

Risk-Taking Propensity and Sensation Seeking in Survivors of Adverse Childhood Experiences

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Abstract

Risk-taking propensity and sensation seeking are developmentally meaningful traits for emerging adults, individuals ages 18 to 25 years. Adverse childhood experiences (ACEs) of childhood abuse and neglect, exposure to domestic violence, residing with a substance abusing or mentally ill caregiver, and growing up with an incarcerated family member negatively impact the well-being of emerging adults. However, the specific association between ACEs and risk-taking propensity and sensation seeking has not been previously examined in this age group. This study aims to determine whether ACEs are individually or cumulatively related to risk-taking propensity (assessed by the Domain-Specific Risk-Taking Scale) and sensation seeking (assessed by the Behavior Inhibition System/Behavior Approach System Scales) in a diverse sample of undergraduates, $n = 436$; $M_{\text{age}} = 19.73$ years ($SD = 1.83$ years); 67% female; 22% Hispanic. Multivariate ordinary least squares regressions were run to examine the association between ACEs and risk-taking propensity and sensation seeking. Individually, emotional abuse predicted greater

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inhibition ($B = .28, p < .001$), growing up with a mentally ill family member ($B = -.12, p < .05$) and emotional neglect ($B = -.13, p < .05$) predicted reduced motivation to pursue rewarding cues, and emotional neglect ($B = -.12, p < .05$) and witnessing domestic violence ($B = -.10, p < .05$) predicted less reward responsiveness. No cumulative effects were found. ACEs related to environmental instability may have a unique impact on sensation seeking domains in emerging adults. Clarifying the role of sensation seeking in emerging adults can contribute to better understanding of risk and resilience factors in this vulnerable population.

Keywords

adverse childhood experiences, risk-taking propensity, sensation seeking, environmental instability

Risk-taking propensity is the tendency to take risks in response to potentially rewarding cues, despite associated negative consequences (Fowles, 1980). Sensation seeking is the tendency to seek out and pursue novel, arousing, and stimulating experiences (Zuckerman, 1979). Heterogeneity in the literature indicates that these constructs can promote or decrease different aspects of adaptive functioning. For example, higher risk-taking propensity is associated with greater entrepreneurship (Stewart & Roth, 2001) and greater “mental toughness” in athletes (Crust & Keegan, 2010). And higher sensation seeking is associated with greater interpersonal effectiveness (Arasaratnam & Banerjee, 2011), intelligence (Raine, Reynolds, Venables, & Mednick, 2002) adaptivity toward negative life experiences (Smith, Johnson, & Sarason, 1978), and more functional behavioral outcomes (O'Connor & Jackson, 2008). However, greater risk-taking propensity and sensation seeking are also related to engagement in health risk behaviors, including risky sex and drug use (Pharo, Sim, Graham, Gross, & Hayne, 2011; Schwartz et al., 2009), which can lead to physical and sexual victimization (Messman-Moore, Ward, & Brown, 2009; Ullman, Najdowski, & Filipas, 2009; Van Roode, Dickson, Herbison, & Paul, 2009). During emerging adulthood (ages 18-25 years), a time period marked by exploration and instability (Arnett, 1996; Tanner & Arnett, 2016), there is increased risk-taking propensity (Dohmen et al., 2011; Josef et al., 2016; Mata, Josef, & Hertwig, 2016) and relatively high sensation seeking (Arnett, 2004, 2007), highlighting the importance of understanding these traits in this population.

Risk-taking propensity and sensation seeking differ in that sensation seeking does not always result in taking risks, and risk-taking propensity does not require novelty seeking (Pizam et al., 2004). However, it is as yet unclear if these traits are truly distinct. In adolescents, research suggests that both traits predict substance use (MacPherson, Magidson, Reynolds, Kahler, & Lejuez, 2010); however, the literature also indicates that only sensation seeking, and not risk-taking propensity, predicts risk-taking behaviors for adolescents and adults (Popham, Kennison, & Bradley, 2011; Romer et al., 2011; Tymula et al., 2012). Relatedly, the sub-constructs of sensation seeking (e.g., fun-seeking and reward responsiveness sensation seeking) and risk-taking propensity (e.g., financial, social, and recreational risk-taking propensity) have not yet been explored in emerging adults.

Adverse childhood experiences (ACEs) are stressful events that include physical and emotional neglect, physical and sexual abuse, and exposure to a substance using family member, among others. The relationship between ACEs and traits of risk-taking and sensation seeking is not well understood. There is evidence that risk-taking propensity mediates between ACEs and negative outcomes (Braquehais, Oquendo, Baca-García, & Sher, 2010). There is also evidence that risk-taking propensity and sensation seeking mediate between childhood traumatic events and risk-taking behaviors in adolescents (Bornovalova, Gwadz, Kahler, Aclin, & Lejuez, 2008). These findings indicate that both traits are associated with a history of ACEs and may even explain specific outcomes associated with ACEs. However, no study to date has explored these relationships in emerging adults.

It is also unclear if there are unique relationships between specific ACEs and risk-taking propensity and sensation seeking. Relatedly, experiencing multiple ACEs (cumulative ACEs) is associated with greater mental health difficulties (Dube, Felitti, Dong, Giles, & Anda, 2003b; Evans & Cassells, 2014), increased health risk behaviors, and early morbidity in a graded fashion (Campbell, Walker, & Egede, 2016). It is not yet known, however, if cumulative ACEs impact risk-taking propensity and sensation seeking in a graded fashion, findings that could help explain how cumulative ACEs impact adaptive functioning.

The objective of the current study is to clarify the relationship between individual and cumulative ACEs and risk-taking propensity and sensation seeking in a sample of emerging adult undergraduates. We predict that (a) risk-taking propensity and sensation seeking will be weakly to moderately correlated with each other, representing related, but distinct, constructs; (b) individual ACEs will predict risk-taking propensity and sensation seeking; and (c) compared with individual ACEs, cumulative ACEs will have a stronger relationship with risk-taking propensity and sensation seeking.

Method

Participants

Between 2015 and 2016, a diverse group of undergraduate participants from a public New York City university completed an online study assessing ACEs, psychopathology, interpersonal relationships, risk-taking propensity, and sensation seeking ($N = 518$). The sample was restricted to only include emerging adults (ages 18-25 years; $M = 19.73$, $SD = 1.83$; $n = 436$; see Supplemental Table 4). Of the 436 participants, 66.70% identified as female ($n = 278$), 21.60% ($n = 90$) as Hispanic, 33.00% as Asian ($n = 137$), 36.90% ($n = 153$) as Caucasian, and 30.10% ($n = 125$) as “Other” (see Supplemental Table 1 for prevalence rates).

Procedure

Participants enrolled in “Introduction to Psychology” participated in an online survey, using Instantly™ (a data-collecting platform), which has been used in previous research with emerging adults (Nikulina, Gelin, & Zwilling, 2017). Participants spent, on average, 89 min completing the survey and were compensated with course credit. Self-reported ACEs are at least as reliable as face-to-face interviews (Barr et al., 2017) and child services records (Nooner et al., 2010), suggesting that an online format is appropriate. All procedures were institutional review board (IRB) approved.

Measures

ACEs were assessed using the Adverse Childhood Experiences Survey (Dube et al., 2003a; Felitti et al., 1998), a well-used measure (Anda et al., 2006; Bruska & Tessin, 2013) of (a) sexual, physical, and emotional abuse; (b) emotional and physical neglect; and (c) stress associated with witnessing domestic violence, having an incarcerated or mentally ill household member, and exposure to substance abuse, all occurring before the age of 18 years. The first wave of the original ACEs study conducted by Felitti and colleagues (1998) did not include emotional and physical neglect. Wave II of the original ACEs study (1997) included these new ACEs variables, which have been included in ACEs research thereafter (Dube et al., 2003a). As such, in the current study, ACEs scores range from 0 (no ACEs) to 9, with scores indicating total number of ACEs experienced. Cumulative ACEs were calculated by adding up endorsed ACEs to create a total number of ACEs experienced.

Risk-taking propensity was assessed using the Domain-Specific Risk-Taking Scale (DOSPERT; Blais & Weber, 2006; Weber, Blais, & Betz, 2002), a reliable and valid measure (Harrison, Young, Butow, Salkeld, & Solomon, 2005) yielding five individual domains (ethical, financial, social, health/safety, and recreational) and an overall total risk-taking domain (Highhouse, Nye, Zhang, & Rada, 2016). Participants read 30 statements about engaging in specific behaviors and rated their perception of associated risk from 1 (*Not at all risky*) to 7 (*Extremely risky*). Total scores were calculated for each domain; higher scores indicate greater risk-taking propensity. Recreational ($\alpha = .85$), Financial ($\alpha = .78$), and Overall ($\alpha = .86$) subscales had acceptable internal reliability, but Social ($\alpha = .62$), Ethical ($\alpha = .67$), and Health/Safety ($\alpha = .68$) did not and were, therefore, excluded from subsequent analyses.

Sensation seeking was assessed using the Behavior Inhibition System/Behavior Approach System Scale (BIS/BAS; Carver & White, 1994). This scale is based on The Reinforcement Sensitivity Theory, which outlines orthogonal dimensions of BIS and BAS that explain motivation to pursue high-intensity stimulation or sensation seeking (Pickering et al., 1997). Compared with other measures (e.g., Arnett Inventory of Sensation Seeking; Arnett, 1994), this measure conceptualizes sensation seeking independent of risk-taking propensity and is well used across fields (Markarian, Pickett, Deveson, & Kanona, 2013; Voigt et al., 2009). It consists of one BIS scale (avoidance of aversive outcomes) and three BAS scales: BAS Drive (motivation to pursue one's goals), BAS Reward Responsiveness (sensitivity to reward), and BAS Fun-seeking (spontaneously pursuing novel rewards). Participants rated each of the 24 scale items from 1 (*very true for me*) to 4 (*very false for me*) and items were summed to create subscale scores, with higher BAS scores indicating greater sensation seeking and higher BIS scores indicating the opposite. BIS ($\alpha = .78$), BAS Reward Responsiveness ($\alpha = .74$), and BAS Drive ($\alpha = .76$) had acceptable internal reliability, but BAS Fun-seeking ($\alpha = .62$) did not and was removed from subsequent analyses.

Demographics were measured with questions about age (continuous), gender (male/female), race (White, Black/African American, American Indian/Alaskan Native, Asian, Native Hawaiian/Other Pacific Islander, Other), ethnicity (Hispanic or not), and childhood and current income (ordinal categories of equal range). For parsimony, race was collapsed into three categories of equivalent size (33.00% Asian, 36.90% Caucasian, and 30.10% Other). Childhood and current income were also each collapsed into three distinct categories of (a) less than US\$35,000, (b) US\$35,000 to US\$74,999, and (c) US\$75,000 or more (see Supplemental Table 1 for prevalence in each category).

Statistical Analyses

Analyses were conducted using SPSS 25. All outcome variables were square root transformed, correcting for skew and kurtosis. Bivariate associations assessing the relationship between variables were run and multivariate outliers removed. Continuous variables (BIS, BAS Drive, and Reward Responsiveness; DOSPERT financial, recreational, and overall; cumulative ACEs, age) were assessed using Pearson's correlation. Discrete variables were assessed using *t* tests (gender, ethnicity, individual ACEs) and analysis of variance (ANOVA; race, childhood, current income). Pearson's correlations were used to address the first hypothesis, looking at the relationship between risk-taking propensity and sensation seeking. To address the second and third hypotheses regarding the relationship between individual and cumulative ACEs and risk-taking propensity and sensation seeking, six multivariate ordinary least square regressions were run. In each regression, a risk-taking propensity or sensation-seeking subscale was the outcome and only predictors that were significantly associated ($p < .05$) in bivariate analyses were included, limiting predictors, thereby decreasing Type I error (Hinkle, Wiersma, & Jurs, 1998).

Results

Prevalence of ACEs, Risk Taking, and Sensation Seeking

In the current sample, within sensation seeking, average values of individual domains were as follows: inhibition ($M = 21.12$, $SD = 3.83$), drive ($M = 11.77$, $SD = 2.35$), and reward responsiveness ($M = 17.80$, $SD = 2.15$). Within risk-taking propensity, sub-domains' average values were as follows: recreational ($M = 21.71$, $SD = 9.65$), financial ($M = 15.26$, $SD = 6.73$), and overall ($M = 93.85$, $SD = 23.72$; see Supplemental Table 5). Emotional abuse was the most common ACE (26.00%), followed by having a mentally ill family member (25.30%). Having an incarcerated household member (3.50%) was least common, with all other ACEs occurring in 10.10% to 15.00% of the sample. Participants reported experiencing 1.5 ACEs, on average, and 63.40% reported experiencing one or more ACE. See Supplemental Table 1 for prevalence rates of all individual ACEs.

Bivariate Correlations Between Predictors and Risk Taking and Sensation Seeking

Bivariate *t* tests and correlations are detailed in Supplemental Tables 2 to 5. Supplemental Table 2 presents associations between ethnicity and gender and

outcome measures of sensation seeking and risk-taking propensity. Supplemental Table 3 presents associations between race, childhood, and current income and sensation seeking and risk-taking propensity outcomes. Supplemental Table 4 presents associations between individual ACEs and outcomes. Supplemental Table 5 presents associations between cumulative ACEs and age and outcomes. Across all bivariate correlations, multiple significant predictors for each outcome measure were revealed. Specifically, emotional abuse, mental illness, cumulative ACEs, and being female were associated with greater behavioral BIS inhibition, whereas physical neglect was associated with less inhibition. Emotional neglect, substance use, mental illness, and cumulative ACEs were associated with less BAS drive. Emotional neglect, physical neglect, domestic violence, age, and being male were associated with less BAS reward responsiveness. Hispanics and males had greater DOSPERT Recreational scores. Physical neglect and being male were associated with greater DOSPERT financial risk taking. Physical neglect, physical abuse, cumulative ACEs, being Hispanic, and being male were associated with greater overall DOSPERT risk-taking.

Hypothesis 1: Bivariate Associations Between Risk-Taking Propensity and Sensation Seeking

Results addressing our first hypothesis can be found in Supplemental Table 5, along with effect sizes. In support of our first hypothesis, risk-taking propensity domains (BIS, BAS Drive, and Reward Responsiveness) were significantly associated with sensation-seeking domains (DOSPERT Recreational, Financial, Overall), except for DOSPERT Recreational and BAS Reward. BIS and BAS Reward were negatively associated with all DOSPERT measures; BAS Drive was positively associated with all DOSPERT measures. Associations between risk-taking propensity and sensation seeking were of small to medium effect size.

Hypotheses 2 and 3: Regressions Predicting Risk-Taking Propensity and Sensation Seeking

Results addressing our second and third hypotheses can be found in Supplemental Table 6, along with effect sizes and significance. In partial support of our second hypothesis, individual ACEs predicted select outcome measures. Specifically, emotional abuse predicted greater inhibition, mental illness and emotional neglect predicted less BAS Drive, and emotional neglect and domestic violence predicted less BAS Reward. No other

individual ACEs significantly predicted any other BIS/BAS or DOSPERT outcomes. Results did not support our third hypothesis; cumulative ACEs did not predict greater BIS/BAS or DOSPERT than individual ACEs. In fact, cumulative ACEs did not significantly predict any outcome measure in multivariate analyses.

Other Findings: Gender Effects

Gender effects can be found in Supplemental Table 6, including effect sizes and significance. For all regressions, except BAS Drive, gender significantly predicted outcomes in the following pattern: For sensation-seeking BIS and BAS Reward, females had higher inhibition and reward responsiveness, compared to males. However, for risk-taking DOSPERT Recreational, Financial, and Overall, females had lower risk-taking propensity than males.

Discussion

The current study aimed to clarify the relationship between ACEs and risk-taking propensity and sensation seeking in emerging adults. As in prior research (Pizam et al., 2004), the current study found small to medium correlations between risk-taking propensity and sensation seeking, suggesting that they are related, but distinct constructs. We also found that some ACEs were associated with sensation seeking but none were related to risk-taking propensity. This provides further evidence that despite being inter-related and often used interchangeably, these constructs are distinct. There is limited precedent to explain the unique association of ACEs with sensation seeking, but it is possible that sensation seeking is governed by brain-based reward systems that are relatively contextually stable (Balconi & Vanutelli, 2016). Comparatively, risk-taking propensity is thought to be context specific (Steinberg, 2008). This context specificity may lead to greater situational variability that masks significant effects. Similarly, longitudinal findings indicate that while both risk-taking propensity and sensation seeking increase in early adolescence, sensation seeking follows a linear path and risk-taking propensity follows a curvilinear path (MacPherson et al., 2010), suggestive that there may be greater variability in development of this trait, which may also mask significant effects.

The individual ACEs that significantly predicted sensation seeking (emotional abuse and neglect, witnessing domestic violence, exposure to mentally ill family member) are related to environmental instability, as compared to ACEs that are directly physical in nature (e.g., physical or sexual abuse). Childhood environmental instability can lead to “schemas of unpredictability”

or internal models of the world as chaotic and unstable (Ross & Hill, 2002). To this effect, research indicates that adults who experienced childhood emotional abuse and neglect tend to have schemas that broadly impact worldview (Wright, Crawford, & Del Castillo, 2009) and that emotional abuse and neglect can be more impactful than concurrent traumatic events (Spertus, Yehuda, Wong, Halligan, & Seremetis, 2003). Importantly, one study found that emotional abuse is associated with greater adult emotional inhibition (i.e., general withdrawal; Krause, Mendelson, & Lynch, 2003), which explains decreased sensation seeking in those who experienced emotional abuse and neglect in the current study. Similarly, environmental instability like witnessing domestic violence is associated with school-age academic outcomes more than biological risks (Gross, Mettelman, Dye, & Slagle, 2001), highlighting the developmental impact of environmental instability. Previous research also shows that family instability is related to sensitivity to rewarding cues (Hill, Jenkins, & Farmer, 2008) and that witnessing domestic violence is related to sensation seeking (Trocki & Caetano, 2003). These findings indicate that ACEs related to environmental instability have significant, long-lasting impacts and that sensation seeking is one such outcome in emerging adults.

Our findings that experiencing the specific ACEs described above are related to *decreased* sensation seeking can shed light on the relationship between ACEs and often-found negative adaptive outcomes. For example, in adults, ACEs are associated with impaired social functioning (Felitti & Anda, 2010), worse academic outcomes (Bethell, Newacheck, Hawes, & Halfon, 2014), and greater functional impairment (Springer, Sheridan, Kuo, & Carnes, 2003). It is possible that sensation seeking may be the mechanisms through which ACEs impacts these domains. Research indicates that the sub-domains of sensation seeking (decreased inhibition, motivation to pursue novelty, and sensitivity to reward) are associated with enhanced interpersonal functioning, intelligence, and adaptivity (Arasaratnam & Banerjee, 2011; Raine et al., 2002; Smith et al., 1978). As such, those who experience ACEs may perform worse in these domains due to decreased sensation seeking. In other words, sensation seeking may function as a mediator or moderator between ACEs and these domains. Biological support for this model may be that childhood trauma is known to alter the biological stress system and leads to decreased cerebellar volume, which is associated with brain-based reward systems (De Bellis & Zisk, 2014) associated with sensation seeking. Future research should explore the mediating and moderating role of sensation seeking in emerging adult ACEs survivors, specifically in the context of gender and ethnic diversity, as described in the following paragraphs.

In the current study, no relationship was found between cumulative ACEs and risk-taking propensity and sensation seeking. Whereas research indicates

a dose-response effect of cumulative ACEs on physical, mental, and emotional health (Dube et al., 2003b; Evans & Cassells, 2014; Hughes et al., 2017; Waite, Davey, & Lynch, 2013), this effect has *not* been found regarding intimate partner violence (Nikulina et al., 2017). It is possible that prior studies of cumulative ACEs do not account for the possibility that individual effects are driving observed cumulative effects (Evans, Li, & Whipple, 2013) and that cumulative effects are rarer than we think. Furthermore, all prior literature on dose-response effects of cumulative ACEs utilized samples varying from ages 19 to 82 years (Waite et al., 2013), with some studies having an average age as high as 56 years (Dube et al., 2003b). Others split age dichotomously to those below and above 35 years (Highhouse et al., 2017), and the only study to look specifically at emerging adults used a high-risk sample (Evans & Cassells, 2014). As such, more research is needed to clarify the nature of observed dose-response effects of cumulative ACEs, specifically in emerging adults.

The current study also found that emerging adult females exhibit less risk-taking propensity than males, confirming a pattern that has been found in the general population (Byrnes, Miller, & Schafer, 1999; Charness & Gneezy, 2012). Our findings that women have greater aversion to aversive stimuli (BIS) are also supported by prior literature (Li, Huang, Constable, & Sinha, 2006; Yuan, He, Qinglin, Chen, & Li, 2008). We also found that females show increased reward responsiveness (BAS Reward), which is supported by prior literature (Lighthall et al., 2012). Scant literature exists on gender effects in sensation seeking; only one study looking at this relationship found higher sensation seeking in females, likely attributable to recent advances in women's rights (i.e., cohort effect). As such, their findings may not generalize well (Zuckerman, Ball, & Black, 1990). Other literature suggests that adolescent females, in general, demonstrate lower sensation seeking relative to their male counterparts (Wilkinson, Shete, Spitz, & Swann, 2011; Wills, Vaccaro, & McNamara, 1994). It is possible that emerging adult females behave differently than adolescent females as a result of the exploration and instability that characterize emerging adulthood. Extant literature on gender differences in this area is lacking, suggesting a need for future research that focuses specifically on gender differences in response to adverse childhood events.

We also found that Hispanic individuals exhibited significantly greater risk-taking propensity, findings that do not correspond with previous literature showing that Black and Hispanic youth have decreased risk-taking propensity relative to white youth (Watt, 2005). Again, it seems that emerging adults behave differently from adolescents, showing an opposite pattern of risk-taking propensity, much like emerging adult females show an opposite

pattern of sensation seeking relative to adolescents. To this author's knowledge, no other research on ethnicity and these traits exists. As such, our findings introduce more questions than they answer regarding gender and ethnicity, areas that future research should further explore, especially in an emerging adult population. Research that focuses on the role of ethnicity and acculturation in response to adverse childhood events is increasingly necessary and relevant, especially in light of the current refugee crises happening across the globe.

Strengths and Limitations

This study's strengths lie in its use of a large, diverse sample of undergraduates and in being the first to look at risk-taking propensity and sensation seeking in emerging adults, a vulnerable population of ACEs survivors (Arnett, 2005). For all analyses, sufficient power existed to detect small to moderate effects. Despite these strengths, data were collected retrospectively via self-report, leading to possible recall bias, underestimating incidence of ACEs (Reuben et al., 2016). The current study is also cross-sectional, precluding causal assertions and utilization of college students limits generalizability. Future research should confirm our findings in noncollege emerging adults, further explore traits that impact risk-taking behaviors, independent of risk-taking propensity, and assess the long-term impact of environmental instability. Furthermore, a greater focus on gender and ethnicity in the context of emerging adult ACEs survivors is also warranted.

Conclusion

The current study shows that risk-taking propensity and sensation seeking are related, but distinct traits in emerging adult ACEs survivors, and that individuals' ACEs related to environmental instability are only related to sensation seeking. Furthermore, despite prior literature suggesting otherwise, cumulative ACEs have no relationship with either trait. This study was conducted using a college sample, a group of individuals that are routinely found to be higher functioning than their noncollege attending peers and more likely to utilize mental health services, yet highly likely to engage in health risk behaviors, like alcohol use (Hunt & Eisenberg, 2010). As such, it is important to elucidate the traits that contribute to risk and resilience in this emerging adult population so that the treatments that college students seek can be best targeted to their needs. It is equally as important to elucidate the roles of gender and ethnicity in response to adverse events so as to better understand the individual needs of diverse populations.

Authors' Note

Amanda Zwilling is also affiliated with John D. Dingell VA Medical Center, Detroit, Michigan, USA. Gabriella Robinson is also affiliated with Queens College, The City University of New York, Queens, USA.

Declaration of Conflicting Interests

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Supplemental Material

Supplemental material for this article is available online.

References

- Anda, R. F., Felitti, V. J., Bremner, J. D., Walker, J. D., Whitfield, C. H., Perry, B. D., . . . Giles, W. H. (2006). The enduring effects of abuse and related adverse experiences in childhood. *European Archives of Psychiatry and Clinical Neuroscience*, 256, 174-186.
- Arasaratnam, L. A., & Banerjee, S. C. (2011). Sensation seeking and intercultural communication competence: A model test. *International Journal of Intercultural Relations*, 35, 226-233.
- Arnett, J. (1994). Sensation seeking: A new conceptualization and a new scale. *Personality and Individual Differences*, 16, 289-289.
- Arnett, J. J. (1996). Sensation seeking, aggressiveness, and adolescent reckless behavior. *Personality and Individual Differences*, 20, 693-702.
- Arnett, J. J. (2004). *Emerging adulthood: The winding road from the late teens through the early twenties*. Oxford, UK: Oxford University Press.
- Arnett, J. J. (2005). The developmental context of substance use in emerging adulthood. *Journal of Drug Issues*, 35, 235-254.
- Arnett, J. J. (2007). Emerging adulthood: What is it, and what is it good for? *Child Development Perspectives*, 1(2), 68-73.

- Balconi, M., & Vanutelli, M. E. (2016). Emotions and BIS/BAS components affect brain activity (ERPs and fNIRS) in observing intra-species and inter-species interactions. *Brain Imaging and Behavior, 10*, 750-760.
- Barr, A. L., Knight, L., França-Junior, I., Allen, E., Naker, D., & Devries, K. M. (2017). Methods to increase reporting of childhood sexual abuse in surveys: The sensitivity and specificity of face-to-face interviews versus a sealed envelope method in Ugandan primary school children. *BMC International Health and Human Rights, 17*(1), Article 4.
- Bethell, C. D., Newacheck, P., Hawes, E., & Halfon, N. (2014). Adverse childhood experiences: Assessing the impact on health and school engagement and the mitigating role of resilience. *Health Affairs, 33*, 2106-2115.
- Blais, A. R., & Weber, E. U. (2006). A domain-specific risk-taking (DOSPERT) scale for adult populations. *Judgment and Decision Making, 1*, 33-47.
- Bornovalova, M. A., Gwadz, M. A., Kahler, C., Aklin, W. M., & Lejuez, C. W. (2008). Sensation seeking and risk-taking propensity as mediators in the relationship between childhood abuse and HIV-related risk behavior. *Child Abuse & Neglect, 32*, 99-109.
- Braquehais, M. D., Oquendo, M. A., Baca-García, E., & Sher, L. (2010). Is impulsivity a link between childhood abuse and suicide? *Comprehensive Psychiatry, 51*, 121-129.
- Bruskas, D., & Tessin, D. H. (2013). Adverse childhood experiences and psychosocial well-being of women who were in foster care as children. *The Permanente Journal, 17*(3), e131-e141.
- Byrnes, J. P., Miller, D. C., & Schafer, W. D. (1999). Gender differences in risk taking: A meta-analysis. *Psychological Bulletin, 125*, 367-383.
- Campbell, J. A., Walker, R. J., & Egede, L. E. (2016). Associations between adverse childhood experiences, high-risk behaviors, and morbidity in adulthood. *American Journal of Preventive Medicine, 50*, 344-352.
- Carver, C. S., & White, T. L. (1994). Behavioral inhibition, behavioral activation, and affective responses to impending reward and punishment: The BIS/BAS scales. *Journal of Personality and Social Psychology, 67*, 319-333.
- Charness, G., & Gneezy, U. (2012). Strong evidence for gender differences in risk taking. *Journal of Economic Behavior & Organization, 83*, 50-58.
- Crust, L., & Keegan, R. (2010). Mental toughness and attitudes to risk-taking. *Personality and Individual Differences, 49*, 164-168.
- De Bellis, M. D., & Zisk, A. (2014). The biological effects of childhood trauma. *Child and Adolescent Psychiatric Clinics, 23*, 185-222.
- Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, J., & Wagner, G. G. (2011). Individual risk attitudes: Measurement, determinants, and behavioral consequences. *Journal of the European Economic Association, 9*, 522-550. doi:10.1111/j.1542-4774.2011.01015.x
- Dube, S. R., Felitti, V. J., Dong, M., Chapman, D. P., Giles, W. H., & Anda, R. F. (2003a). Childhood abuse, neglect, and household dysfunction and the risk of

- illicit drug use: The Adverse Childhood Experiences Study. *Pediatrics*, *111*, 564-572. doi:10.1542/peds.111.3.564
- Dube, S. R., Felitti, V. J., Dong, M., Giles, W. H., & Anda, R. F. (2003b). The impact of adverse childhood experiences on health problems: Evidence from four birth cohorts dating back to 1900. *Preventive Medicine*, *37*, 268-277.
- Evans, G. W., & Cassells, R. C. (2014). Childhood poverty, cumulative risk exposure, and mental health in emerging adults. *Clinical Psychological Science*, *2*, 287-296.
- Evans, G. W., Li, D., & Whipple, S. S. (2013). Cumulative risk and child development. *Psychological Bulletin*, *139*, 1342-1396.
- Felitti, V. J., & Anda, R. F. (2010). The relationship of adverse childhood experiences to adult medical disease, psychiatric disorders and sexual behavior: Implications for healthcare. In R. A. Lanius, E. Vermetten, & C. Pain (Eds.), *The impact of early life trauma on health and disease: The hidden epidemic* (pp. 77-87). New York, NY: Cambridge University Press.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, *14*, 245-258.
- Fowles, D. C. (1980). The three arousal model: Implications of Gray's two-factor learning theory for heart rate, electrodermal activity, and psychopathy. *Psychophysiology*, *17*, 87-104.
- Gross, S. J., Mettelman, B. B., Dye, T. D., & Slagle, T. A. (2001). Impact of family structure and stability on academic outcome in preterm children at 10 years of age. *The Journal of Pediatrics*, *138*, 169-175.
- Harrison, J. D., Young, J. M., Butow, P., Salkeld, G., & Solomon, M. J. (2005). Is it worth the risk? A systematic review of instruments that measure risk propensity for use in the health setting. *Social Science & Medicine*, *60*, 1385-1396.
- Highhouse, S., Nye, C. D., Zhang, D. C., & Rada, T. B. (2017). Structure of the DOSPRT: Is there evidence for a general risk factor? *Journal of Behavioral Decision Making*, *30*, 400-406.
- Hill, E. M., Jenkins, J., & Farmer, L. (2008). Family unpredictability, future discounting, and risk taking. *The Journal of Socio-Economics*, *37*, 1381-1396.
- Hinkle, D. E., Wiersma, W., & Jurs, S. G. (1998). *Applied statistics for the behavioral sciences* (4th ed.). Boston, MA: Houghton Mifflin Harcourt.
- Hughes, K., Bellis, M. A., Hardcastle, K. A., Sethi, D., Butchart, A., Mikton, C., . . . Dunne, M. P. (2017). The effect of multiple adverse childhood experiences on health: A systematic review and meta-analysis. *The Lancet Public Health*, *2*(8), e356-e366.
- Hunt, J., & Eisenberg, D. (2010). Mental health problems and help-seeking behavior among college students. *Journal of Adolescent Health*, *46*, 3-10.
- Josef, A. K., Richter, D., Samanez-Larkin, G. R., Wagner, G. G., Hertwig, R., & Mata, R. (2016). Stability and change in risk-taking propensity across the adult life span. *Journal of Personality and Social Psychology*, *111*, 430-450.

- Krause, E. D., Mendelson, T., & Lynch, T. R. (2003). Childhood emotional invalidation and adult psychological distress: The mediating role of emotional inhibition. *Child Abuse & Neglect, 27*, 199-213.
- Li, C. S. R., Huang, C., Constable, R. T., & Sinha, R. (2006). Gender differences in the neural correlates of response inhibition during a stop signal task. *NeuroImage, 32*, 1918-1929.
- Lighthall, N. R., Sakaki, M., Vasunilashorn, S., Nga, L., Somayajula, S., Chen, E. Y., . . . Mather, M. (2012). Gender differences in reward-related decision processing under stress. *Social Cognitive and Affective Neuroscience, 7*, 476-484.
- MacPherson, L., Magidson, J. F., Reynolds, E. K., Kahler, C. W., & Lejuez, C. W. (2010). Changes in sensation seeking and risk-taking propensity predict increases in alcohol use among early adolescents. *Alcoholism: Clinical and Experimental Research, 34*, 1400-1408.
- Markarian, S. A., Pickett, S. M., Deveson, D. F., & Kanona, B. B. (2013). A model of BIS/BAS sensitivity, emotion regulation difficulties, and depression, anxiety, and stress symptoms in relation to sleep quality. *Psychiatry Research, 210*, 281-286.
- Mata, R., Josef, A. K., & Hertwig, R. (2016). Propensity for risk taking across the life span and around the globe. *Psychological Science, 27*, 231-243.
- Messman-Moore, T. L., Ward, R. M., & Brown, A. L. (2009). Substance use and PTSD symptoms impact the likelihood of rape and revictimization in college women. *Journal of Interpersonal Violence, 24*, 499-521.
- Nikulina, V., Gelin, M., & Zwillig, A. (2017). Is there a cumulative association between adverse childhood experiences and intimate partner violence in emerging adulthood? *Journal of Interpersonal Violence*. Advance online publication. doi:10.1177/0886260517741626
- Nooner, K. B., Litrownik, A. J., Thompson, R., Margolis, B., English, D. J., Knight, E. D., . . . Roesch, S. (2010). Youth self-report of physical and sexual abuse: A latent class analysis. *Child Abuse & Neglect, 34*, 146-154.
- O'Connor, P. J., & Jackson, C. (2008). Learning to be saints or sinners: The indirect pathway from sensation seeking to behavior through mastery orientation. *Journal of Personality, 76*, 733-752.
- Pharo, H., Sim, C., Graham, M., Gross, J., & Hayne, H. (2011). Risky business: Executive function, personality, and reckless behavior during adolescence and emerging adulthood. *Behavioral Neuroscience, 125*, 970-978.
- Pickering, A. D., Corr, P. J., Powell, J. H., Kumari, V., Thornton, J. C., & Gray, J. A. (1997). Individual differences in reactions to reinforcing stimuli are neither black nor white: To what extent are they gray? In H. Nyborg (Ed.), *The scientific study of human nature: Tribute to Hans J. Eysenck at eighty* (pp. 36-67). London, England: Elsevier.
- Pizam, A., Jeong, G. H., Reichel, A., van Boemmel, H., Lusson, J. M., Steynberg, L., . . . Montmany, N. (2004). The relationship between risk-taking, sensation-seeking, and the tourist behavior of young adults: A cross-cultural study. *Journal of Travel Research, 42*, 251-260.

- Popham, L. E., Kennison, S. M., & Bradley, K. I. (2011). Ageism, sensation-seeking, and risk-taking behavior in young adults. *Current Psychology, 30*, 184.
- Raine, A., Reynolds, C., Venables, P. H., & Mednick, S. A. (2002). Stimulation seeking and intelligence: A prospective longitudinal study. *Journal of Personality and Social Psychology, 82*, 663-674.
- Reuben, A., Moffitt, T. E., Caspi, A., Belsky, D. W., Harrington, H., Schroeder, F., . . . Danese, A. (2016). Lest we forget: Comparing retrospective and prospective assessments of adverse childhood experiences in the prediction of adult health. *Journal of Child Psychology and Psychiatry, 57*, 1103-1112.
- Romer, D., Betancourt, L. M., Brodsky, N. L., Giannetta, J. M., Yang, W., & Hurt, H. (2011). Does adolescent risk taking imply weak executive function? A prospective study of relations between working memory performance, impulsivity, and risk taking in early adolescence. *Developmental Science, 14*, 1119-1133.
- Ross, L. T., & Hill, E. M. (2002). Childhood unpredictability, schemas for unpredictability, and risk taking. *Social Behavior and Personality: An International Journal, 30*, 453-473.
- Schwartz, S. J., Zamboanga, B. L., Ravert, R. D., Kim, S. Y., Weisskirch, R. S., Williams, M. K., . . . Finley, G. E. (2009). Perceived parental relationships and health-risk behaviors in college-attending emerging adults. *Journal of Marriage and Family, 71*, 727-740.
- Smith, R. E., Johnson, J. H., & Sarason, I. G. (1978). Life change, the sensation seeking motive, and psychological distress. *Journal of Consulting and Clinical Psychology, 46*, 348-349.
- Spertus, I. L., Yehuda, R., Wong, C. M., Halligan, S., & Seremetis, S. V. (2003). Childhood emotional abuse and neglect as predictors of psychological and physical symptoms in women presenting to a primary care practice. *Child Abuse & Neglect, 27*, 1247-1258.
- Springer, K. W., Sheridan, J., Kuo, D., & Carnes, M. (2003). The long-term health outcomes of childhood abuse. *Journal of General Internal Medicine, 18*, 864-870.
- Steinberg, L. (2008). A social neuroscience perspective on adolescent risk-taking. *Developmental Review, 28*, 78-106.
- Stewart, W. H., Jr., & Roth, P. L. (2001). Risk propensity differences between entrepreneurs and managers: A meta-analytic review. *Journal of Applied Psychology, 86*, 145-153.
- Tanner, J. L., & Arnett, J. J. (2016). The emergence of emerging adulthood: The new life stage between adolescence and young adulthood. In A. Furlong (Ed.), *Routledge handbook of youth and young adulthood* (pp. 34-40). New York, NY: Taylor & Francis.
- Trocki, K. F., & Caetano, R. (2003). Exposure to family violence and temperament factors as predictors of adult psychopathology and substance use outcomes. *Journal of Addictions Nursing, 14*, 183-192.
- Tymula, A., Belmaker, L. A. R., Roy, A. K., Ruderman, L., Manson, K., Glimcher, P. W., & Levy, I. (2012). Adolescents' risk-taking behavior is driven by tolerance to

- ambiguity. *Proceedings of the National Academy of Sciences of the United States of America*, *109*, 17135-17140.
- Ullman, S. E., Najdowski, C. J., & Filipas, H. H. (2009). Child sexual abuse, post-traumatic stress disorder, and substance use: Predictors of revictimization in adult sexual assault survivors. *Journal of Child Sexual Abuse*, *18*, 367-385.
- Van Roode, T., Dickson, N., Herbison, P., & Paul, C. (2009). Child sexual abuse and persistence of risky sexual behaviors and negative sexual outcomes over adulthood: Findings from a birth cohort. *Child Abuse & Neglect*, *33*, 161-172.
- Voigt, D. C., Dillard, J. P., Braddock, K. H., Anderson, J. W., Sopory, P., & Stephenson, M. T. (2009). Carver and White's (1994) BIS/BAS scales and their relationship to risky health behaviours. *Personality and Individual Differences*, *47*, 89-93.
- Waite, R., Davey, M., & Lynch, L. (2013). Self-rated health and association with ACEs. *Journal of Behavioral Health*, *2*, 197-205.
- Watt, T. T. (2005). Race/ethnic differences in alcohol abuse among youth. *Journal of Ethnicity in Substance Abuse*, *3*(3), 33-47. doi:10.1300/J233v03n03_03
- Weber, E. U., Blais, A. R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making*, *15*, 263-290.
- Wilkinson, A. V., Shete, S., Spitz, M. R., & Swann, A. C. (2011). Sensation seeking, risk behaviors, and alcohol consumption among Mexican origin youth. *Journal of Adolescent Health*, *48*, 65-72.
- Wills, T. A., Vaccaro, D., & McNamara, G. (1994). Novelty seeking, risk taking, and related constructs as predictors of adolescent substance use: An application of Cloninger's theory. *Journal of Substance Abuse*, *6*, 1-20. doi:10.1016/s0899-3289(94)90039-6
- Wright, M. O. D., Crawford, E., & Del Castillo, D. (2009). Childhood emotional maltreatment and later psychological distress among college students: The mediating role of maladaptive schemas. *Child Abuse & Neglect*, *33*, 59-68.
- Yuan, J., He, Y., Qinglin, Z., Chen, A., & Li, H. (2008). Gender differences in behavioral inhibitory control: ERP evidence from a two-choice oddball task. *Psychophysiology*, *45*, 986-993.
- Zuckerman, M. (1979). Sensation seeking and risk taking. In C. E. Izard (Eds.), *Emotions, Personality, and Psychotherapy: Emotions in personality and psychopathology* (pp. 161-197). Boston, MA: Springer.
- Zuckerman, M., Ball, S. A., & Black, J. (1990). Influences of sensation seeking, gender, risk appraisal, and situational motivation on smoking. *Addictive Behaviors*, *15*, 209-220. doi:10.1016/0306-4603(90)90064-5

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