high self-regulation and high altruistic tendencies. Empathic concern followed a surprising pattern, however, in that the lowest levels of binge drinking were actually reported by young adults with high empathic concern and *low* self-regulation rather than high (Figure 4). Similarly, in participants with low altruistic tendencies, drunk driving was actually higher in those with high self-regulation as opposed to low (Figure 2). This pattern contrasted with research hypotheses, which expected lower drunk driving and binge drinking with *high* self-regulation coupled with high altruistic tendencies and empathic concern. Still, young adults with high altruistic tendencies and empathic concern reported lower levels of drunk driving and binge drinking overall, and with drunk driving, the lowest levels were with high self-regulation and low altruistic tendencies. Previous research has identified a positive relation between empathy and self-regulation (Eisenberg, Lennon, & Roth, 1983; Gardner et al., 2008; Padilla-Walker, 2014; Soutschek et al., 2016), in which higher perspective-taking (i.e. putting oneself in another's shoes) and empathic concern (i.e. being tenderly concerned with others' well-being) is linked to greater regulation of one's own emotions and impulses. If an adolescent (or young adult) is deeply concerned with the feelings and safety of a peer, then they may also demonstrate a heightened capacity to regulate their own impulses in the context of risk-taking, such as driving recklessly (e.g. texting while driving).

Mediating effects were not identified in this study, suggesting that rather than a mediating connection, empathic concern may involve variance that overlaps with altruistic tendencies and prosocial peer affiliation. Empathic concern was related to many of the risk outcomes, and partial correlations revealed that controlling for empathic concern lessened the relations between other prosocial characteristics and risk-taking; but this is not explained through mediation. Empathic concern was strongly correlated with both altruistic tendencies and PPA, showing evidence of theoretical overlap, despite being distinct concepts. It is possible that altruism is most beneficial in the context of risk-taking if it is tied to increased emotional concern for others' well-being, which could involve both reward sensitivity and self-regulation. Similarly, having prosocial friends combined with individual prosociality would be most protective, and social homophily asserts that prosocial adolescents will select prosocial friends in the first place (Brechwald & Prinstein, 2011; Espelage et al., 2003). For example, an altruistic and highly-concerned adolescent could decide not to drive drunk, which in turn is rewarding since they are potentially protecting others from harm. Additionally, concern for others' well-being could strengthen one's ability to exercise self control and choose not to text while driving, even if reading a text would be rewarding. The same pattern is logical with PPA, in which spending time with prosocial friends could be protective against illicit substance use and other risks, but only if those peers influence an individual's empathic concern (and perhaps, through that path, self-regulation). It is possible, however, that texting while driving has become more normative in recent years, and thus perceived as less risky. For illicit substance use, previous research has linked drug use to deviant peers (Carlo et al., 2014; Dishion & Owen, 2002; Dishion et al., 1991; Oxford et al., 2001; Spoth et al., 1996), but without acknowledging those peers' possible prosocial or antisocial characteristics, beyond behaviors. Further research should expand upon these potential relations, perhaps incorporating brain imaging techniques alongside self-report and behavioral techniques.

Results from behavioral games (the Balloon Analogue Risk Task, and the Dictator Game) were inconclusive, potentially due to fatigue effects, attrition, and other methodological concerns. It was hypothesized that POS scores from the Dictator Game would be correlated with altruistic tendencies, since they are theoretically measuring the same construct with different methodologies; but POS scores were not related to any PTM scores, nor any risk variables. Similarly, BART mean pumps were expected to reflect behavioral risk-taking tendencies that would correlate with self-report risk behaviors, but BART scores were not related to any other risk variables. Several survey question results were also counter-intuitive, such as self-regulation and reward sensitivity not being directly related to some types of risk-taking, although previous work identifies them as strong predictors of risk-taking (Baer, 2002; Gardner et al., 2008; Geier, 2013; Padilla-Walker, 2014; Richards et al., 2016). As described in the method, the Inquisit tasks were located at the end of the study, following many questionnaires. It is possible that participants experienced fatigue after completing surveys, and therefore were less effortful in their responses to the BART and the Dictator Game. Several participants did not complete the tasks, and some of those who did provided answers that appeared to be unrelated to their self-reported tendencies and preferences.

Further, limitations of the present thesis study include an extensive completion time, online completion instead of an in-person laboratory setting, geographically-limited and homogenous aged sample, restriction of range in some scales, and lack of neuroimaging and longitudinal design elements. The data presented in this thesis are a subset of a larger study, in which there were additional measures that required approximately 45 minutes to complete. Since the study was presented on MTurk for up to an hour or longer, it is likely that participants experienced fatigue before the end of the study, which could have affected results herein. Extended periods of time viewing a computer screen are known to cause eye strain (Sommerich, Joines, & Psihogios, 2001), and the cognitive effort could have led to fatigue effects.

Additionally, the sample was more limited than expected, with all participants being 20 years or older and residing in the Southeastern United States. The lack of cognitive control findings (e.g. self-regulation) could be a result of the age of the sample, as a 20-year-old participant could have a more developed and active regulatory system (e.g. prefrontal cortex) than an 18-year-old participant (Geier, 2013; Squeglia & Cservenka, 2017; Steinberg, 2005; Tang, Posner, Rothbart, & Volkow, 2015; van Duijvenvoorde, Peters, Braams, & Crone, 2016). This could also explain why binge drinking was not related to more predictor variables, as most participants were aged 21 or older. Additionally, external validity would have been bolstered by having a more geographically-diverse sample, with participants from areas beyond the Southeast.

Certain scales also displayed a restriction in range, such as the altruistic tendencies mean being relatively high (requiring a transformation to produce a normal distribution), which could have hindered potential results.

Lastly, reliance on self-report methods was a limitation, even if behavioral tasks were also included. Self-presentation biases such as social desirability responding are a concern for any survey (Fisher, 1993; Van de Mortel, 2008), but particularly for surveys measuring altruism and other characteristics on which people want to score highly (Arnold & Feldman, 1981; Baker, 2001; Carlo & Randall, 2002; Embretson & Reise, 2000; Paulhus & Vazire, 2005). In addition to a multi-method design, a longitudinal design could remedy concerns about self-presentation and consistency. Since the present study conducted tests within a neurobiological theoretical framework, the lack of neuroimaging (or other physiological measures) is a drawback to constructing arguments about brain development and buffering effects. Future work in this line of research should examine neurological activity, both subcortical (e.g. fMRI neuroimaging) and cortical (e.g. electroencephalography), to accompany these results.

Despite methodological limitations, the present study contributes novel and important findings to the field of adolescent risk-taking. To my knowledge, no other studies have tested main effects of prosociality on risk-taking, along with moderating and mediating effects involving neural correlates, such as reward sensitivity and self-regulation. Additionally, the PPAS is a novel measure that could be used in future studies. Most research has focused more on negative risk factors, such as deviant peer group affiliation, antisocial tendencies and behaviors, and social rejection (Carlo et al., 2014; Cauffman & Steinberg, 2000; Dishion & Owen, 2002; Do et al., 2016; Prinstein et al., 2001; Rudolph, Miernicki, Troop-Gordon, Davis, & Telzer, 2016; Silk et al., 2014; Telzer, 2016; van Hoorn et al., 2016), but less on positive protective factors like prosocial tendencies and empathy. Additionally, not many studies have incorporated both self-report survey and behavioral tasks in the same session, producing a clearer picture of how an individual behaves in real-world situations. With the present results, along with potential future results, practitioners might be more informed in prevention and intervention decisions affecting illicit substance use and antisocial behavior in youth.

Future research could investigate the relations among prosocial characteristics, neural correlates, and risk-taking with a neuroimaging and a longitudinal approach. Since the present study found limited evidence of prosociality variables moderating associations between neural correlates and risk behaviors, further work could examine if prosocial characteristics elicit brain activation in socioemotional reward as well as cognitive control regions. For example, a future study could examine if reading scenarios involving risky situations and potential harm to peers (e.g. deciding whether or not to drive your friend home after you've consumed several alcoholic drinks) activates not only social cognition areas of the brain (such as the TPJ; Rodrigo et al., 2014; Telzer, 2016; Van Hoorn et al., 2016), as found in previous studies of altruism and social cognition, but also self-regulation areas of the brain (such as regions of the PFC; Geier, 2013; Soutschek et al., 2016). Similarly, neuroimaging could be performed on reward areas of the brain (such as the VS; Guyer et al., 2009; Telzer et al., 2013) during prosocial and other tasks, expanding upon the link between prosociality and reward sensitivity on certain risk variables identified in the current study. Similar to the procedure in Telzer et al. (2013), a study could measure brain activity in reward areas during prosocial tasks, and how individual differences in that activity predict future risk-taking; but also include cognitive control areas. If prosocial tasks or questions are found to elicit response in cognitive control areas of the brain, this finding would have direct implications for intervention.

Beyond neuroimaging, future work would benefit from longitudinal designs, since adolescence and young adulthood are developmental periods of rapid change in brain and behavior (Carlo et al., 2012; Schriber & Guyer, 2016; Smith, Chein, & Steinberg, 2013; Steinberg, 2008), particularly early adolescence soon after pubertal changes. Even in the present sample, substantial biological and social changes can occur between the ages of 20 and 25. Lastly, future studies could continue the same Inquisit tasks and questionnaires, but divide them into separate studies to reduce potential fatigue and order effects. Researchers could also include experimental designs, manipulating the extremity of options in the Dictator Game, or priming participants with scenarios before administering the tests.

In conclusion, the present thesis examined if self-reported health risk variables (as well as behavioral risk-taking) are associated with altruistic tendencies, PPA, and empathic concern, both directly as main effects but also as moderating variables with established neurobiological correlates (reward sensitivity and self-regulation). Results indicated that prosocial characteristics were related to several risk variables (drunk driving, texting while driving, and binge drinking), and also that prosocial characteristics moderated some connections between neural correlates and risk variables. This study is among the first to investigate prosocial characteristics and risk-taking, identifying potential protective factors such as empathic concern. Results clarify previously-established links between deviant peers and substance use (Dishion et al., 1991; Fergusson et al., 2007; Spoth et al., 1996), which may be influenced by an individual's level of empathic concern for others' well-being (both friends and strangers). Identifying potential protective factors in adolescent and young adult risk-taking remains a crucial task, as the majority of deaths during adolescence are the result of avoidable risk-taking such as reckless driving (Crone & Dahl, 2012; Simons-Morton et al., 2014; Telzer, 2016), and of substance-related injuries, especially in young adults between the ages of 18 and 25 (Stone et al., 2012; Studer et al., 2014). Further research should expand upon these findings and continue identifying paths to intervention, including neurobiological and sociological perspectives, to remedy the societal problem of avoidable, dangerous risk-taking during adolescence and young adulthood.

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APPENDIX A: Table of descriptive statistics for demographic variables.

Table 1.

Descriptive statistics for demographic study variables (N = 51).

Variable	Frequency	Percent
Age	*M* = 22.55	*SD* = 1.39
Sex (Recoded)		
Female	2.00	4.82
Male	25.00	51.02
Other / Prefer Not to Say	4.00	8.16
Ethnicity (Recoded)		
White / Caucasian	24.00	48.98
Black / African American	15.00	3.61
Asian	6.00	12.24
Hispanic / Latino	3.00	6.12
Other	1.00	2.04
Neighborhood (Recoded)		
Suburban	28.00	57.14
Other	21.00	42.86
Education (Recoded)		
High School Diploma or GED	24.00	5.00
College Degree (Any)	24.00	5.00
Mother's Education (Recoded)		

Less Than High School	8.00	16.33
High School Diploma or GED	25.00	51.02
Bachelor’s Degree	8.00	16.33
Graduate Degree	8.00	16.33
Father's Education (Recoded)		
Less Than High School	6.00	12.77
High School Diploma or GED	2.00	42.55
Bachelor’s Degree	14.00	29.79
Graduate Degree	7.00	14.89
Employment (Recoded)		
Student	13.00	27.08
Employed	3.00	62.50
Unemployed	5.00	1.42
Marital Status (Recoded)		
Single	28.00	57.14
Married or In Relationship	21.00	42.86
Income (Recoded)		
$30,000 or Less	18.00	36.73
Between $30,000 and $70,000	17.00	34.69
More than $70,000	14.00	28.57

APPENDIX B: Tables of reliability and validity for quantitative scales.

Table 2.

Reliability scores for quantitative scales included in the study.

Assessment	Cronbach's α	N of Items
Altruistic Tendencies	.74	3
Prosocial Peer Affiliation	.88	8
Empathic Concern	.88	7
Perspective Taking	.88	5
Self-regulation	.91	19
Reward Sensitivity	.90	5
Deviant Peer Group Affiliation	.74	8

Table 3.

Results from principle components analysis (PCA) for the Prosocial Peer Affiliation Scale (PPAS).

Item	*M*	*SD*	Extract.
My friends think that volunteer work is a good and moral thing to do.	3.82	1.06	.57
My friends disapprove of having unprotected sex.	3.09	1.25	.60
My friends mentor other people, either at work or in their personal lives.	2.57	.97	.58
My friends would comfort someone who is very upset.	3.68	1.03	.60
My friends tend to help people who are in need.	3.70	.90	.72
My friends donate money to charitable causes when they can.	2.93	1.11	.61
My friends stand up for other people who are bullied, at work or in their personal lives.	3.11	.99	.66
If someone else is driving dangerously, my friends would tell them to stop.	3.45	1.19	.63
My friends disapprove of fighting other people. (Factor 2)	3.41	1.11	.73

	Stat.
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	.85

	Stat.	Var.
Eigenvalue, Component 1 (first 8 items)	4.55	.51
Eigenvalue, Component 2 (9^{th} item)	1.16	.13

Note: Analysis was conducted with orthogonal rotation, and found two factor loadings.

APPENDIX C: Tables of descriptive statistics for study variables.

Table 4.

Descriptive statistics for quantitative predictor variables.

Predictor Variables	*M*	*SD*	*N*
Prosocial Tendencies	3.53	.70	52.00
Altruistic Tendencies	4.18	1.02	52.00
Prosocial Peer Affiliation	3.30	.76	48.00
POS	2.19	.59	95.00
Perspective Taking	5.06	.98	6.00
Empathic Concern	5.26	1.15	6.00
Self-regulation	3.86	.61	62.00
Reward Sensitivity	3.29	.58	48.00
Deviant Peers	2.18	.51	61.00

Note: POS Score refers to Prosocial Orientation Score from the Dictator Game.

Table 5.

Descriptive statistics for quantitative outcome variables.

Outcome Variables	*M*	*SD*	*N*
BART Mean Pumps	4.34	1.14	93.00
Substance Use (Any)	.57	1.20	91.00
Substance Use (Mean Days in Past 30 Days)	1.29	.61	94.00
Drunk Driving[a]	.25	.19	94.00
Binge Drinking[a]	2.67	1.30	92.00
Tobacco Use[a]	1.38	.69	94.00
Marijuana Use (Lifetime)[a]	1.67	.69	94.00
Marijuana Use (Past 30 Days)[a]	1.20	.40	94.00
Age of First Sexual Intercourse	2.51	.83	94.00
Number of Sexual Partners (Lifetime)	1.85	.59	94.00
Seatbelt Use[b]	2.11	.26	94.00
Texting While Driving[a]	1.68	.58	94.00

[a] square-root transformed variable.

[b] logarithmic (LG10) transformed variable.

Table 6.

Frequency statistics for qualitative outcome variables.

Variable	Frequency	Percent
Substance Use (Any Kind; Lifetime)		
Never	68.00	74.73
At Least Once	23.00	25.27
Binge Drinking (Past 30 Days)		
Have Not Drank	67.00	72.83
Have Binge Drank At Least Once	25.00	27.17
Drunk Driving (Past 30 Days)		
Have Not Driven Drunk	81.00	86.17
Have Driven Drunk At Least Once	13.00	13.83
Cigarette Use (Lifetime)		
Never	44.00	46.81
At Least Once	5.00	53.19
Marijuana Use (Lifetime)		
Never	4.00	42.55
At Least Once	54.00	57.45
Marijuana Use (Past 30 Days)		
Never	72.00	76.60
At Least Once	22.00	23.40
Sexual Intercourse While on Drugs/Alcohol (Past 30 Days)		

Never	81.00	87.10
At Least Once	12.00	12.90
Condom Use (Past 30 Days)		
Did Not Use Protection	66.00	71.74
Always Used Protection	26.00	28.26
Texting While Driving (Past 30 Days)		
Never	53.00	56.38
At Least Once	41.00	43.62
Cocaine Use (Lifetime)		
Never	84.00	89.36
At Least Once	1.00	1.64
Heroin Use (Lifetime)		
Never	87.00	94.57
At Least Once	5.00	5.43
Steroid Use (Lifetime)		
Never	9.00	96.77
At Least Once	3.00	3.23
Prescription Drug Use (Lifetime)		
Never	64.00	68.09
At Least Once	3.00	31.91

APPENDIX D: Tables of zero-order correlations among study variables.

Table 7.

Zero-order correlations among quantitative predictor variables.

	Altruistic Tendencies	Prosocial Peer Affiliation	POS	Perspective Taking	Empathic Concern	Self-Regulation
Prosocial Peer Affiliation	.27*					
POS	-.15	-.15				
Perspective Taking	.50*	.40*	.03			
Empathic Concern	.67**	.74**	-.16	.52**		
Self-regulation	.18	.20	-.04	.36*	.33	
Reward Sensitivity	-.05	.17	-.09	.20	.48**	.26

*Significant at $p < .05$

**Significant at $p < .01$

Note: POS Score refers to Prosocial Orientation Score from the Dictator Game.

Table 8.

Zero-order correlations among predictor and outcome variables (quantitative) used in the study.

	Altruistic Tendencies	Prosocial Peer Affiliation	POS Score	Empathic Concern	Self-regulation	Reward Sensitivity	BART Mean Pumps
Substance Use (Any)	-.06	-.06	.03	-.27*	.15	-.01	-.09
Substance Use Mean Days	-.07	-.13	.05	-.22	.22	-.02	-.09
Drunk Driving (SQRT)	-.47**	-.29*	.15	-.34**	-.01	-.01	.12
Binge Drinking (SQRT)	-.24	-.28	-.09	-.48**	.06	-.04	.03
Tobacco Use Mean Days	-.09	-.21	.11	-.29*	.03	-.20	.00
Marijuana Use (Lifetime; SQRT)	.06	.10	.05	-.10	.09	-.11	-.02
Marijuana Use (30 Days; SQRT)	-.12	-.11	.08	-.27*	.00	-.09	.07
Age of First Sexual Intercourse	-.07	-.10	.06	-.12	-.07	-.15	-.04
Number of Sexual Partners (Lifetime)	-.11	.02	.11	-.08	.08	.12	-.06
Seatbelt Use (LOG)	.16	.50**	-.12	.21	.10	.08	-.02
Texting While Driving (SQRT)	-.44**	-.22*	.19	-.22*	.08	.08	-.09

*Significant at $p < .05$

**Significant at $p < .01$

APPENDIX E: Tables of multiple regression analyses.

Table 9. *Regression analysis results for altruistic tendencies, reward sensitivity, and the interaction term on drunk driving.*

	Drunk Driving								
	Step 1			Step 2			Step 3		
Predictor Variable	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	.06 (.07)	.42	1.38	.03 (.05)	0.17	1.53	.03 (.06)	.16	1.53
Sex	-.20 (.23)	-.43	1.45	-.12 (.16)	-0.25	1.98	-.05 (.29)	-.11	3.54
Ethnicity	-.11 (.16)	-.37	1.34	-.03 (.09)	-0.12	1.45	-.05 (.13)	-.17	1.67
Altruistic Tendencies				-0.13 (.05)*	-0.75*	1.52	-.15 (.10)*	-.87*	2.74
Reward Sensitivity				.08 (.12)*	0.22*	1.62	.14 (.23)*	.36*	3.23
Altruistic Tendencies X Reward Sensitivity							-.17 (.22)*	-.27*	6.02
R^2		.31			.68			.89	
R^2 (adjusted)		-.21			.57			.72	
ΔR^2					.37*			.21*	
F		.60			2.83			1.33	

*Significant at $p < .05$

**Significant at $p < .01$

Table 10.

Regression analysis results for altruistic tendencies, self-regulation, and the interaction term on drunk driving.

	Drunk Driving								
	Step 1			Step 2			Step 3		
Predictor Variable	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	.03 (.03)	.22	1.03	.01 (.03)	.05	1.41	.03 (.03)	.19	1.50
Sex	.04 (.06)	.15	1.01	.02 (.05)	.06	1.05	.01 (.05)	.04	1.05
Ethnicity	.00 (.06)	.01	1.02	.03 (.05)	.14	1.08	.03 (.04)	.11	1.08
Altruistic Tendencies				-.10 (.04)*	-.63*	1.24	-.08 (.03)*	-.47*	1.36
Self-Regulation				.05 (.08)	.15	1.43	-.06 (.07)	-.17	1.94
Altruistic Tendencies X Self-Regulation							-.12 (.04)*	-.54*	1.38
R^2		.08			.41			.62	
R^2 (adjusted)		-.08			.21			.45	
ΔR^2					.33**			.21*	
F		0.49			2.07			3.73*	

*Significant at $p < .05$

**Significant at $p < .01$

Table 11.

Regression analysis results for prosocial peer affiliation, self-regulation, and the interaction term on drunk driving.

	Drunk Driving								
	Step 1			Step 2			Step 3		
Predictor Variable	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	.05 (.03)	.40	1.15	.04 (.02)	.28	1.20	.04 (.02)	.28	1.20
Sex	.18 (.09)	.43	1.01	.19 (.06)**	.45**	1.33	.20 (.06)**	.48**	1.42
Ethnicity	.07 (.06)	.25	1.15	.08 (.04)	.29	1.25	.08 (.04)	.29	1.25
Prosocial Peer Affiliation				-.11 (.03)**	-.46**	1.23	-.12 (.04)**	-.51**	1.51
Self-Regulation				.18 (.05)**	.49**	1.22	.19 (.06)**	.53**	1.45
Prosocial Peer Affiliation X Self-Regulation							.05 (.07)	.11	1.57
R^2		.42			.84			.84	
R^2 (adjusted)		.29			.76			.75	
ΔR^2					.42**			0	
F		3.18			11.14**			8.92**	

*Significant at $p < .05$

**Significant at $p < .01$

Table 12.

Regression analysis results for empathic concern, self-regulation, and the interaction term on drunk driving.

	Drunk Driving								
	Step 1			Step 2			Step 3		
Predictor Variable	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	.05 (.03)	.39	1.09	-.00 (.02)	-.01	1.43	.01 (.02)	.08	1.61
Sex	-.06 (.09)	-.17	1.09	-.06 (.05)	-.18	1.11	-.06 (.05)	-.17	1.11
Ethnicity	.01 (.07)	.03	1.17	.05 (.04)	.23	1.26	.04 (.04)	.18	1.31
Empathic Concern				-.13**	-.96**	1.61	-.09 (.04)*	-.63*	4.23
Self-Regulation				.08 (.05)	.25	1.35	.03 (.06)	.11	1.88
Empathic Concern X Self-Regulation							-.06 (.04)	-.34	2.76
R^2		.18			.78			.82	
R^2 (adjusted)		-.01			.68			.71	
ΔR^2					.60**			.04	
F		.97			7.66**			7.48**	

*Significant at $p < .05$

**Significant at $p < .01$

Table 13.

Regression analysis results for altruistic tendencies, self-regulation, and the interaction term on texting while driving.

	Texting While Driving								
	Step 1			Step 2			Step 3		
Predictor Variable	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	-.04 (.08)	-.11	1.03	-.12 (.08)	-.33	1.41	-.08 (.07)	-.21	1.50
Sex	.19 (.16)	.27	1.01	.15 (.14)	.21	1.05	.13 (.12)	.19	1.05
Ethnicity	.20 (.14)	.31	1.02	.26 (.13)*	.42*	1.08	.25 (.11)*	.39*	1.08
Altruistic Tendencies				-.24 (.09)*	-.56*	1.24	-.18 (.09)*	-.42*	1.36
Self-Regulation				.24 (.20)*	.29*	1.43	.00 (.20)*	.01*	1.94
Altruistic Tendencies X Self-Regulation							-.27 (.12) †	-.46†	1.38
R^2		.18			.44			.59	
R^2 (adjusted)		.03			.25			.42	
ΔR^2					.26*			.15*	
F		1.21			2.33			3.38*	

*Significant at $p < .05$ **Significant at $p < .01$ † Marginally significant at $p < .10$

Table 14.

Regression analysis results for altruistic tendencies, self-regulation, reward sensitivity, and the interaction terms on texting while driving, without demographic variables included.

	Texting While Driving					
	Step 1			Step 2		
Predictor Variable	B (SE)	β	VIF	B (SE)	β	VIF
Altruistic Tendencies	-.24 (.09)*	-.51*	1.0	-.20 (.10)*	-.41*	1.12
Reward Sensitivity	.01 (.10)	.02	1.0	.12 (.11)	.05	1.01
Altruistic Tendencies X Reward Sensitivity				-.24 (.17)	-.29	1.12
R^2 (adjusted)		.26			.33	
ΔR^2					.07	
F		3.28*			2.95†	
Altruistic Tendencies	-.25 (.08)*	-.48*	1.02	-.24 (.08)*	-.46*	1.03
Self-Regulation	.17 (.14)	.18	1.02	.14 (.12)	.15	1.03
Altruistic Tendencies X Self-Regulation				-.19 (.11) †	-.24†	1.01
R^2 (adjusted)		.48			.54	
ΔR^2					.06	
F		5.45**			4.76**	

*Significant at $p < .05$

**Significant at $p < .01$

† Marginally significant at $p < .10$

Table 15.

Regression analysis results for prosocial peer affiliation, self-regulation, and the interaction term on texting while driving.

	Texting While Driving								
	Step 1			Step 2			Step 3		
Predictor Variable	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	.06 (.08)	.17	1.15	.02 (.06)	.06	1.20	.02 (.06)	.06	1.20
Sex	.46 (.22)	.44	1.01	.49 (.18)*	.46*	1.33	.47 (.19)	.45*	1.42
Ethnicity	.31 (.17)	.43	1.15	.34 (.12)*	.46*	1.25	.33 (.13)	.46*	1.25
Prosocial Peer Affiliation				-.26 (.10)*	-.42*	1.23	-.24 (.12)*	-.39*	1.51
Self-Regulation				.42 (.15)*	.45*	1.22	.40 (.17)*	.43*	1.45
Prosocial Peer Affiliation X Self-Regulation							-.07 (.23)	-.06	1.57
R^2		.41			.76			.76	
R^2 (adjusted)		.27			.64			.61	
ΔR^2					.35**			0	
F		2.98			6.81**			5.22*	

*Significant at $p < .05$

**Significant at $p < .01$

Table 16.

Regression analysis results for empathic concern, reward sensitivity, and the interaction term on texting while driving.

	Texting While Driving								
	Step 1			Step 2			Step 3		
	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	-.07 (.13)	.13	1.04	-.23 (.11)	.11	1.43	-.26 (.15)	.15	2.20
Sex	-.24 (.23)	.23	1.05	-.12 (.18)	.18	1.10	-.07 (.23)	.23	1.69
Ethnicity	.14 (.27)	.27	1.02	.16 (.21)	.21	1.02	.11 (.24)	.25	1.30
Empathic Concern				-.34 (.13)*	.13*	1.47	-.41 (.22)*	.22	3.93
Reward Sensitivity				.63 (.25)*	.25*	1.11	.78 (.46)*	.47	3.60
Empathic Concern X Reward Sensitivity							.13 (.33)	.33	4.57
R^2		.16			.59			.60	
R^2 (adjusted)		-.05			.39			.34	
ΔR^2					.43**			.01	
F		.75			2.93†			2.26	

*Significant at $p < .05$

**Significant at $p < .01$

† Marginally significant at $p < .10$

Table 17.

Regression analysis results for prosocial peer affiliation, reward sensitivity, and the interaction term on texting while driving.

	Binge Drinking								
	Step 1			Step 2			Step 3		
	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	.38 (.26)	.47	1.01	.20 (.29)	.25	1.42	.43 (.15)*	.52*	1.62
Sex	.10 (.45)	.07	1.02	.11 (.45)	.08	1.16	-.17 (.22)	-.13	1.27
Ethnicity	-.47 (.59)	-.26	1.03	-.35 (.56)	-.19	1.06	.04 (.27)	.02	1.18
Prosocial Peer Affiliation				-.63 (.52)	-.45	1.50	-.01 (.28)	-.01	2.01
Reward Sensitivity				.73 (.61)	.38	1.08	.54 (.28)	.28	1.10
Prosocial Peer Affiliation X Reward Sensitivity							-2.03 (.46)*	-.83*	1.82
R^2		.27			.54			.92	
R^2 (adjusted)		-.04			.08			.80	
ΔR^2					.27			.38*	
F		.88			1.17			7.79*	

*Significant at $p < .05$

**Significant at $p < .01$

Table 18.

Regression analysis results for empathic concern, self-regulation, and the interaction term on binge drinking.

	Binge Drinking								
	Step 1			Step 2			Step 3		
Predictor Variable	B (SE)	β	VIF	B (SE)	β	VIF	B (SE)	β	VIF
Age	.42 (.17)*	.60*	1.22	.01 (.13)	.02	2.05	.22 (.13)	.30	3.36
Sex	.99 (.54)	.46	1.22	.62 (.33)	.28	1.37	.92 (.29)	.42	1.68
Ethnicity	-.01 (.38)	-.01	1.25	.19 (.22)	.12	1.33	.17 (.18)	.11	1.33
Empathic Concern				-.69 (.14)**	-.89**	2.07	-.21 (.23)*	-.27*	8.22
Self-Regulation				.87 (.25)**	.52**	1.41	.45 (.27)*	.27*	2.41
Empathic Concern X Self-Regulation							-.49 (.20)*	-.51*	4.26
R^2		.44			.85			.91	
R^2 (adjusted)		.29			.77			.85	
ΔR^2					.41**			.06*	
F		2.91			1.37**			14.18**	

*Significant at $p < .05$

**Significant at $p < .01$

APPENDIX F: Tables of binary logistic regression analyses.

Table 19.

Binary logistic Regression analysis results for empathic concern, self-regulation, reward sensitivity, and the interaction term on substance use, without demographic variables included.

	Substance Use (Any in Lifetime)					
	Step 1			Step 2		
	B	*SE*	*Exp(B)*	*B*	*SE*	*Exp(B)*
Empathic Concern	-.47†	.37	.62†	-.41†	.46	.66†
Self-Regulation	-.30*	.76	.74*	-.39*	.88	.67*
Empathic Concern X Self-Regulation				-.14	.64	.87
R^2 (Cox & Snell)		.07			.08	
df		29.00			28.00	
Empathic Concern	-1.07	.63	.34	-1.02	.36	.36
Reward Sensitivity	1.63	1.19	5.11	1.57	4.80	4.8
Empathic Concern X Reward Sensitivity				-.56	.57	-.41
R^2 (Cox & Snell)		.16			.17	
df		29.00			28.00	

*Significant at $p < .05$

**Significant at $p < .01$

† Marginally significant at $p < .10$

Table 20.

Binary logistic Regression analysis results for prosocial peer affiliation, self-regulation, reward sensitivity, and the interaction term on tobacco use, without demographic variables included.

	Tobacco Use (Any in Lifetime)					
	Step 1			Step 2		
	B	*SE*	*Exp(B)*	*B*	*SE*	*Exp(B)*
Prosocial Peer Affiliation	-.63	.51	.88	.63	.62	.87
Self-Regulation	-.81	.70	.45	-.51	.80	.60
Prosocial Peer Affiliation X Self-Regulation				2.04	1.27	1.67
R^2 (Cox & Snell)		.08			.20	
df		29.00			28.00	
Prosocial Peer Affiliation	-.13†	.96	.26†	-.64†	.97	.16†
Reward Sensitivity	.98*	.88	5.91*	.89*	.95	5.50*
Prosocial Peer Affiliation X Reward Sensitivity				1.09	1.74	1.32
R^2 (Cox & Snell)		.26			.27	
df		29.00			28.00	

*Significant at $p < .05$

**Significant at $p < .01$

† Marginally significant at $p < .10$

APPENDIX G: Tables of mediation analyses.

Table 21.

Mediation analysis results for altruistic tendencies, prosocial peer affiliation, empathic concern, and drunk driving.

	Drunk Driving							
	Direct Effect				Indirect Effect			
Predictor Variable	*b*	*t*	*F*	R^2	*b*	*t*	*F*	R^2
Altruistic Tendencies	-.06	-1.50	6.83*	.41	-.13**	-3.28**	1.76**	.34
Empathic Concern	-.08	-1.52						
Sobel's Z test (Direct – Indirect Effect)	*Z* = -1.37							
Effect Size (Percent Mediation)	$P_M = .40$							
Confidence Interval	Lower = -.18	Upper = .0						
Prosocial Peer Affiliation	-.08	-.92	2.89	.19	-.14*	-2.23*	4.98*	.16
Empathic Concern	-.05	-.84						
Sobel's Z test (Direct – Indirect Effect)	*Z* = -.89							
Effect Size (Percent Mediation)	$P_M = .45$							
Confidence Interval	Lower = -.21	Upper = .06						

*Significant at $p < .05$ **Significant at $p < .01$

Note: Presented mediation models were not significant, as indicated by Sobel's z-test and confidence intervals. Predictors included altruistic tendencies and PPA, and the mediating variable was empathic concern.

Table 22.

Mediation analysis results for altruistic tendencies, prosocial peer affiliation, empathic concern, and texting while driving.

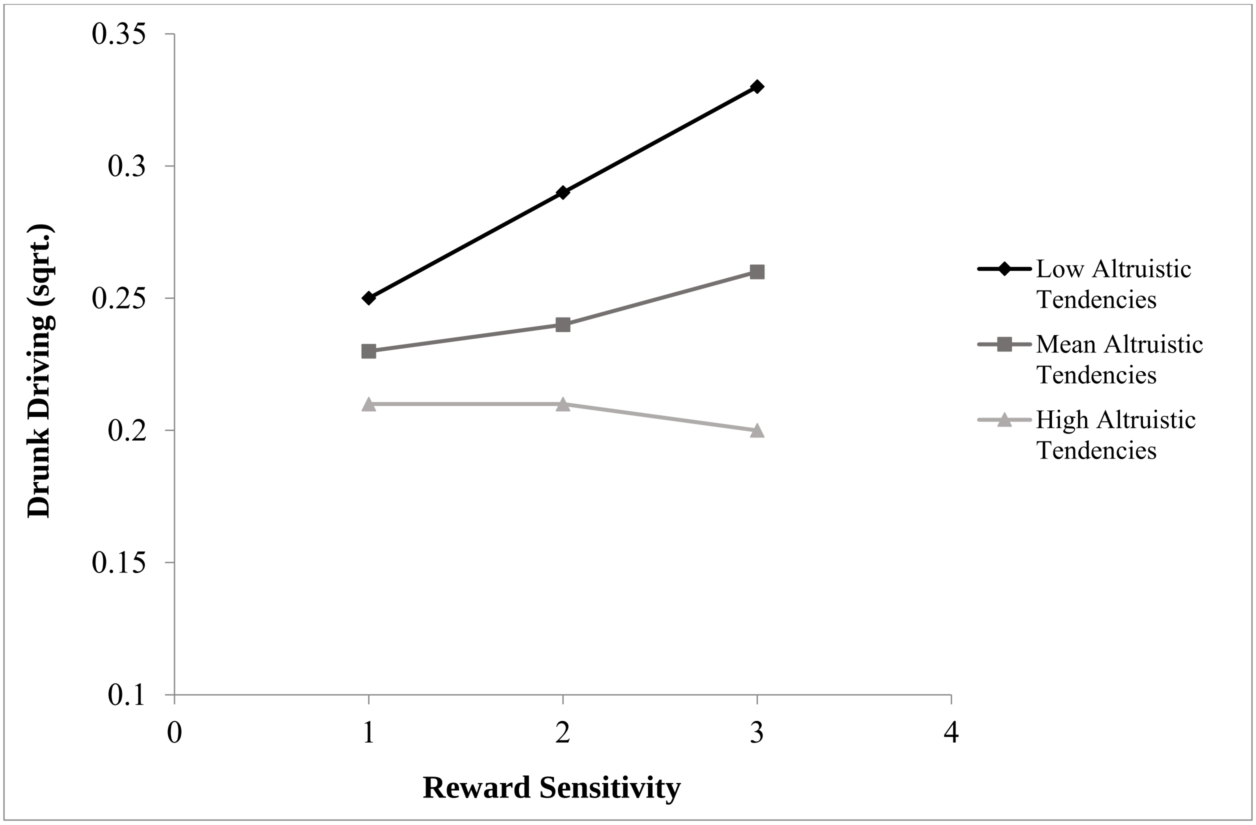
	Texting While Driving							
	Direct Effect				Indirect Effect			
Predictor Variable	*b*	*t*	*F*	R^2	*b*	*t*	*F*	R^2
Altruistic Tendencies	-.22	-1.45	3.26†	.25	-.28*	-2.52*	6.35*	.23
Empathic Concern	-.08	-.60						
Sobel's Z test (Direct – Indirect Effect)	Z = -.58							
Effect Size (Percent Mediation)	P_M = .22							
Confidence Interval	Lower = -.39	Upper = .13						
Prosocial Peer Affiliation	-.30	-1.21	2.68	.18	-.39*	-2.31*	5.32*	.18
Empathic Concern	-.06	-.45						
Sobel's Z test (Direct – Indirect Effect)	Z = -.40							
Effect Size (Percent Mediation)	P_M = .21							
Confidence Interval	Lower = -.44	Upper = .25						

*Significant at $p < .05$ **Significant at $p < .01$ † Marginally significant at p < .10

Note: Presented mediation models were not significant, as indicated by Sobel's z-test and confidence intervals. Predictors included altruistic tendencies and PPA, and the mediating variable was empathic concern.

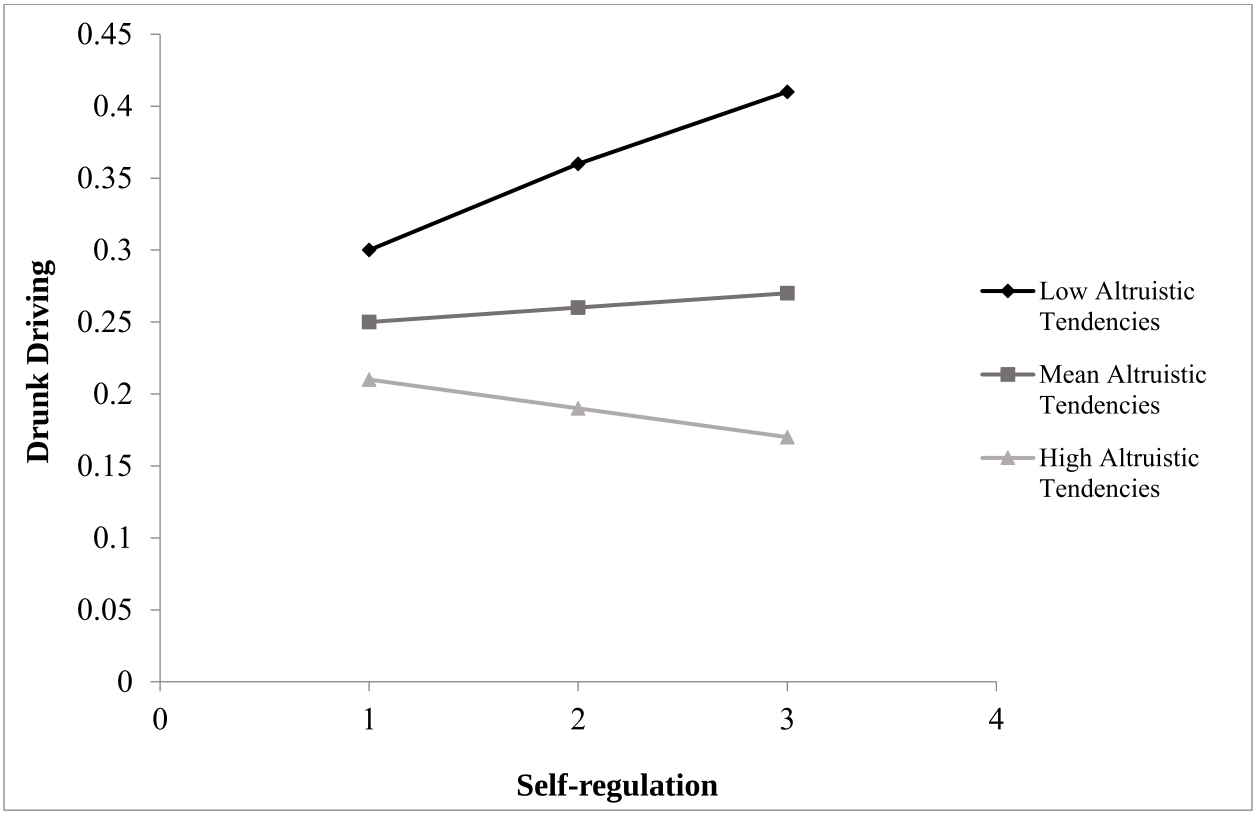
APPENDIX H: Figures of interactions from moderated multiple regressions.

Figure 1.



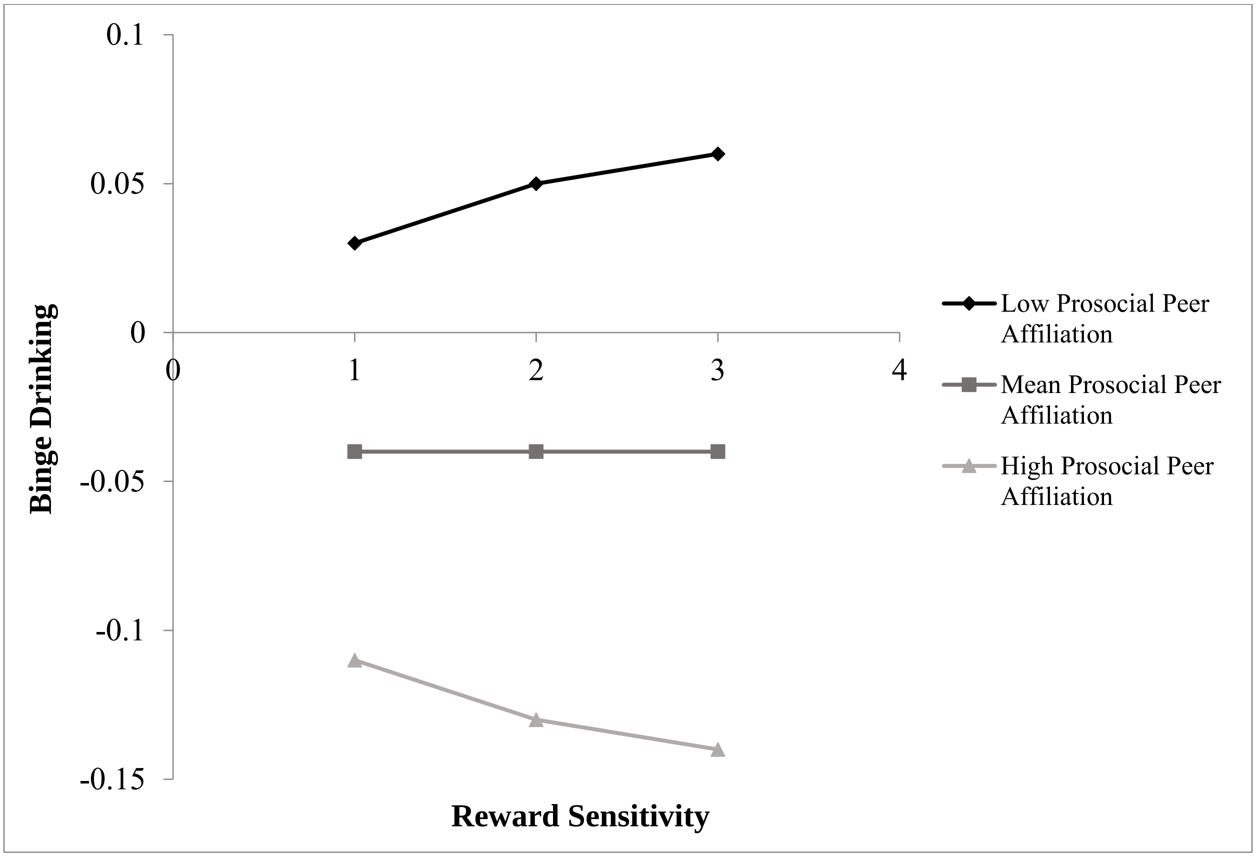
Drunk driving as a function of reward sensitivity, across three different levels of altruistic tendencies (mean, one standard deviation below the mean, and one standard deviation above the mean).

Figure 2.



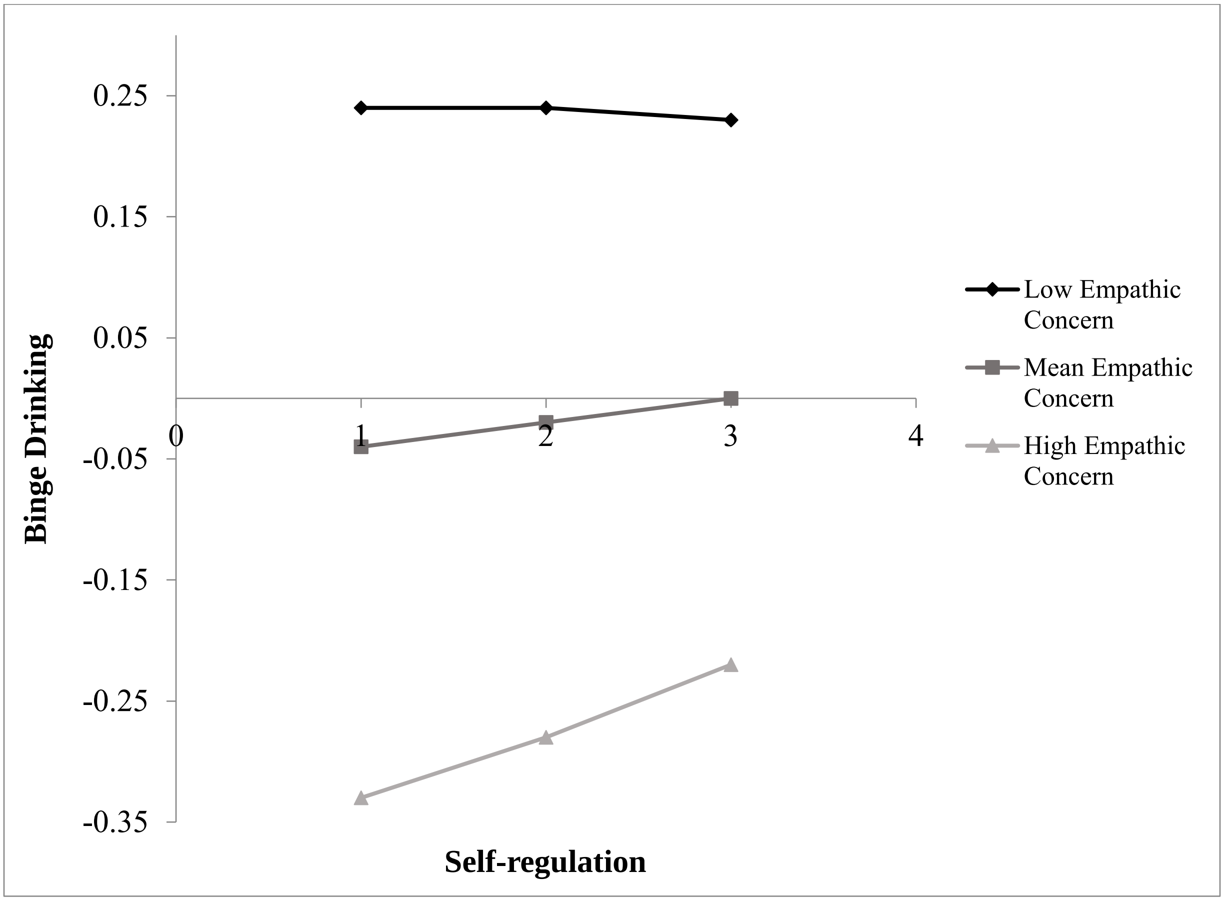
Drunk driving as a function of self-regulation, across three different levels of altruistic tendencies (mean, one standard deviation below the mean, and one standard deviation above the mean).

Figure 3.



Binge drinking as a function of reward sensitivity, across three different levels of prosocial peer affiliation (mean, one standard deviation below the mean, and one standard deviation above the mean).

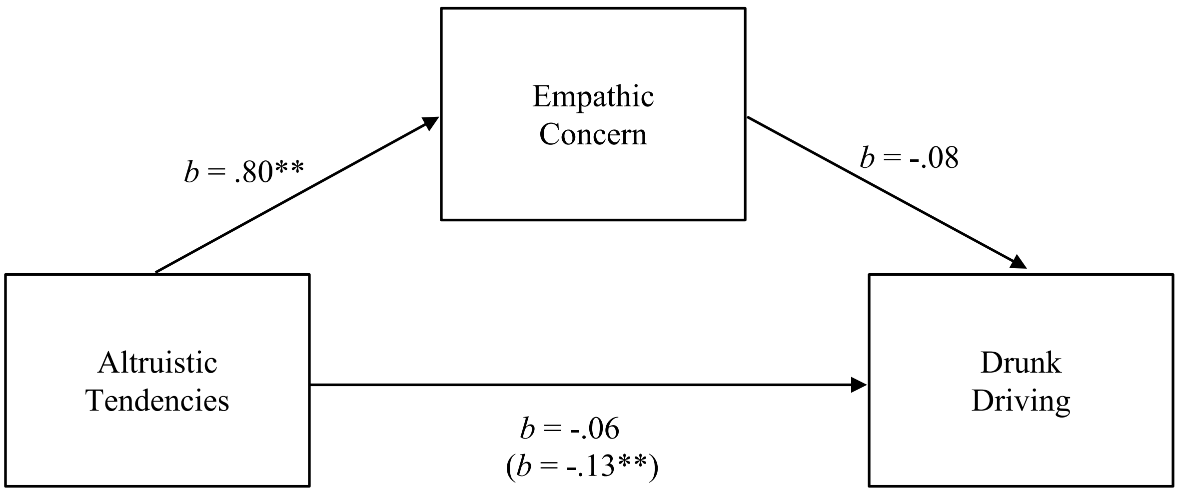
Figure 4.



Binge Drinking as a function of Self-regulation, across three different levels of Empathic Concern (mean, one standard deviation below the mean, and one standard deviation above the mean).

APPENDIX I: Figure of mediation model.

Figure 5.



Mediation analysis results for altruistic tendencies, empathic concern, and drunk driving.

Note: b refers to the regression coefficient for the effect of X on Y. Presented mediation models were not significant, as indicated by sobel's z-test and confidence intervals, as well as a non-significant path b (empathic concern predicting drunk driving).

VITA

Sarah Jean Beard graduated with a Bachelor of Science in Psychology from the University of North Florida in December, 2014. She submitted an undergraduate Honor's thesis on the topic of evolutionary origins of false memory and risky decision-making, viewing riskiness in decisions relevant to personal survival. She then pursued a Master of Science degree, working on this thesis with Dr. Jennifer Wolff, along with other projects related to risk-taking during adolescence and young adulthood. She has also been employed as a Graduate Teaching Assistant who taught Research Methods Lab, an Administrative Assistant in the department, an Academic Tutor, and a Research Assistant. Her research interests are in prosocial behaviors as a protective factor in adolescent health-risk behaviors, particularly substance use, and how patterns of brain development contribute to individual differences in risk-taking. Sarah will be pursuing a doctoral degree in Human Development at the University of California at Davis, starting in September 2017. She aspires to conducting research and teaching courses in development and neuroscience as a professor in a university setting. Her current publications are listed below, and full curriculum vitae is listed on the following pages.

Publications:

Grotuss, J., & **Beard, S. J.** (in press). Procedures for dealing with bullying. In T. K. Shackelford & V. A. Weekes-Shackelford (Eds.), *The Encyclopedia of Evolutionary Psychological Science*. New York: Springer International Publishing.

Grotuss, J., & **Beard, S. J.** (in press). Appearance and beauty in girls. In T. K. Shackelford & V. A. Weekes-Shackelford (Eds.), *The Encyclopedia of Evolutionary Psychological Science*. New York: Springer International Publishing.

Grotuss, J. & **Beard, S. J.** (2016). Rome was not built in one day: Underlying biological and cognitive factors responsible for the emergence of agriculture and ultrasociality. *Behavioral and Brain Sciences, 39.* [Peer commentary on 'The Economic Origins of Ultrasociality' by J. Gowdy & L. Krall].

Manuscripts in preparation:

Beard, S. J., Wolff, J. M. (2017, in preparation). Associating with positive peers moderates the relations between neurobiological variables and substance use in young adults. Manuscript in preparation. **Status:** final revisions, formatting for scientific journals

Beard, S. J., & Toglia, M.P. (2017, in preparation). Risky business: Does survival processing affect false memory and risky decision-making? Manuscript in preparation. **Status:** writing discussion, constructing graphs and tables

Beard, S. J., Wolff, J. M., & Stanley, N. (2017, in preparation). Positive risk-taking in adolescence. Manuscript in preparation. **Status:** designing psychometric measure

Sarah Jean Beard

Education

Master of Science in General Psychology (M.S.G.P.) *2017 (August)*

University of North Florida, Jacksonville, FL

Thesis: Prosocial Tendencies and Peer Affiliation on Risky Decision-Making in Adolescents and Emerging Adults.

Bachelor of Science (B.S.) in Psychology, Summa Cum Laude with Honors *2014 (December)*

University of North Florida, Jacksonville, FL

Thesis: Risky business: Survival processing, false memory, and risky decision-making.

Publications

Grotuss, J., & **Beard, S. J.** (in press). Procedures for dealing with bullying. In T. K. Shackelford & V. A. Weekes-Shackelford (Eds.), *The Encyclopedia of Evolutionary Psychological Science*. New York: Springer International Publishing.

Grotuss, J., & **Beard, S. J.** (in press). Appearance and beauty in girls. In T. K. Shackelford & V. A. Weekes-Shackelford (Eds.), *The Encyclopedia of Evolutionary Psychological Science*. New York: Springer International Publishing.

Grotuss, J. & **Beard, S. J.** (2016). Rome was not built in one day: Underlying biological and cognitive factors responsible for the emergence of agriculture and ultrasociality. *Behavioral and Brain Sciences, 39.* [Peer commentary on 'The Economic Origins of Ultrasociality' by J. Gowdy & L. Krall].

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Beard, S. J., Wolff, J. M., & Stanley, N. (2017, in preparation). Positive risk-taking in adolescence. Manuscript in preparation. **Status:** designing psychometric measure

Presentations

Beard, S. J., Kawczynski, N., & Wolff, J. M. (2017, April). Associating with positive peers moderates the relations between neurobiological variables and substance use in young adults. Poster session to be presented at the biennial meeting of the *Society for Research in Child Development*, Austin, Texas.

Beard, S. J., Mott, R., Burk, H., & Richard, D. F. (2016, August). Community-Based transformational learning: Links to student retention at the University of North Florida. Presentation to the *Center for Community-Based Learning,* Director Marnie Jones. University of North Florida, Jacksonville, Florida.

Garcia, A., Toglia, M. P., & **Beard, S. J.** (2016, May). Emotional valence and memory for thematic lists and stories: Implications for interviewing. Poster presented by invitation at *Applied Cognition and the Cognitive Interview: A Conference in Honor of Dr. Ron Fisher.* Florida International University, Miami, Florida.

Beard, S. J., Wolff, J. M., & Kawczynski, N. (2016, April). Prosocial personality characteristics and risky decision-making in adolescents. Poster session presented at the annual meeting of the *Showcase of Osprey Advancements in Research & Scholarship*, University of North Florida, Jacksonville, Florida.

Beard, S. J. & Toglia, M. P. (2015, June). Survival utility, false memory, and risky decision-making. Poster session presented at the annual meeting of the *Society for Applied Research in Memory and Cognition*, Victoria, British Columbia, Canada.

Beard, S. J. & Toglia, M. P. (2015, March). Risky Business: Does survival processing affect false memory and risky decision-making? Poster session presented at the annual meeting of the *Southeastern Psychological Association*, Hilton Head, South Carolina.

Charles, D., Antonio, L., **Beard, S. J**., Kozikowski, C., Mazza, E., Leedy, A., & Toglia, M. P. (2014, April). The Role of Intent to Remember in the Survival Memory Enhancement Effect. Paper presented at the annual meeting of the *Showcase of Osprey Advancements in Research & Scholarship*, University of North Florida, Jacksonville, Florida.

Leedy, A., **Beard, S. J.**, Mazza, E., Kozikowski, C., Shah, J., Navarret, B., & Toglia, M. P. (2014, April). Norming Words on Survivability, Pleasantness, and Categorizability in DRM Lists That Create False Memories. Poster session presented at the annual meeting of the *Showcase of Osprey Advancements in Research & Scholarship*, University of North Florida, Jacksonville, Florida.

Beard, S. J. & Toglia, M. P. (2014, April). Risky Business: Survival processing on false memory and risky decision-making. Poster session presented at the annual meeting of the *Showcase of Osprey Advancements in Research & Scholarship*, University of North Florida, Jacksonville, Florida.

Research Experience

<u>Principal Investigator</u>, Master's Thesis, Adolescent Development (2015-2017)
Laboratory Director: Dr. Jennifer Wolff
Title: Prosocial Tendencies and Peer Affiliation on Risky Decision-Making in Adolescents and Emerging Adults.

<u>Graduate Research Assistant</u>, Adolescent Development (2015-2017)
Laboratory Director: Dr. Jennifer Wolff
Projects: Positive peers and substance use, prosocial risk-taking, sexual harassment and college graduation Duties: analyzing data, assisting with SEM analyses, creating graphs, writing 2 papers for publication, submitting 2 abstracts for SRCD spring 2017

<u>Graduate Research Assistant</u>, Community-Based Learning (May – October 2016)
Directors: Dr. Daniel F. Richard, Heather Burk (assistant director, Center for Community-Based Learning)
Project Title: Community-Based transformational learning: Links to student retention
*Received a Community Engagement Scholarship for this work ($500)
**Prepared an infographic for presentation to the University President, coauthored written report

<u>Laboratory Manager</u>, (Undergraduate), Cognitive Psychology (2014-2015)
Laboratory Director: Dr. Michael P. Toglia
Duties: supervising students working on projects and honors theses, leading lab meetings, providing writing feedback, assisting with IRB packages, assisting with data, mentoring students

<u>Principal Investigator</u>, Undergraduate Honors Thesis (2014)
Laboratory Director: Dr. Michael P. Toglia
Title: Risky Business: Survival processing, false memory, and risky decision-making.

<u>Research Assistant</u>, Cognitive Psychology (2012-2015)
Laboratory Director: Dr. Michael P. Toglia
Projects: Norming words in DRM lists, false memories from survival processing, emotional memory

Teaching Experience

<u>Graduate Instructor</u> (.5 FTE), Research Methods in Psychology Laboratory (2016-2017)
Supervisors: Dr. Jennifer Wolff, Dr. Tracy Alloway
Courses Covered: Research Methods in Psychology Lab (2 sections, 25 students each)
Duties: lecturing on the topics of research design and analysis, instructing undergraduate students in SPSS and Microsoft Excel, providing writing feedback, grading term research reports, administering exams

<u>Graduate Teaching Assistant</u> (.25 FTE), Community-Based Learning Activities (2015-2016)
Supervisors: Dr. Jennifer Wolff, Dr. Heather Truelove, Dr. Tracy Alloway
Courses Covered: Lifespan Developmental Psychology (4 sections total), Social Psychology (2 sections total), Conservation Psychology (1 section)

Duties: scheduling students to volunteer with organizations, programming projects in Qualtrics, analyzing data, grading group research papers, providing writing feedback

Guest Lecture in Social Psychology: "Volunteering and Other Prosocial Behaviors: Developmental Trajectories, Evolutionary Origins, Individual Differences, and Individual Benefits (2 sections of 100 students each)

Supervised Volunteer Experiences: Daniel Kids Playday (sports, video games), MaliVai Washington Youth Foundation Friday Book Club (reading, arts & crafts activities)

Teaching Assistant, Cognitive Psychology, Research Methods in Psychology (2014-2015)

Course Instructors: Dr. Michael P. Toglia, Dr. Joseph Schmuller

Courses Covered: Cognitive Psychology (2 sections total), Research Methods in Psychology (1 section)

Duties: preparing assignments, editing lectures, assisting with exams and study guides, holding office hours, organizing review sessions, providing writing advice, grading writing assignments

Guest Lecture in Research Methods: "Working with Nominal Data: Levels of Analysis, Probabilities of Independent Events, and Chi-Square Analyses"

Tutor in Psychology, Academic Support Services (2014-2015)

Supervisor Deatrice Kennedy, Associate Athletics Director

Courses Covered: Introduction to Psychology, Research Methods in Psychology, Social Psychology, Lifespan Developmental Psychology

Duties: assisting student athletes with studying strategies, answering conceptual questions, creating study guides and practice exercises, creating quizzes to assess progress, providing feedback on writing

Awards

Community Engagement Scholarship for Research on Community-Based Learning (August, 2016)

Amount: $500

Directors: Dr. Marnie Jones, Heather Burk (Center for Community-Based Learning at UNF)

Honors

Outstanding Undergraduate Psychology Student of the Year, University of North Florida (2014)

Honors in the Major, with completion of undergraduate Honors thesis (2014)

Summa Cum Laude distinction in graduation with Bachelor of Science

Professional Affiliations

SRA (Society for Research on Adolescence), Graduate Student Member, since 2016

SRCD (Society for Research in Child Development), Graduate Student Member, since 2016

SRHD (Society for Research in Human Development), Graduate Student Member, since 2016

SARMAC (Society for Applied Research in Memory & Cognition), Student Member, 2015-2016
SEPA (Southeastern Psychological Association), Student Member, 2014-2016

Other Relevant Experience

Administrative Assistant, Department of Psychology Office (2014-2017)
Supervisors: Alicia Crystalus (Office Manager), Dr. Lori Lange (Department Chair)
Duties: assisting faculty and students with departmental tasks, providing faculty with grading services (ParScore and ZipGrade), preparing brochures and advertisements for programs, assisting with campus outreach, coordinating with other campus offices, scheduling rooms and meetings, taking minutes at faculty meetings, monitoring inventory of supplies, maintaining copiers, general duties as needed by the office

President of Forensic Science Club, University of North Florida (2014-2015)
Supervisor: Dr. Michael P. Toglia
Duties: organizing annual Forensic Science Day*, leading club meetings, directing campus and community outreach, arranging for guest speakers at meetings, maintaining club finances
*Arranged for Dr. Valerie Reyna and Dr. Charles Brainerd from Cornell to provide lectures.