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Differential Association of Child Abuse With Self-Reported Versus Laboratory-Based Impulsivity and Risk-Taking in Young Adulthood

Ayesha C. Sujan¹, Kathryn L. Humphreys^{1,2}, Lara A. Ray², and Steve S. Lee²

Abstract

Young adults (ages 18–26) with ($n = 20$) and without ($n = 55$) a history of child abuse (CA) completed self-report and laboratory-based measures of impulsivity and risk-taking. Relative to individuals without abuse histories, individuals with a history of CA self-reported a greater number of lifetime sexual partners as well as elevated trait impulsivity (specifically, elevated lack of premeditation and lack of perseverance). No group differences were observed for self-reported safety-related behaviors and risk-taking propensity. Notably, however, laboratory-based measures suggested that individuals with a history of CA showed significantly less impulsivity and risk-taking than individuals without abuse histories. These results suggest that self-report and laboratory measures of risk-taking and impulsivity measured in emerging adulthood may differentially relate to CA. Specifically, whereas laboratory-based measures may be influenced by hypervigilance or in the moment actions, self-report measures may assess more general behaviors related to real-world impulsivity and risk-taking.

Keywords

child abuse, impulsivity, risk-taking

There is replicated evidence that child abuse (CA) is significantly associated with adult psychopathology (e.g., Hillberg, Hamilton-Giachritsis, & Dixon, 2011). However, the mechanisms underlying the association of CA with respect to adult psychopathology are not fully understood. CA may disrupt normative developmental processes, including those that impact impulsive and risk-taking behaviors (e.g., Annerbäck, Sahlqvist, Svedin, Wingren, & Gustafsson, 2012; Roy, 2005), which are independently linked to adult psychopathology (Brawner, Gomes, Jemmott, Deatricks, & Coleman, 2012; Duka & Crews, 2009; Jentsch et al., 2014). Given the sharp rise in risk-related behaviors during emerging adulthood (e.g., Arnett, 1992; Pharo, Sim, Graham, Gross, & Hayne, 2011; Shulman & Cauffman, 2014) and the association between risk-related behavior in this period and the development of psychopathology (e.g., Clapper, Buka, Goldfield, & Lipsitt, 1995), it is important to study those susceptible to engaging in risk-taking and impulsive behaviors. Individuals exposed to abuse as children may be at increased risk for engaging in risk-related behaviors during emerging adulthood, and if so, identifying patterns of impulsivity and risk-taking in this developmental period could be particularly impactful in understanding adult psychopathology risk.

Although impulsivity and risk-taking are correlated, they are factorially independent. Impulsivity typically involves

rapid, unplanned reactions without regard to negative consequences (Moeller, Barratt, Dougherty, Schmitz, & Swann, 2001), whereas risk-taking involves actions that have uncertain outcomes (Fischhoff, 1992) and includes balancing the potential for both positive and negative outcomes (Byrnes, Miller, & Schafer, 1999; Leigh, 1999). Nonetheless, both impulsivity and risk-taking are associated with CA, and in particular, extensive research has focused on the association of childhood sexual abuse and heightened risky sexual behavior later in life (see Tyler, 2002). Research has also demonstrated that childhood maltreatment (i.e., childhood abuse or neglect) is associated with heightened self-reported trait impulsivity (e.g., Li et al., 2012; Roy, 2005). However, given that impulsivity is multidimensional (Lynam, Smith, Whiteside, & Cyders, 2006), CA may show specificity with respect to particular aspects of impulsivity. A recent study utilizing the UPPS

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Impulsive Behavior Scale found that continuously measured child maltreatment independently predicted the negative urgency domain of trait impulsivity, but no other impulsivity domain (Gagnon, Daelman, McDuff, & Kocka, 2013). This suggests that childhood maltreatment may be more strongly associated with impulsivity only in the presence of negative affect.

There are limitations in self-report measures, which are often used to report on past risky acts and assess propensity for future risky behavior, especially given that risk-taking propensity and actual behavior do not always align. Self-report measures are subject to reporter bias, given that individuals may not accurately report past behaviors or may believe that reporting risky behaviors may result in negative consequences (Lejuez et al., 2002). Given concerns regarding the use of self-report measures, “in vivo” laboratory-based assessments have been used to directly assess individuals’ impulsivity and risk-taking. The association between CA and performance on these measures has not been fully elucidated. Individuals with and without a history of CA (hereafter referred to as CA and no-CA, respectively) completed the Stop Task, a test of behavioral impulsivity (Navalta, Polcari, Webster, Boghossian, & Teicher, 2006), resulting in mixed evidence of increased impulsivity among CA individuals. Furthermore, in a study of 126 male children, CA youth showed more difficulties in response inhibition (i.e., more false alarms) than comparison children (Mezzacappa, Kindlon, & Earls, 2001), indicating that CA male children may show impulsivity by preemptively responding to stimuli. Among trauma-exposed youth, risk-taking measured by performance on the Balloon Analog Risk Task (BART) was positively associated with post-traumatic stress disorder (PTSD) symptoms (Danielson, Ruggiero, Daughters, & Lejuez, 2010). Similarly, PTSD was associated with greater risk-taking on the BART in a sample of substance dependent patients (Tull et al., 2009). However, it is important to note that the experience of trauma and the development of PTSD are distinct, as a minority of individuals who experience a traumatic event develop PTSD (e.g., Ackerman, Newton, McPherson, Jones, & Dykman, 1998). Therefore, it is important to examine the independent association of CA with impulsivity and risk-taking, regardless of PTSD diagnosis.

Although there is evidence that trauma history may predict increased impulsivity and risk-taking, trauma may also result in increased cautiousness or hypervigilance. For example, preschoolers with a history of maltreatment were better able to differentiate essential from nonessential visual details than nonmaltreated counterparts, suggesting that maltreatment may be associated with increased attention to detail (Frankel, Boetsch, & Harmon, 2000). Additionally, early adversity in the form of maternal deprivation has been linked to decreased exploration and increased exploitation under risk, an association mediated by separation anxiety (Humphreys et al., 2014), indicating that extreme cautiousness may follow from maltreatment in early life. Thus, it is possible that risk-averse behavior may be observed in individuals with a history of CA.

Study Aims

Given that the association between CA and impulsivity and risk-taking is relatively unexplored, with mixed findings thus far, we examined the association of CA (defined as physical or sexual abuse prior the age of 17) with multiple measures of impulsivity and risk-taking in young adults, a subset of the population known to be at elevated risk of engaging in risk-related behaviors (e.g., Arnett, 1992; Pharo et al., 2011). Varied measures, including self-report and laboratory-based in vivo measurements, were used in order to characterize the specificity of the association of CA with impulsivity and risk-taking.

Method

Participants

Participants in this study were 75 (25 male and 50 female) young adults enrolled in a large research university. Twenty-three percent of participants were in their first year in college, 23% in their second year, 41% in their third year, and 14% in their fourth or fifth year. Participants ranged in age from 18 to 26 years ($M = 20.20$, standard deviation [SD] = 1.72) and self-endorsed the following racial-ethnic distribution: 45% Asian, 31% White, 9% mixed or other, 5% American Indian/Alaskan Native, 4% African American, 4% Native Hawaiian or Pacific Islander, and 1% Hispanic. Participants were recruited via an announcement on the university’s online experiment management system and received partial course credit for their participation.

Procedure

The current study was part of a larger project assessing the impact of stress on impulsivity and risk-taking. Participants came to the testing room on two separate occasions and completed self-report measures at Session 1 and two sets of three computerized tasks (emotional go/no-go task, BART, and the delay discounting task [DDT]), following neutral and stress inductions at Session 2. Computerized tasks and the stress/neutral mood induction were randomly ordered. All procedures were approved by the UCLA Institutional Review Board.

Measures and Tasks

Childhood Traumatic Events Scale (CTES). The CTES (Pennebaker & Susman, 1988) assesses childhood trauma occurring before the age of 17. For the current study, 2 items (“prior to the age of 17, did you have a traumatic sexual experience [raped, molested, etc.]?” and “prior to the age of 17, were you the victim of violence [child abuse, mugged or assaulted—other than sexual]?”) were used to create a binary variable of CA. If either item was endorsed, participants were categorized in the CA group. We chose to focus on these two types of childhood stress, as other childhood stressors may differentially relate to adult psychopathology (Carr, Martins, Stingel, Lemgruber, & Juruena, 2013). Furthermore, the focus on physical and sexual

Table 1. Self-Reported Risky Behaviors From the Youth Risk Behavior Survey.

| | Child abuse | | No child abuse | | Analysis | |
|--|----------------|------|----------------|------|---------------------|-----|
| | n ^a | % | n ^a | % | χ ² | p |
| Not wearing a helmet (past 12 months) | 7/7 | 100 | 27/33 | 81.8 | 1.50 | .22 |
| Not wearing a seatbelt | 5/19 | 26.3 | 12/53 | 26.2 | 0.11 | .75 |
| Riding with someone who had been drinking (past 30 days) | 6/19 | 31.6 | 14/53 | 26.4 | 0.19 | .67 |
| Drinking and driving (past 30 days) | 4/19 | 21.1 | 4/53 | 7.5 | 2.58 | .11 |
| Not wearing a condom (last sexual intercourse) | 4/13 | 30.8 | 9/29 | 31.0 | 0.00 | .99 |
| Inadequate pregnancy prevention method (last sexual intercourse) | 2/13 | 15.4 | 5/29 | 17.2 | 0.02 | .88 |
| | | | | | Wald χ ² | p |
| Age of first sexual intercourse ^b | | | | | | |
| 15 or younger | 1/13 | 7.7 | 5/30 | 16.7 | 0.83 | .36 |
| 16 | 2/13 | 15.4 | 6/30 | 20.0 | | |
| 17+ | 10/13 | 76.9 | 19/30 | 63.3 | | |
| Number of sexual partners (last 3 months) ^b | | | | | Wald χ ² | p |
| 1 | 2/13 | 15.4 | 11/30 | 36.7 | 2.87 | .09 |
| 2 | 6/13 | 46.2 | 13/30 | 43.3 | | |
| 3 | 3/13 | 23.1 | 5/30 | 16.7 | | |
| 4+ | 2/13 | 15.4 | 1/30 | 3.3 | | |
| Number of sexual partners (lifetime) ^b | | | | | Wald χ ² | p |
| 1 | 2/13 | 15.4 | 9/30 | 30.0 | 4.90 | .03 |
| 2 | 1/13 | 7.7 | 8/30 | 26.7 | | |
| 3 | 2/13 | 15.4 | 3/30 | 10.0 | | |
| 4 | 1/13 | 7.7 | 5/30 | 16.7 | | |
| 5+ | 7/13 | 53.8 | 5/30 | 16.7 | | |

^an indicates number of participants who endorsed the behavior/total number of participants included in the analysis. ^bGeneralized linear regression specified ordinal logistic distributions.

abuse domains, in contrast to more broad definitions of maltreatment, is consistent with other work (Fergusson, Boden, & Horwood, 2008; Singer, Humphreys, & Lee, 2012). Twenty participants (26%) reported CA before age 17. Eight endorsed sexual abuse, 14 endorsed physical abuse, and 2 endorsed both. The mean age of onset for sexual and physical abuse was 11.14 years (*SD* = 4.10) and 11.30 years (*SD* = 4.53), respectively.

UPPS-P Impulsivity Behavior Scale (UPPS-P). This 59-item self-report measure assesses five domains of trait impulsivity: negative urgency (tendency to act rashly when experiencing negative emotions), lack of premeditation (tendency to act without planning or deliberation), lack or perseverance (tendency to give up when activities became difficult or boring), sensation seeking (tendency to seek out exciting or dangerous activities), and positive urgency (tendency to act rashly when experiencing positive emotions). Participants completed Likert-type scale ratings ranging from 1 (*agree strongly*) to 4 (*disagree strongly*). The UPPS-P (Lynam et al., 2006) is a revised version of the UPPS that includes one additional domain of impulsivity (i.e., positive urgency). The UPPS has shown acceptable concurrent and discriminant validity (Cyders et al., 2007; Miller, Derefinco, Lynam, Milich, & Fillmore, 2010; Whiteside, Lynam, Miller, & Reynolds, 2005).

Risk Taking Index (RTI). The RTI (Nicholson, Soane, Fenton-O’Creevy, & Willman, 2005) is a 6-item self-report scale assessing everyday risk-taking propensity related to recreational risks (e.g., rock climbing), health risks (e.g., smoking), career risks (e.g., quitting a job without another to go to), financial risks (e.g., gambling), safety risks (e.g., fast driving), and social risks (e.g., publicly challenging a rule). Participants rated their current and past behaviors by using Likert-type scale ratings ranging from 1 (*never*) to 5 (*very often*). RTI scores have been correlated with sensation seeking and risk-taking propensity (Nicholson et al., 2005). Two risk-taking propensity scores were obtained: one for past behaviors and other for current behaviors, obtained by taking the mean score of the 6 items.

Youth Risk Behavior Survey (YRBS). The YRBS (Eaton et al., 2010) is an 87-item self-report survey assessing a range of risky behaviors. An abbreviated version was used to reduce participant burden and assessed items related to risky sexual behavior and physical safety behaviors related to biking and driving. Time frames for when the behaviors took place varied by item (see Table 1).

BART. The BART (Lejuez et al., 2002) is a computerized measure of risk-taking, in which participants inflate a series of

Table 2. Demographic Characteristics.

| | Child abuse (<i>n</i> = 20) | | No child abuse (<i>n</i> = 55) | | Analysis | |
|---|------------------------------|-----------|---------------------------------|-----------|----------------------|----------|
| | Mean | <i>SD</i> | Mean | <i>SD</i> | χ^2 or <i>t</i> | <i>p</i> |
| Age | 20.85 | 2.16 | 19.96 | 1.49 | -1.70 | .10 |
| Year in college (1-4) | 2.78 | 1.11 | 2.40 | 0.98 | -1.35 | .18 |
| | <i>n</i> | % | <i>n</i> | % | χ^2 or <i>t</i> | <i>p</i> |
| Sex (male) | 5 | 25 | 20 | 36% | 0.85 | .36 |
| Race | | | | | 4.05 | .67 |
| American Indian/Alaskan Native | 1 | 1 | 3 | 4 | | |
| Asian | 10 | 13 | 24 | 32 | | |
| African American | 1 | 1 | 2 | 3 | | |
| Native Hawaiian or Other Pacific Islander | 1 | 1 | 2 | 3 | | |
| White | 4 | 5 | 19 | 25 | | |
| Hispanic | 1 | 1 | 0 | 0 | | |
| Mixed or other | 2 | 3 | 5 | 7 | | |

virtual balloons in order to earn points. Participants indicated the number of pumps desired for each balloon, with a larger number resulting in more points but a higher probability of balloon explosion, resulting in the loss of accrued points on that trial. Optimal behavior on the task requires neither overly cautious nor overly risky behavior, as both strategies result in a low number of points. Participants gained additional entries into a movie ticket drawing for more points earned. Average adjusted pumps (the average number of pumps made on unexploded balloons) have correlated with self-report measures of impulsivity and real-world risk-behaviors (Lejuez et al., 2002). Additionally, performance on the BART has significantly incrementally predicted self-reported delinquency/safety risk-behaviors above and beyond demographics, impulsivity, and sensation seeking (Aklin, Lejuez, Zvolensky, Kahler, & Gwadz, 2005).

The emotional go/no-go task. The emotional go/no-go task (Hare, Tottenham, Davidson, Glover, & Casey, 2005) is a task that assesses cognitive control processes during emotional information processing. The task comprised eight randomly ordered blocks. On half of the blocks, participants were instructed to press for neutral faces and withhold responses for the nontarget facial expressions (angry, fearful, sad, or happy). For the other half of the blocks, participants were instructed to press for the target emotional facial expressions (angry, fearful, sad, or happy) and withhold responses for neutral facial expressions. Scores were obtained for reaction times, false alarms, and accuracy. Reaction times for hits were calculated for correct trials only, and outlier trials (more than 3 *SDs* away from the mean) were removed.

The delay discounting task (DDT). The DDT (Rachlin, Raineri, & Cross, 1991) assesses the extent to which an individual prefers a smaller immediate monetary reward over a larger delayed monetary reward and produces an interference point (i.e., the monetary amount for each delay that an individual switches

from choosing the small immediate award to choosing the larger delayed reward) for each participant. Performance on the DDT has correlated with performance on a gambling task in which participants make choices between expected payoffs and expected penalties (Monterosso, Ehrman, Napier, O'Brien, & Childress, 2001).

Data Analysis

Demographic characteristics were examined using *t*-tests and χ^2 analyses. Pending nonsignificant differences ($p > .10$), these covariates were excluded from further analyses. For outcome measures, when normality assumptions were met, *t*-tests were used to examine group differences (CA vs. no-CA). If other distribution types were found, analyses reflected the correct distribution. In addition, as the original experiment tested performance on the three laboratory tasks after both a neutral and stress script, only performance following the neutral induction was used, controlling for script order, using univariate analysis of variance. The addition of this covariate did not significantly change the main effect of CA group on any outcome. Finally, given the exploratory nature of the study and the tendency for adjustments for multiple testing to yield overly conservative estimates, Type I error rate adjustments were not included in statistical testing (Bender & Lange, 2001; Harris, Reeder, & Hyun, 2009; Tyler, Normand, & Horton, 2011).

Results

Demographic data are presented by CA group in Table 2. There were no significant group differences for demographic variables examined. A correlation matrix of all dependent measures (Table 3) revealed low to moderate levels of associations. Generally, measures of self-reported risk-taking demonstrated low to nonsignificant correlations with laboratory-based risk-taking. Similarly, self-reported measures of impulsivity demonstrated

Table 3. Correlation Matrix for Dependent Measures of Risk Taking and Impulsivity.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | |
|---|--------|--------|-------|--------|------|--------|--------|------|------|--------|--------|--------|------|------|--------|-------|-------|-------|---------|------|----|--|
| 1. Negative urgency | — | | | | | | | | | | | | | | | | | | | | | |
| 2. (Lack of) premeditation | .44*** | — | | | | | | | | | | | | | | | | | | | | |
| 3. (Lack of) perseverance | .19 | .48*** | — | | | | | | | | | | | | | | | | | | | |
| 4. Sensation seeking | .28* | .30* | -.12 | — | | | | | | | | | | | | | | | | | | |
| 5. Positive urgency | .81*** | .44*** | .13 | .27* | — | | | | | | | | | | | | | | | | | |
| 6. Current risk-taking | .06 | .09 | -.29* | .45*** | -.00 | — | | | | | | | | | | | | | | | | |
| 7. Past risk-taking | .04 | .25* | -.22† | .43*** | -.01 | .52*** | — | | | | | | | | | | | | | | | |
| 8. Not wearing a helmet | .16 | .35* | .25 | .43*** | -.09 | .32* | .27† | — | | | | | | | | | | | | | | |
| 9. Not wearing a seatbelt | -.06 | -.06 | -.04 | -.01 | -.12 | .14 | .07 | .10 | — | | | | | | | | | | | | | |
| 10. Riding with someone who had been drinking | -.15 | -.07 | -.08 | .08 | -.14 | .13 | .07 | .24 | .10 | — | | | | | | | | | | | | |
| 11. Drinking and driving | .10 | .06 | .13 | .07 | .06 | .33*** | .06 | .14 | .01 | .37*** | — | | | | | | | | | | | |
| 12. Not wearing a condom | .16 | .20 | .20 | .00 | -.12 | .15 | -.09 | .23 | -.05 | .11 | .32* | — | | | | | | | | | | |
| 13. Inadequate pregnancy prevention method | .12 | .09 | -.08 | .01 | -.02 | .15 | .03 | .16 | -.12 | -.02 | .00 | .67*** | — | | | | | | | | | |
| 14. Age of first intercourse | .07 | .15 | .31* | -.05 | .12 | -.25 | .01 | -.15 | -.21 | -.23 | .10 | .02 | -.11 | — | | | | | | | | |
| 15. Number of sexual partners (past 3 months) | .19 | .04 | .10 | -.08 | .19 | .18 | .06 | -.15 | .33* | .03 | .47*** | .15 | -.03 | .20 | — | | | | | | | |
| 16. Number of sexual partners in lifetime | .21 | .26† | .19 | -.01 | .08 | .32* | .32* | .03 | .22 | .10 | .34* | .24 | .13 | -.15 | .57*** | — | | | | | | |
| 17. BART average adjusted pumps | -.05 | .04 | -.07 | .31** | -.08 | .15 | .21† | .01 | .12 | .00 | -.06 | -.10 | -.10 | -.12 | -.04 | .01 | — | | | | | |
| 18. Emotional go/no-go false alarms | .17 | -.00 | -.20 | .30* | .26* | .01 | .33*** | .02 | -.12 | -.11 | -.25* | -.12 | .17 | -.20 | -.44** | -.35* | .06 | — | | | | |
| 19. Emotional go/no-go reaction time | -.18 | -.17 | -.15 | -.08 | -.09 | .05 | -.07 | -.04 | .13 | -.05 | .05 | -.24 | -.16 | .29† | .27† | .10 | .02 | -.28* | — | | | |
| 20. Emotional go/no-go accuracy | -.02 | -.02 | .05 | .19 | .02 | .07 | -.05 | -.02 | -.07 | .13 | .10 | .25 | .13 | -.18 | -.15 | -.25 | .24† | .16 | -.36*** | — | | |
| 21. Delay discounting indifference point | .28* | .02 | -.09 | -.24* | .22† | .02 | -.14 | -.01 | -.19 | -.20† | .05 | .23 | .25 | -.06 | .16 | .28† | -.29* | -.18 | -.01 | -.09 | — | |

Note. BART = balloon analogue risk task.
† $p < .10$. * $p < .05$. ** $p < .01$. *** $p < .001$.

Table 4. Self-Report Measures of Trait Impulsivity and Risk-Taking Propensity.

| | Child abuse (<i>n</i> = 20) | | No child abuse (<i>n</i> = 53) | | Analysis | | |
|---------------------------------|------------------------------|------|---------------------------------|------|----------|----------|---------------------------|
| | Mean | SE | Mean | SE | <i>t</i> | <i>p</i> | Cohen's <i>d</i> [95% CI] |
| UPPS-P Impulsivity Scale | | | | | | | |
| Negative urgency | 25.51 | 1.83 | 25.62 | 0.91 | 0.06 | .95 | -0.02 [-0.53, 0.50] |
| (Lack of) premeditation | 22.91 | 1.35 | 20.18 | 0.58 | -2.16 | .03 | 0.57 [0.04, 1.09] |
| (Lack of) perseverance | 21.34 | 1.11 | 18.03 | 0.62 | -2.72 | .01 | 0.71 [0.18, 1.23] |
| Sensation seeking | 31.20 | 2.02 | 33.40 | 1.09 | 1.01 | .31 | -0.17 [-0.69, 0.34] |
| Positive urgency | 23.67 | 1.96 | 24.28 | 1.08 | 0.28 | .78 | -0.08 [-0.78, 0.25] |
| Risk taking Index | | | | | | | |
| Current risk-taking | 1.55 | 0.13 | 1.69 | 0.07 | 0.94 | .35 | -0.26 [-0.78, 0.25] |
| Past risk-taking | 1.92 | 0.14 | 1.69 | 0.08 | -1.48 | .15 | 0.39 [-0.13, 0.90] |

Note. CI = confidence interval; SE = standard error.

Table 5. Laboratory Measures of Risk Taking and Impulsivity.

| | Child abuse (<i>n</i> = 20) | | No child abuse (<i>n</i> = 53) | | Analysis | | |
|----------------------------------|------------------------------|-------|---------------------------------|-------|----------|----------|---------------------------|
| | Mean | SE | Mean | SE | <i>F</i> | <i>p</i> | Cohen's <i>d</i> [95% CI] |
| BART | | | | | | | |
| Average number of adjusted pumps | 50.17 | 2.70 | 56.59 | 1.64 | 4.12 | .046 | -0.54 [-1.05, -0.01] |
| Emotional go/no-go | | | | | | | |
| False alarms | 0.87 | 0.22 | 1.41 | 0.11 | 4.78 | .03 | -0.63 [-1.15, -0.10] |
| Reaction time | 516.87 | 29.22 | 513.40 | 15.44 | 0.01 | .92 | 0.03 [-0.49, 0.54] |
| Accuracy | 16.81 | 0.83 | 17.09 | 0.43 | 0.09 | .76 | -0.08 [-0.60, 0.43] |
| Delay discounting | | | | | | | |
| Indifference point (natural log) | -5.25 | 0.44 | -5.62 | 0.26 | 0.52 | .47 | 0.19 [-0.32, 0.71] |

Note. CI = confidence interval. BART = Balloon analogue risk task; SE = standard error.

low to nonsignificant correlations with measures of laboratory-based impulsivity.

Self-Report Measures

UPPS-P Impulsivity Scale. Significant group differences were observed on the lack of premeditation and lack perseverance domains, where the CA group scored higher than the no-CA group on both domains (Table 4). Example items include the following: "I like to stop and think things over before I do them (reverse scored)" and "I tend to give up easily" for lack of premeditation and perseverance, respectively. No group differences were observed on the negative urgency, sensation seeking, and positive urgency domains of impulsivity (Table 4).

RTI. There were no significant group differences between CA and no-CA with respect to current and past risk-taking propensity (Table 4).

YRBS. A significant group difference was found in the number of lifetime sexual partners reported (Table 1). More than half of the CA group reported having five or more lifetime sexual partners, compared to 16.7% of the no-CA group, despite nonsignificant group differences for age of first sexual intercourse

(Table 1). No group differences were observed in the number of sexual partners endorsed in the previous 3 months, in condom use with last partner, and in pregnancy prevention methods for previous sexual intercourse (only participants who endorsed sexual intercourse were included in the analysis; Table 1). Similarly, CA group status was unrelated to wearing a seatbelt, riding in a car driven by someone who had been drinking, having driven after drinking, and wearing a helmet while riding a bicycle in the last 12 months (Table 1).

Computerized Laboratory Tasks

BART. Significant group differences were observed in performance on the BART, such that the CA group exhibited *fewer* average adjusted pumps than the no-CA group (Table 5).

Emotional go/no-go task. Group differences were found for the average number of false alarms, such that the CA group exhibited *fewer* false alarms than the no-CA group (Table 5). No significant differences were observed in reaction time or accuracy (Table 5).

DDT. No significant group differences between the CA and the no-CA group were observed on the DDT (Table 5).

Discussion

This study examined the association of CA to self-reported and laboratory-based impulsivity and risk-taking in 75 young adults with and without a history of abuse during childhood. Although several measures of impulsivity and risk-taking were not significantly associated with CA status, young adults with a history of CA had higher levels of self-reported trait impulsivity (specifically, lack of premeditation and perseverance) and more lifetime sexual partners. However, our laboratory-based assessments provided evidence for decreased impulsivity and risk-taking among CA individuals (i.e., fewer false alarms on the emotional go/no-go and lower average adjusted pumps on the BART). The dissociation with respect to CA status and self-report and laboratory measures merits further consideration, as the divergent results may be useful for understanding behavioral sequelae of CA and targeting prevention and intervention efforts for these individuals.

Self-report measures indicated that the CA and no-CA group were not significantly different on most items assessing risky sexual behavior. Specifically, no group differences were observed for condom use, pregnancy prevention, age of first intercourse, and number of partners in last 3 months. However, in concert with research showing that CA is associated with increased risk of engaging in risky sexual behaviors (see Tyler, 2002), CA individuals, on average, had a higher number of lifetime sexual partners. Nearly half of CA individuals self-reported having six or more lifetime sexual partners, compared to only one sixth of no-CA individuals. Previously, number of sexual partners has been linked to adverse health and psychological consequences, including sexually transmitted diseases (e.g., Joffe et al., 1992; Mo, Wong, & Merrick, 2007) and psychological distress (Burris, Brechting, Salsman, & Carlson, 2009). Condom use may not decrease the risk of contracting some sexually transmitted diseases (e.g., human papillomavirus; Manhart & Koutsky, 2002), and thus even protected sex with multiple sexual partners may constitute risky sexual behavior.

CA was positively associated with two domains of trait impulsivity: lack of both perseverance and premeditation, suggesting that CA individuals may have deficits in planning and implementation skills. Similar to the only other study to examine the UPPS impulsivity traits in relation to child maltreatment (i.e., Gagnon et al., 2013), this study indicated domain-specific self-reported trait impulsivity. However, contrary to Gagnon and colleagues' findings, which showed elevated negative urgency, we observed increased trait impulsivity on lacking perseverance and premeditation domains of impulsivity in CA individuals. These divergent results may have resulted from different measurement techniques. The other study assessed maltreatment using a continuous variable that included items on physical, sexual, and emotional abuse, as well as emotional and physical neglect. This broad-based dimensional assessment of early maltreatment is qualitatively different from the binary characterization of CA used in this study. Nonetheless, both studies indicate that maltreatment may be related to domain-specific increases in self-reported trait impulsivity.

Although significant group differences were observed on some domains of self-reported impulsivity and risk-taking, other domains showed no significant group differences. No significant group differences were reported regarding past and present global risk-taking propensity and in the safety domains of biking and driving. The CA and no-CA group were similar in negative urgency, positive urgency, and sensation seeking domains of impulsivity. These three impulsivity domains are related to seeking out heightened arousal or emotional states, indicating that CA individuals may be no more "thrill seeking" than no-CA individuals.

While self-report measures demonstrated either no significant group differences or increased impulsivity and risk-taking among CA individuals, laboratory measures demonstrated either no significant group differences or *reduced* impulsivity and risk-taking among CA individuals. Compared to no-CA individuals, CA individuals had fewer false alarms on the emotional go/no-go, a laboratory measure of impulsivity, and had fewer average adjusted pumps on the BART, a laboratory measure of risk-taking. No significant group differences were observed for delay discounting. Elevated impulsivity and risk-taking on some laboratory measures among CA individuals may seem incongruent with prior findings that suggested CA may be associated with increased impulsivity and risk-taking on laboratory tasks. However, past studies assessing CA and performance on laboratory tasks of impulsivity found an association between CA and impulsivity either under limited circumstances (e.g., reduced accuracy only when there was a long delay between the target stimuli and the stop stimuli; Navalta et al., 2006) or when conducted with a limited population (i.e., only male children; Mezzacappa et al., 2001). Furthermore, although studies have shown a relationship between maladaptive response to trauma (i.e., PTSD) and elevated risk-taking on laboratory tasks (Danielson et al., 2010; Tull et al., 2009), no prior study has examined the independent relationship of CA to laboratory-based measures of risk-taking.

Nonetheless, our seemingly divergent findings from self-report and laboratory measures merit further consideration. Self-report measures may assess general real-world risk-taking propensity related to individuals' stable trait characteristics, whereas laboratory measures may reflect specific in the moment behaviors related to individuals' psychological states during the experiment. Indeed, while some prior studies have found a positive association between self-report measures of impulsivity and laboratory measures of impulsivity (e.g., Nolan, D'Angelo, & Hoptman, 2011), other studies found that these associations were modest or nonsignificant (e.g., Lane, Cherek, Rhoades, Pietras, & Tcheremissine, 2003; Reynolds, Ortengren, Richards, & de Wit, 2006; Reynolds, Penfold, & Patak, 2008). Furthermore, factor analyses indicate that laboratory-based measures assess specific dimensions of impulsivity and thus cannot be generalized to the same broader construct of impulsivity assessed by self-report measures (Dougherty et al., 2009; Lane et al., 2003).

The results from our laboratory-based measures suggest that CA individuals may be more risk-averse than comparison

individuals. This theory is in line with research linking childhood trauma to hypervigilance (Coates & Gaensbauer, 2009). Although increased vigilance to threat following stress and trauma is common (Davidson, Stein, Shalev, & Yehuda, 2004; Joëls & Baram, 2009), it may decrease in the moment impulsivity and risk-taking as a form of self-protection. Indeed, anxiety is related to risk-aversion (Giorgetta et al., 2012) and behavioral inhibition (Muris, Meesters, Bouwman, & Notermans, 2014). Specifically, dispositional anxiety relates to risk-averse performance on the BART (Maner et al., 2007) and experimentally induced anxiety relates to fewer errors of omission (i.e., false alarms) on a go/no-go task (Robinson, Krimsky, & Grillon, 2013). Thus, although reduced impulsivity and risk-taking are generally conceptualized as positive phenotypes, these behaviors should be considered in light of research indicating that risk-taking can be adaptive (e.g., Humphreys, Lee, & Tottenham, 2013) and chronically risk-averse behavior can be maladaptive. Both smokers (Dean, Sugar, Hellemann, & London, 2011) and excessive drinkers (Ashenhurst, Jentsch, & Ray, 2011) performed worse on the BART than comparison participants. Furthermore, the congruency between laboratory and real-world risk-takers may be problematic. Individuals who engage in elevated real-world risk-taking behaviors may be less incentivized by rewards, which could lead to poorer performance on the laboratory tasks (Dean et al., 2011).

One potential explanation for reduced impulsivity and risk-taking on laboratory-based tasks, coupled with the observed self-reported deficits in planning and implementation in CA individuals, is attentional allocation differences. Individuals who have experienced intense anxiety or trauma are thought to reallocate attentional resources to processing negative emotions and intrusive thoughts and away from higher executive function involved in planning and decision-making (see the limited-capacity model of cognitive processing; Kahneman & Treisman, 1984). Among CA individuals, attentional allocation differences could lead to suppression of higher order executive function and heightened reactivity for in the moment responses. It is possible that the reduced impulsivity and risk-taking behavior observed among CA individuals on laboratory-based measures is reflective of a response process guided by heightened in the moment reactivity, while elevated impulsivity and risk-taking on self-report measures may be reflective of deficits in long-term planning and decision-making. Thus, CA individuals may benefit from interventions targeting reducing reactivity as well as increasing long-term planning and decision-making skills. Nonetheless, future research should examine potential mechanisms by which early adversity may result in both heightened and reduced impulsivity and risk-taking.

There were several limitations to this study. The sample was relatively small and comprised of presumably high-functioning young adults (i.e., currently enrolled undergraduate students). There were also limitations pertaining to our measurement of CA. Data on CA history were collected through retrospective recall. Reliance on retrospective recall can lead to errors of commission (reporting incidents that did not occur) and errors of omission (failing to report incidents that did occur; Cantor-

Graae, Cardenal, Ismail, & McNeil, 1998). However, there is evidence that retrospective measures of self-reported early adverse events are valid sources of data (Brown, Craig, Harris, Handley, & Harvey, 2007). Our measurement of abuse was also limited to a dichotomous classification of CA (present or absent) and the association of trauma severity to risk-related behaviors was not assessed. Thus, this study was unable to detect whether severity of the abuse relates to impulsivity and risk-taking in emerging adults. Furthermore, only two types of traumatic events (i.e., physical and sexual abuse) were evaluated. Future research should evaluate the relationship of other forms of stressors to the emergence of risk-related behaviors. In regard to our laboratory-based measures, it should be noted that laboratory-based behavior can be influenced by situational demands, emotional states, and stress of performing under pressure (e.g., Choi et al., 2013; Worthy, Markman, & Maddox, 2009). If these situational demands had a greater influence on one group over the other, they may have driven the observed differences on the laboratory measures. Furthermore, because participants may be aware that laboratory-based measures have no strong external consequences, these measures may not be a useful metric of real-world impulsive and risk-taking propensity. Self-report measures are also limited, as they reflect individuals' perceptions of their tendencies to engage in real-world behaviors and thus are subject to reporting biases and social desirability. Additionally, we only assessed some domains of self-reported risk-taking behavior, and prior research has shown an association between CA and substance abuse (e.g., Hovdestad, Tonmyr, Wekerle, & Thornton, 2011). Finally, it is important to note that this study provides preliminary evidence for differential long-term outcomes related to CA and merits replication.

In sum, compared to young adults without a history of abuse in childhood, those with a history of CA show similar levels of impulsivity and risk-taking in a number of domains. However, both increased and decreased impulsivity and risk-taking behaviors, depending on whether data are collected via laboratory-based measures or self-report measures, were also found. It is likely that these seemingly divergent results reflect the different constructs that self-report and laboratory-based measures assess, as laboratory measuring of impulsivity and risk-taking may be tapping into hypervigilance or in the moment behaviors and self-report measures may be assessing general trait level and real-world risk-taking and impulsivity. These findings highlight the special risks in emerging adulthood among those who have experienced CA, both in terms of increased risk of engaging in potentially harmful behaviors related to impulsivity and risk-taking and potentially maladaptive risk-averse behavior patterns.

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