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## Stress Coping Strategies as Mediators: Toward a Better Understanding of Sexual, Substance, and Delinquent Behavior-Related Risk-Taking among Transition-Aged Youth

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### Abstract

Transitional aged youth (18-24) report increasing and peaking risk-taking (sexual, substance, and delinquent behavior). Stressful life events (SLE) are associated with these risk-taking behaviors. Little is known regarding what mediates these relationships. This study tests whether various coping strategies mediate the relationship between SLE and risky behavior in three domains among 18-24 year olds (N=126; M age = 21.3, SD = 1.9; 52% Black; 56% female). After adjusting for covariates and simultaneously modeling two stress variables, only stressful life events, but not perceived stress, was uniquely associated with risk-taking behaviors at moderate to high levels. Significant indirect effects of SLE via avoidance coping were found for illicit drug use both concurrently and prospectively and for risky sex concurrently. For participants reporting greater stressful life experiences, substance use and risky sex behaviors become greater as avoidance coping increases. Avoidance coping was a partial mediator for the concurrent relationship between stressful life events and substance use/risky sex, but a full mediator for the prospective relationship between stressful life event and substance use. None of the coping strategies mediate the relationship between stressful life events and delinquency. Prevention and intervention strategy implications for reducing avoidance coping and promoting alternative coping styles are discussed.

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## Keywords

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## Introduction

Youth between ages 18 and 24 (known as transition age youth) have been particularly understudied relative to other developmental stages despite characteristically high risk behavior prevalence. Transition-aged youth (18-24) reported increasing and peaking risk-taking, including sexual, substance use, and delinquent behaviors. Half of all new Sexually Transmitted Infections (STIs) are reported by youth ages 15 to 24, yet they constitute one-quarter of the population (CDC 2013; Weinstock, Berman, and Cates 2004). Recent surveillance data evidence that STI rates among 15-24 year olds increased between 2013 and 2017 for chlamydia, gonorrhea, and syphilis (Braxton et al. 2018). HIV is predominately contracted and transmitted via sexual behaviors and second by intravenous drug use (Prejean et al. 2011). In 2018, 18- to 25-year old youth in the US reported the highest levels of drug use compared to other age groups: binge drinking (34.9%), marijuana use (34.8%), and combined illicit drug use (38.7%) (Bose, Hedden, and Lipari 2019). Decades of criminological studies have found support to the age-crime curve manifesting as a dramatic rise in the level of offending to a peak around age 15-19 and then a gradual decline after youth enter adulthood (Farrington 1986; Gottfredson and Hirschi 1990; Greenberg 1977; Liu 2015; Moffitt 1993). Thus, risk behaviors among 18- to 24-year olds remain an important public health problem.

Additionally, many of these youth, especially urban youth have experienced major stressors including increased violence exposure, early and chronic stress, and single-parent headed households (as marriage has declined and divorce has increased). Previous research highlights the role of stressful life events in delinquent behavior, substance use and risky sexual behavior (Compas, Malcarne, and Fondacaro 1988; Sinha 2008). For example, according to General Strain Theory, when negative emotions resulting from strains are not coped with well, individuals may be prone to violent behavior (Agnew 2006; Agnew, Brezina, Wright, and Cullen 2002). Relatively little is known, however, regarding whether there are similar pathways that connects stress and these various risk-taking behaviors.

## Stress and risk-taking behavior

Previous research has highlighted the role of stress in risky sex, substance use and delinquency. The link between stress and substance use/addiction has been explained with the self-medication hypothesis and stimulation seeking hypothesis from a psychopharmacological point of view (Goeders 2003; Preston 2006). The roles stress and adverse childhood experiences play in predisposing youth to risky sexual behavior was also documented (Biswas and Vaughn 2011; Dube, Felitti, Dong, Chapman, Giles, and Anda 2003; Fang, Chuang, and Lee 2016). Stress is also highlighted in the literature focused on delinquency. General strain theory proposes that certain strains generate negative emotions which predispose youth to delinquency as a reaction to cope with the negative emotion, anger in particular (Agnew 2013). Despite the large body of research on stress and risky

behavior, most studies focused generally on one behavior domain, such as substance use only. It remains unclear whether stress is differentially associated with different risk-taking behaviors and whether the path from stress to behavior shares similar characteristics within one sample of individuals.

Stress has been used in a generic sense and in different studies stress is referred to either as events that causes stress (i.e., stressors or stressful life events) and/ or as subjective stress, the perceived negative emotion (Compas 1987; Smith and Carlson 1997). The interchangeable use of stress and its components can result in confusion. There are separate components involved in the process. Despite their overlapping and intricate feedback loop, it is still beneficial to define them separately to seek understanding of the mechanism of stress as it related to risk-taking behavior. Stress, as a process, involves the external events that cause stress (i.e., stressor or stressful life events), the cognitive and affective processes evaluating the event and available resources (i.e., appraisal), biological responses to the stressor, and behavior or cognitive response to the stressor (i.e., coping) (Sinha 2001). In the current study, we focus on understanding the role of coping in the pathway that connects stress to risk-taking behavior.

### **Coping and risk-taking behavior**

Coping is recognized as one of the important psychosocial mediator of the stress and psychopathology association for several decades (Broidy and Santoro 2018; Folkman and Lazarus 1988; Meng, Tao, Wan, Hu, and Wang 2011; Wills, Sandy, Yaeger, Cleary, and Shinar 2001). Lazarus define coping as cognitive and behavior efforts to manage specific demands that are appraised as taxing (Lazarus 1966). Nurius (2000) further highlighted the demands that needed to be managed include the threat itself, the meaning of the threat and the negative feelings associated with the threat. Coping is closely linked to various emotions, with some forms of coping resulting in an increase of positive emotion whereas others resulting in an increase of negative emotion (Folkman and Lazarus 1988).

There is no universal agreement on the categories of coping and coping strategies have very different definitions across studies depending on the measures used. Nevertheless, there are three main categories, including problem focused coping, emotion focused coping, and avoidance coping (Billings and Moos 1981; Endler and Parker 1994; Skinner, Edge, Altman, and Sherwood 2003). How coping strategies relate and mediate the relationship between previous stressful experiences and perceived stress with multiple risk-taking behavior domains (sexual, substance, and delinquency) has not been previously examined. By taking an approach that looks at stressful life events and perceived stress, this study identified different components of stress in a way that other studies do not. This is important because it enables a more individual-level personalized prevention (Fishbein and Dariotis 2019). This research is important for identifying future intervention and prevention strategies that may be tailored to the unique coping needs of youth.

While the relationship between stress and risk behaviors is well established, more research is needed to better understand mechanisms by which stress exerts its influence on individual's engagement in these risky behaviors. Most of the research examining the role of stress in maintaining risky behaviors focuses primarily on using these behaviors to cope with

stress. For example, the coping models of addiction proposed a direct influence of stress on engaging in substance use (e.g., alcohol, binge drinking), which is regarded as a way of coping with stress via decreasing negative affect and/or increasing positive affect (Dermody, Cheong, and Manuck 2013).

Similar models can be found in delinquency literature where delinquency is conceptualized as the means of coping as proposed in General Strain Theory for delinquency (Agnew 2013; Broidy and Santoro 2018; Peck 2013). Given that coping is defined as cognitive and behavioral responses to stressor, such proposition is consistent. Along the same vein, this kind of coping model can be used for to explain risky sex as a mean to regulate the negative affect. However, in the General Strain Theory framework (Agnew 2013), it has been recognized that not all strains elicit delinquent coping, and certain strains are more likely to link to delinquent coping. Thus, the link between stress and risky behavior may not be as direct as this kind of coping model of risky behavior would presume.

Alternatively, the Stress-Vulnerability model proposed that decision making processes are influenced by stress and there are moderating/mediating variables in the link of stress and risky behavior (Sinha 2001; Starcke and Brand 2012). For example, stress may act indirectly through altering cognitive/affective and social competency processes that underlie behavior. In relation to coping strategies, this model would suggest that when individuals are under stress, they shift to coping strategies they tend to adopt with more automatic process, and some coping strategies are more automatic whereas others may be more intentional and purposeful which need more efforts. The more effortless strategies, such as avoidance or denial may grant immediate relief of stress such that individuals engage in more maladaptive coping mechanisms that, in turn, could further lead to more risk-taking behavior because the stressors are not adequately dealt with and only negative affects are addressed by those coping strategies.

Prior research has found that engaging coping strategies (e.g., active problem solving, behavioral solutions – doing something about it) were inversely linked to drug initiation and growth of drug use over time, whereas avoidant or disengagement coping strategies (e.g., anger, giving up) were positively linked to more drug use (Eftekhari, Turner, and Larimer 2004; McConnell, Memetovic, and Richardson 2014; Wills, Sandy, Yaeger, Cleary, and Shinar 2001). Similar findings were revealed for risky sex (Folkman, Chesney, Pollack, and Phillips 1992; Hulland, Brown, Swartzendruber, Sales, Rose, and DiClemente 2015; Stein and Nyamathi 1998). These associations, however, sometimes differ as a function of gender with greater associations between coping and drug use for men and coping and sexual risk for women (Stein and Nyamathi 1998). However, some studies did not reveal any linkages between coping, measured as a unidimensional construct with higher score indicating more negative coping, and delinquency, risky sex or drug use among juvenile offenders (Biswas and Vaughn 2011) and among women (Ickovics, Beren, Grigorenko, Morrill, Druley, and Rodin 2002).

Coping may be best conceptualized as a multidimensional rather than unidimensional construct to allow for teasing apart its link to risk-taking behaviors. Further, it is not well studied whether the relationship among stress, coping and risk behaviors functions similarly

or differently across risk domains. This has not been adequately examined because most studies explore the relationship of coping and stress with risk behaviors in isolation whereby some studies examine delinquency (DiClemente and Richards 2019; Hasking 2007; Rosario, Salzinger, Feldman, and Ng-Mak 2003), others explore sexual risk (Folkman, Chesney, Pollack, and Phillips 1992; Hulland, Brown, Swartzendruber, Sales, Rose, and DiClemente, 2015; Ickovics, Beren, Grigorenko, Morrill, Druley, and Rodin 2002; Weiss, Peasant, and Sullivan 2019), and still others investigate substance use (Eftekhari, Turner, and Larimer 2004; McConnell, Memetovic, and Richardson 2014; Wills, Sandy, Yaeger, Cleary, and Shinar 2001). In addition, many of these studies focus on select or marginalized samples (e.g., gay men, offenders, minority adults or youth, people living with HIV/AIDS).

From a prevention and intervention viewpoint, if we can establish the mediating role of coping strategies from stressor to risk-taking behavior, coping strategies could be adopted as the intervening target. If this is studied based on a more representative sample, findings may apply more broadly than past studies.

### Current study

Among a diverse (race, gender, social-economic) sample of 18-24 year old youth, this study focuses particularly on coping strategies in a longitudinal context to elucidate how stressors in life are linked to risk-taking behavior in different behavior domains. Several research questions guide this study: (1) To what extent are risky behaviors related to stressful life events and concurrently and prospectively correlated with each other? (2) To what extent are stressful life events and perceived stress correlated with different coping strategies? (3) Which has a larger role in risk-taking behavior, stressful life events or perceived stress? (4) How, if at all, do certain types of coping mediate the effect of stressful life events on risk-taking behavior? With a clear delineation of stressor, stress, coping and behavior outcomes, this study aims to fill in this gap of the proximal factors of risk-taking behavior by testing (a) the relative importance of stressors and perceived stress on risk-taking behavior; (b) the mediation role of coping strategies and examining whether and how the effect of stress on risky behavior may be mediated by five different coping strategies, namely active problem solving, positive reframing coping, distraction, avoidance and support-seeking coping; and (c) whether this indirect effect varies for risk-taking behavior across domains.

## Materials and Methods

### Project overview and participants

Data were drawn from the HOrmone and NEurological Survey of Texting Youth (HONESTY) project, which aimed to examine biosocial determinants (e.g., hormones, brain activation) of risk-related decision making. Participants had to identify as female or male given biological markers collected as part of the larger, parent study. Sample demographic characteristics are presented in the lower panel of Table 1. The participants were 126 unmarried youth aged 18 to 24 years old with an average age of 21.34 years ( $SD = 1.88$ ). About half of the sample identified as Black (52.4%) and were female (55.6%). Other identified racial categories included White (41.3%), Asian (4.8%), and American Indian/ Other (1.6%). Nearly 5% of the sample identified as Hispanic. Over half (54%) of

participants reported free or reduced lunch eligibility as a minor, 48 percent lived with both biological parents at age 14, and 41 percent were not currently enrolled in school either part- or full-time.

The recruitment strategies included advertisement in local newspapers and social media, flyers and peer referrals. Because brain imaging data and other biological data were collected in the HONESTY project, exclusion criteria for initial enrollment were certain history of physical and mental health conditions including: positive HIV status, stroke, epilepsy, traumatic brain injuries, brain illness (because of potential cognitive functioning impact); left-handedness (opposite hemispheric brain activation compared to right-handedness); permanently embedded metal (e.g., screws, rods, cages) and metal ink tattoos (due to impact on magnetic field); history of claustrophobia and pregnancy at initial visit (concern with imaging scanner exposure). . It is not expected that these exclusion criteria are related to major variables of interest in this study.

We obtained a heterogeneous sample in terms of age, race, sex and risk behavior profiles (risk avoidant to risk-taking) by recruiting youth residing in an inner city marked by high STI and crimes as well as surrounding counties characterized with fewer risk outcomes. During the data collection years, as compared to the national data, this targeted city had higher rates (per 100,000) of HIV (24.3 vs. 13.9) in 2014 (Centers for Disease Control and Prevention, 2015). The crime rates (per 100,000) were also higher in 2014 compared to the average across cities with similarly size: violent crime (1,338.5 vs. 863.7), murder and non-negligent manslaughter (33.8 vs. 11.0), robbery (589.7 vs. 280.3), aggravated assault (675.7 vs. 515.1), and property crimes (4,718.4 vs. 4,387.7)<sup>1</sup>

The HONESTY project, from Summer 2011 to Summer 2014, was approved by the Institutional Review Board (IRB) at the Johns Hopkins Bloomberg School of Public Health and was approved by the IRB at the University of Cincinnati from 2015 to 2020. Participants received compensation for their participation. The study was conducted in accordance with the Declaration of Helsinki. Participants provided written consent after they understood all components of the research. During in-person visit, data were collected using an Audio Computer Assisted Self-Interview (ACASI) survey, neuropsychological tasks were administered via computer, interviewer, and paper-and-pencil formats. Urine specimens and saliva samples were collected. Participants received compensation for their time using a reloadable cash card.

The HONESTY project included two in-person visits that were 12 months apart. During the 12-month interval between in-person visits, survey items about sexual behaviors, substance use behaviors, and violence behaviors were collected via text (SMS) messaging, a state of the art method for collecting the most reliable and proximate data to the behavior of interest. Once a week for 52 weeks, participants were asked to reply to a series of questions sent via SMS message to their personal cell phone. The data used in the current study include those collected at the initial visit (baseline) and the first three months of texting data between the

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<sup>1</sup>Source: <https://www.ucrdatatool.gov/Search/Crime/Local/RunCrimeOneYearofDataLarge.cfm>

two in-person visits. The timeline of all the relevant measures is shown in Figure 1. We report the test-retest reliability if a measure was used at both baseline and follow up.

## Measures

### Stress and coping

**Stressful life events.:** The Life Events Scale (D'Imperio, Dubow, and Ippolito 2000) (29 items;  $\alpha = 0.85$ ) assessed life stress (e.g., family members died) and neighborhood stress (e.g., had to hide someplace because of shootings in neighborhood). We also included seven additional items to measure relationship related stressful experiences (e.g., found out boy/girlfriend was pregnant; family member beaten/ attacked). Participants reported whether a particular stressful life events happened to them (1 = yes; 0 = no) over the past 12-month using the combined 36-item scale which had a high reliability ( $\alpha = 0.88$ ). Scores were summed and ranged from 0 to 35. Higher scores denote greater number of stressful events. Test-retest reliability over a year was moderate to strong ( $r = .51, p < .001$ ).

**Perceived stress.:** The Perceived Stress Scale (PSS; Cohen 1988; Cohen and Janicki-Deverts 2012) is one of the most commonly used instruments to measure perception of stress. The PSS has ten items ( $\alpha = 0.60$ ) assessing the frequency of thoughts and feelings of stress in the last month (e.g., "how often have you felt that you were unable to control the important things in your life"). Scores from the ten items were summed to form a score. Test-retest reliability over a year was moderate ( $r = .48, p < .001$ ).

**Coping strategies.:** Coping was measured with a 54-item Coping Strategies Checklist (Ayers, Sandier, West, and Roosa 1996). Participants responded on a 4-point scale (1 = "never"; 5 = "most of the time") how often they used the strategies described in the statement when they had problems in the past month. Thirteen coping strategies were measured, and they were organized into five dimensions. The first dimension is active problem solving ( $\alpha = .88$ ; 12 items), including cognitive decision making (e.g., "You thought about which things are best to do to handle the problem"), direct problem solving (e.g., "You tried to make things better by changing what you did"), seeking understanding (e.g., "You thought about why it happened"). The second dimension is positive reframing coping ( $\alpha = .90$ ; 12 items), including positivity (e.g., "You tried to notice or think about only the good things in your life"), Control (e.g., "You reminded yourself that you knew what to do"), and Optimism (e.g., "You told yourself that it would work itself out"). The third dimension is distraction ( $\alpha = .70$ ; 9 items), including distracting actions (e.g., "You did something like video games or a hobby") and physical release of emotions ("You played sports"). The fourth dimension is avoidance ( $\alpha = .78$ ; 12 items), including avoidant actions (e.g., "You avoided the people who made you feel bad"), repression (e.g., "You tried to put it out of your mind"), wishful thinking (e.g., "You daydreamed that everything was okay"). The last dimension is support-seeking ( $\alpha = .90$ ; 9 items), including seeking support for actions (e.g., "You talked to someone who could help you solve the problem"), and seeking support for feeling (e.g., "You let other people know how you felt"). Mean scores of each dimension were used (range: 1-5). Higher values denote more of that type of coping. Coping were measured at baseline and at the one-year follow up. The test-retest reliability of the five dimensions are moderate to strong ( $r$  ranged from .42 to .63,  $p < .001$ ).

### **Risk-taking behaviors collected during in-person visit**

**Lifetime sexual risk-taking behavior:** Participants reported on whether they ever had the following five types of risky sexual experiences in their lifetime: (1) Male-on-male sex; (2) sex with a prostitute or ever exchanged sex for money, drugs, or something else; (3) sex with an intravenous drug user; (4) sex with an HIV-positive partner; and (5) sex with someone only once. Scores could range from 0 to 5.

**Illicit drug use:** Illicit drug use was assessed by self-reported survey items and urine testing. Using ACASI, participants reported their current (last 30 days), recent (last 12 months), and lifetime (ever use) substance use. Substances included tobacco, alcohol, prescription drugs taken without a prescription, inhalants, and illicit drugs (e.g., opiates, marijuana, hallucinogens). Using the Panel Dip Substance Use Screening Device (Redwood Toxicology Laboratory), urine samples were tested for a total of 12 illicit substances. These two sources of data were combined to create a variable of unique substances participants ever used. The composite measure was first calculated using positive urine results. Then, if a participant reported they used a substance in the last 30 days, 12 months, or lifetime that was unique from the illicit substances for which they had a positive urine test, these were added to the total unique illicit substances detected in their urine.

**Delinquent behavior:** Participants responded to ten items measuring delinquent behavior in the last 12 months from the 1995 Add-Health survey at baseline and at one-year follow up. Participants responded on 5-point scale (0 = never; 1 = once, 2 = twice; 3 = 3 or 4 times; and 4 = 5 or more) how often they committed ten different kinds of behavior. Three items indicate violent delinquent behavior including injuring someone who needed medical attention, threatening to use or using weapons to get things, and physical fighting. Seven items assessed nonviolent delinquent behavior including damaging property, stealing, and being unruly in public. Items were all dichotomously scored to indicate ever engaging in that behavior and were summed to create a variety score of delinquent behaviors committed during the past year ( $\alpha = .75$ ). Participants also responded to the same 10 items at the second in-person visit ( $\alpha = .67$ ) and a variety score of delinquent behavior was computed indicating how many types of delinquent behavior participants committed in the last 12 months. The one-year test-retest reliability of the delinquent behavior measure is strong ( $r = .62, p < .001$ ).

### **Risk-taking behaviors collected via texting (3-month period)**

**Risky sex:** One item assessing risky sexual partners in the past 7 days was asked once every two weeks for 3 months (“how many risky partners such as prostitutes, IV drug users, MSM, or partners with HIV did you have sex with?”). Only one participant endorsed this item with a non-zero count during the 3-month period and the variance is so small that we did not conduct analysis with risky sex measured via texting as outcome for the prospective association between stress and risky sex. For this reason, immediate follow up risky sex is not reported in tables and figures in the Results section.

**Substance use:** Four items were used to measure substance used in the past 7 days via texting. The four substance use categories include binge drinking (“5 or more drinks within



a few hours”), marijuana, prescription medication without prescription, and illegal/street drug other than marijuana. Participants responded how many days they used a particular kind of substance once every two weeks for a period of 3 months. Each substance was coded to show whether participants used the substance during the 3-month period (1 = yes, 0 = no). A variety score was created by summing the dichotomous indicators of each substance to indicate the types of substance that have been used during these 3 months.

**Delinquent behavior:** Participants responded once a month for 3 months regarding how many times in the past 28 days they engaged in physical fights, forcing or coercing someone into having sex, stealing, breaking/destroying property without owner’s permission. Each behavior was coded to reflect whether participants engaged in it (1 = yes, 0 = no) during the 3 months. These indicators were summed to form a variety score to show the types of delinquent behavior in 3 months.

**Covariates**—Covariates included demographic variables such as sex (1= Male; 0 = Female), age, and race (1 = Black; 0 = Non-Black). To assess childhood poverty, a proxy measure was used by assessing whether participants were eligible for free or reduced lunch as a minor (1 = eligible; 0 = not eligible). Last, sensation seeking was included as a covariate. Sensation seeking was measured using the subscale of sensation seeking from the UPPS-P Impulsive Behavior Scale (Cyders, Smith, Spillane, Fischer, Annus, and Peterson 2007). This subscale includes 12 statements and participants rated on a 4-point scale (1 = Agree Strongly; 4 = disagree strongly) the extent to which they agreed the statement ( $\alpha = .83$ ). Scores were reversed coded and averaged so that higher scores indicate higher levels of sensation seeking.

### Analytic plan

We conducted analyses in two parts with Mplus 8.0 (Muthén and Muthén 2017). The first part tested the association of perceived stress and stressful life events with each risk-taking behavior in the three behavior domains with Poisson Regression (except for 12-month delinquent behavior where Negative Binomial Regression was used due to overdispersion). Perceived stress, stressful life events, and covariates were included as predictors to examine the unique effect of perceived stress and stressful life events (Model 1, Table 2). A similar model was tested with behaviors collected via SMS to ensure the temporal order of stress and behavior (Model 2, Table 2). Because of the variance of risky sex collected via SMS was too small, the second model was only conducted with delinquent behavior and substance use and modeled with Poisson regression. The stress measure (perceived stress or stressful life events) with unique contribution to risk-taking behavior after adjusting for the other would be included in the second part of the analyses where we explore its indirect effects via coping strategies.

To examine whether five coping strategies mediated the concurrent association between stress and risk-taking behavior and adjust for the correlated nature of the five coping strategies, we tested a parallel-mediator model (Model 3, Table 3). That is, we added coping strategies and included five indirect paths from stress to risky behavior through coping

strategies (see Figure 2). A similar model was tested with prospective risk-taking behavior collected via SMS (Model 4, Table 3).

Analyses were conducted with maximum likelihood estimation with robust standard errors (MLR) and full information maximum likelihood (FIML) was used to handle missing data (Savalei and Rhemtulla 2012). Because the behavioral outcomes are all count variables and we used Poisson Regression (except for 12-month delinquent behavior where Negative Binomial Regression was used due to overdispersion), model fit such as chi-square test and the Comparative Fit Index are not available. Following existing recommendations (MacKinnon, 2008; MacKinnon, Lockwood, and Williams 2004), significance of indirect effects was evaluated using bias-corrected bootstrapping ( $n = 5,000$ ). Significant effects are those that do not include zero in the 95% asymmetric confidence intervals (CIs).

Post hoc power analyses using Monte Carlo simulation (Muthén and Muthén 2002) were conducted to examine the power we have of detecting the significant indirect effect via avoidance. We assumed the estimates from the sample were the population parameters, and we generated 500 random samples drawn from the sample with replacement.

## Results

### Risky behavior prevalence descriptive statistics

As seen in Table 1, 51% of participants engaged in at least one delinquent behavior in the last 12 months, 68% used at least one illicit drugs, and 27% had at least one high-risk sexual partner. Note that although there were more zeros on the risky sex variable (63%), this variable also has much limited range, going from 0 to 3, whereas drug use ranged from 0 to 8 with about 30% reporting one illicit substance, approximately 12% reporting two and 11% reporting three; and delinquent behavior ranged from 0 to 8 with nearly 15% reporting one behavior and 14% reporting two behaviors. In addition, in their monthly texting reports during the three-month period following their first in-person visit, 26% of participants reported at least one type of delinquent behavior and 76% engaged in binge drinking or used marijuana, illicit drugs, or non-prescribed medications. These findings indicate high levels of risk-taking behavior.

### To what extent are risky behaviors related to stressful life events and concurrently and prospectively correlated with each other?

The correlation matrix in Table 1 reveals that stressful life events were significantly correlated with risky sex at baseline and with delinquent behavior and substance use at baseline and during immediate follow up. Individuals who reported more counts of stressful life events had significantly higher levels of risky sex concurrently, and more substance use and delinquency both concurrently and prospectively ( $r$  range: 0.18-0.36). Perceived stress was also significantly positively related to all of these behavior measures except for delinquent behavior during immediate follow up. Risk-taking behaviors were positively correlated with each other at baseline and follow up. The relationship between delinquency and substance use was stronger than both delinquency and substance use with risky sex.

Sensation seeking was also positively correlated with all risk-taking behaviors and was significant except for delinquent behavior during immediate follow up.

### **To what extent are stressful life events and perceived stress correlated with different coping strategies?**

There was a moderate correlation between perceived stress and stressful life events ( $r = .43$ ). Perceived stress was inversely correlated with positive framing coping and positively correlated with avoidance coping (see Table 1). That is, individuals reporting higher perceived stress tend to adopt less positive framing but adopt more avoidance coping strategies. Stressful life events were positively correlated with distraction and avoidance coping, suggesting individuals with more stressful life events reported using more distraction and avoidance coping strategies. Stressful life events were not correlated significantly with any of the engaging coping strategies such as active problem solving.

### **Which has a larger role in risk-taking behavior, stressful life events or perceived stress?**

Although both stressful life events and perceived stress were correlated with risk-taking behaviors, it is unclear whether both would have unique contribution over and above the effect of other covariates. To test this, we included both of them as predictor variables in the regression models in Table 2. Perceived stress did not have a unique contribution to the risk-taking behavior after accounting for the effect of stressful life events and other covariates, whereas stressful life events has a moderate to strong effect on all three types of risk-taking behavior collected concurrently ( $\beta_s = .38-.54$ ; see Model 1 in Table 2) and on delinquent and substance use during the immediate follow up ( $\beta_s = .50$  and  $.55$ ; see Model 2 in Table 2). Thus, the subsequent analyses explored the indirect effect of stressful life events (not perceived stress) via coping on risk-taking behavior.

### **How, if at all, do certain types of coping mediate the effect of stressful life events on risk-taking behavior?**

Stressful life events indirectly predicted increases in baseline (concurrent) substance use and risky sex through greater use of avoidance coping. The indirect effects were both significant ( $B_s = .95$  and  $1.57$ ; 95%  $CI = [.16, 2.29]$  and  $[.18, 3.70]$ ) based upon the asymmetric biased corrected bootstrap confidence intervals. The indirect effects via avoidance coping explain 13.9% and 22.1% of the total effect of stressful life events on substance use and risky sex respectively. The direct effect of stressful life events on these risky behaviors, however, were still significant (Model 3, Table 3). In other words, avoidance coping partially mediated the relationship between stressful life events and both concurrent substance use and risky sex.

Due to low endorsement on risky sex (only 1 person had non-zero count) at the immediate follow up via texting, we only modeled delinquent behavior and substance use. Consistent with findings for behavior collected concurrently, stressful life events indirectly predicted increases in substance use through greater use of avoidance coping. The indirect effect was significant ( $B = .75$ ; 95%  $CI = [.13, 1.88]$ ) based upon the asymmetric biased corrected bootstrap confidence intervals and this indirect effect explained 25.60% of the total effect of stressful life events on substance use. The direct effect of stressful life events on substance use was no longer significant and was reduced in effect size (Model 4, Table 3). Avoidance

coping fully mediated the relationship between stressful life events and immediate follow up substance use whereby greater avoidance coping predicted greater substance use. No mediation of coping strategies was found for concurrent or prospective delinquent behaviors.

The breakdown of total effect, direct effect and total indirect effect is reported in Table 3. Note that total indirect effect had a small magnitude because indirect effects via different coping may assume different directions and cancel each other out. We found that with a sample size of 126, we have 80% - 95% power to detect all significant direct effect. As expected, there is lower power to detect indirect effects of stress via avoidance coping on life time drug use (62% power), risky sex (58% power), and drug use within 3 months of the first in-person visit (50% power). A sample size of 180 would increase power to detect indirect effect to 84%, 78% and 75%, respectively.

## Discussion and conclusion

### Summarize findings

Multiple risk-taking behavior domains, perceived stress and reported stressful life events, and various coping strategies have not been well studied holistically. This study collectively examined these constructs concurrently and prospectively to delineate the pathway from stress to risky behaviour in various domains.

In the past 12 months, half of participants reported engaging in at least one delinquent behavior, 68% used one or more illicit drugs, and 27% had sex with at least one high-risk partner. These prevalence findings indicate high levels of risk-taking behavior characteristic of transition aged youth. This developmental period is marked by the greatest levels of risk taking for several reasons (National Research Council 2011; Steinberg 2008) including (1) immature brain development whereby the limbic regions – responsible for more emotional and impulsive decision-making – are more mature than the prefrontal cortex – responsible for cognitive control and planful, rationale decision-making; (2) high androgen levels that are linked with more competitive and aggressive behaviors; (3) continued identify formation that may be characterized by experimentation with riskier behaviors; and (4) fewer structural and familial supports as children age out of foster care or leave home (less parental or guardian monitoring) and complete or drop out of school. Collectively, these factors – brain development, hormones, identify development, and reduced structures and supports – promote risk-taking behaviors. If youth typically use disengaged or avoidance coping strategies coupled with stressful life events, risk-taking behaviors may be further promoted.

We found that stressful life events were concurrently associated with all three domains and predictive of greater risk taking for substance use and delinquency. Perceived stress and sensation seeking were positively correlated with risk taking. Risk-taking domains varied in their associations with each other, and we found that delinquency and substance use had a stronger relationship with each other than either with risky sex. This last finding may be due, in part, to lower levels of sexual risk-taking behaviors compared to delinquency and substance use.

Stressful life events and perceived stress were similar in how they were related to coping strategies. Greater perceived stress and stressful life events were each negatively correlated with more adaptive (e.g., positive framing, support seeking, active problem solving) and positively correlated with less adaptive (e.g., avoidance, distraction) coping strategies. The significance levels of these relationships varied, but the pattern held for both stressful events and perceptions. One important finding the current study contribute is that after adjusting for covariates, only stressful life events, but not perceived stress, was uniquely associated with risk-taking behaviors at moderate to high levels. This suggests that stressful experiences, independent of the perception of the stress, have implications for concurrent and future risk-taking behaviors.

Regarding the coping strategies as mediators for stress and risky behavior, we found that avoidance coping partially mediated the relationship between stressful life events and both concurrent substance use and risky sex, and it also fully mediated the relationship for stressful life events and follow-up substance use. For participants reporting greater stressful life experiences, substance use and risky sex behaviors become greater as avoidance coping increases. But none of the coping strategies mediate the relationship between stressful life events and delinquency. These findings together suggested that stress coping differentially impacts risky behaviors across domains. Based on the findings, we believe the Stress-Vulnerability model (Sinha, 2001; Starcke and Brand 2012) provides a better framework for studying risky behavior than models that treat risky behavior directly as the coping mechanism. By referencing the Stress-Vulnerability model and unpacking the “vulnerability,” we have an opportunities to better delineate the path from stress to risky behavior via biopsychological mechanisms. The current study only posits coping strategies as mediators, yet it is possible that they moderate the stress-delinquency relationship and individuals exposed to greater stress but adopt certain coping strategies are at higher or lower risks to engage in delinquent acts. Future studies are needed.

We did not reveal any mediating effects of the coping strategies typically considered functional, adaptive, positive, and buffering in the relationship between stress and risky taking behaviors. Instead, this study evinced that avoidance coping is associated with and predicts greater risk-taking behaviors, particularly in the substance use domain and risky sex. Yet, many existing programs try to promote these positive adaptive strategies (Haggerty, Garnezy, Sherrod, and Rutter 1996; Kraag, Zeegers, Kok, Hosman, and Abu-Saad 2006) rather than directly trying to decrease maladaptive or dysfunctional strategies like avoidance coping. Future prevention and intervention programming should consider directly addressing avoidance coping. For example, using mindfulness practices to help people identify avoidant coping strategies they use and when they use them and teaching mindful yoga and other positive coping strategies that provide practical and feasible alternatives to minimize avoidance coping strategies. Mindfulness-based and mindful yoga programs have been shown to be beneficial for emotional regulation and coping skills development including reduced impulsivity and increased prosocial coping strategies (Dariotis, Cluxton-Keller, Mirabal-Beltran, Gould, Greenberg, and Mendelson 2016; Dariotis, Mirabal-Beltran, Cluxton-Keller, Gould, Greenberg, and Mendelson 2016; Mendelson, Greenberg, Dariotis, Gould, Rhoades, and Leaf 2010). Further, mindfulness based programs implemented among violent adult offenders have shown promising outcomes in terms of reduced aggression

(Shonin, Van Gordon, Slade, and Griffiths 2013). The mechanisms underlying program efficacy or effectiveness and the long term impact of these programs on youth risk-taking behaviors is not well known and warrants future study. Empirical research is also needed to investigate whether prevention and intervention programs designed to promote mindfulness to address avoidance coping actually break off the mediating pathways we uncovered in this study. Given the relative low cost of mindfulness-based programs and easy adaptations to different populations and settings (e.g., school-based or community-based), the return on investment may be substantial especially if they can reduce high school dropout, unintended pregnancies, arrests, repeat offenses, and other negative outcomes of risk-taking youth.

### Strengths

This study had several strengths worthy of note. First, by including both reported stressful life events and perceived stress, we can move toward a better understanding of how stress versus stressors influence youth risk-taking behaviors. This study uses reliable and valid measures of stressors and stress that are divergent from behavior, avoiding the tautology problems in measurement that limit other studies. Future studies are needed to further explore how these two stress variables – lived experience and perception – impact coping and risk behaviors. Second, the heterogeneous sample of urban youth allows these findings to generalize to more diverse populations than past studies conducted on racial majority and college-going youth. Third, the use of urine testing for illicit substances minimizes reporting bias criticisms of self-reported drug use. Fourth, the inclusion of both concurrent and longitudinal, prospective data allows for temporal ordering, moving beyond correlational to predictive modeling. Last, the use of Audio Computer Assisted Self-Interviewing allows for more candid reporting of risky behaviors and text messaging data collection increases reporting accuracy because it reduces the time between behavior and reporting.

### Limitations

The sample size of 126 participants may result in limited power to detect statistically significant differences although quite a few results reached significance. This is particularly limiting when examining behaviors with low variation (in this case, risky sex in the past week). The sample is limited to youth living in and around an urban setting. Based the magnitude of indirect effects of stress via avoidance coping on lifetime drug use, risky sex, and drug use within three months found in this study, a sample size of 180 or so would be adequately powered. The current sample size, however, is adequately powered for numerous direct effects. Given this is the first study of its kind to include all of these risk measures and includes a large sample size for neuroimaging studies, future studies should include replicate these findings using a larger sample size. Study findings should be replicated with larger sample sizes and among rural youth. Furthermore, the risky behaviour measures collected at baseline during in-person visit and at follow up via texting data may not capture the exact same construct due to the difference in the items and the time frame. For example, substance use at baseline assessed lifetime drug use using both urine analyses and self-report whereas substance use at follow up assessed only limited kinds of substance use in the past 24 hours for every other week. Nonetheless, findings were replicated for concurrent and prospective associations, suggesting the relationships revealed may be robust to the exact measures used for the constructs.

## Future Directions

One coping strategy that is nearly universally considered positive – active problem solving – did not mediate the relationship between stressful life events and risky behaviors. It may be that active problem solving and other engaged coping strategies serve as moderators rather than as mediators. The moderating role of different stress coping strategies could be the focus of future studies. Furthermore, the indirect effect of a coping strategy was not in the same direction (positive or negative) for all risk behaviors and did not have a significant relationship for delinquent behaviors. Future research is needed to explore these differences as well as other potential strategies aside from avoidance and distraction. Learning why certain coping strategies like avoidance and distraction promote risk-taking behaviors will be vital for informing prevention and intervention programs. Stressful life events continued to have direct effects on risky behaviors, suggesting that additional strategies or interventions are needed to reduce the effects of stressful life events on these behaviors. Using mixed methods to answer “why” and process questions will be important. Further, exploring the interaction among stress reactivity, stressful life events, perceived stress, and coping skills and how these predict risky behaviors will provide a more comprehensive understanding of risk-taking.

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## Biography

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Jacinda K. Dariotis is a Professor, the Pampered Chef Endowed Chair in Family Resiliency, and Director of the Family Resiliency Center in the Department of Human Development and Family Studies in the College of Agricultural, Consumer and Environmental Sciences at the University of Illinois, Urbana-Champaign.. She received her Ph.D. and M.S. in Human Development and Family Studies and M.A.S. in Statistics from Penn State University and M.A. concentrating in Developmental Psychopathology from Columbia University. Her work examines psychological, social, biological, and environmental determinants to understand risk-taking, risk-avoidance, and resiliency (e.g., sexual, substance use, violent, and delinquent behaviors) and inform how to tailor prevention and intervention strategies to determinants, contexts, and mechanisms to promote healthier outcomes. She has a particular research focus on programs that foster emotional regulation and executive cognitive functioning like mindfulness-based programs. Her research has been

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Chen Short Biosketch – Deviant Behavior

Frances R. Chen is an Assistant Professor in the Department of Criminal Justice and Criminology at Georgia State University. Her research is focused on biosocial bases of antisocial behavior and related personality constructs such as impulsivity and callous unemotional traits. She received her Ph. D. in Criminology at the University of Pennsylvania and her M.S. in Clinical Psychology at the Peking University, China. Her quantitative works examine how life events and turning points in life (e.g., marriage) shape antisocial behavior, and how environment interplays with individuals' biological characteristics (e.g., emotion regulation, reward sensitivity) to exacerbate or limit antisocial behavior throughout the life-course. Her current research on psychobiological characteristics of active offenders is an endeavor to advance our knowledge of the persistence in offending. Her research has been recently published in *Psychoneuroendocrinology*, *Personality and Individual Differences*, *Development and Psychopathology*, *Aggressive Behavior*, *Pediatrics*, and *Journal of Abnormal Child Psychology*. <https://orcid.org/0000-0001-5292-2486>

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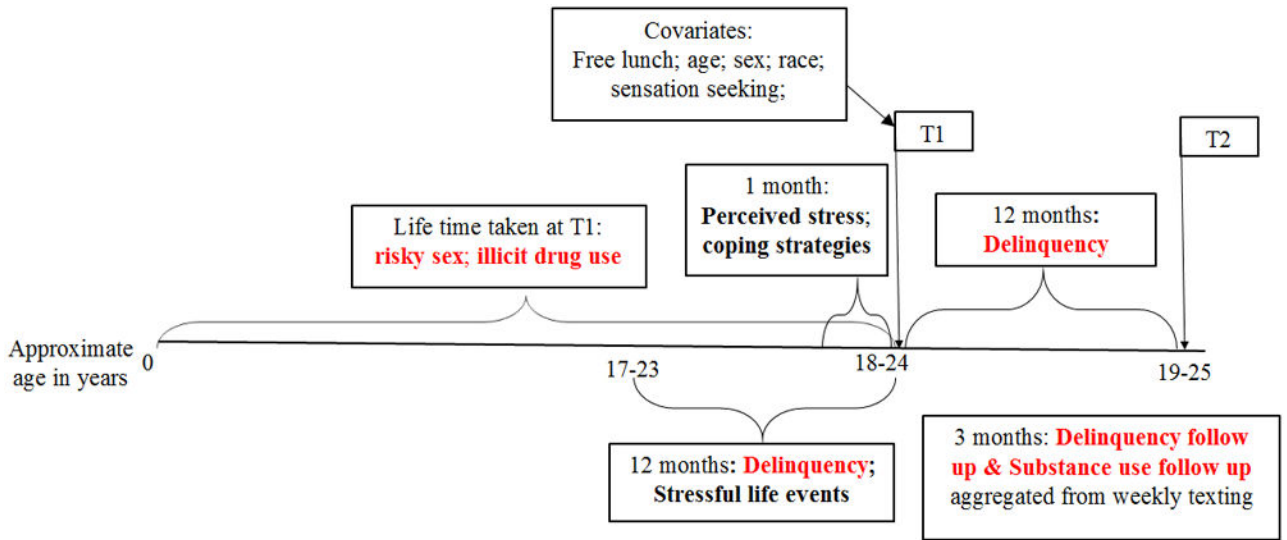
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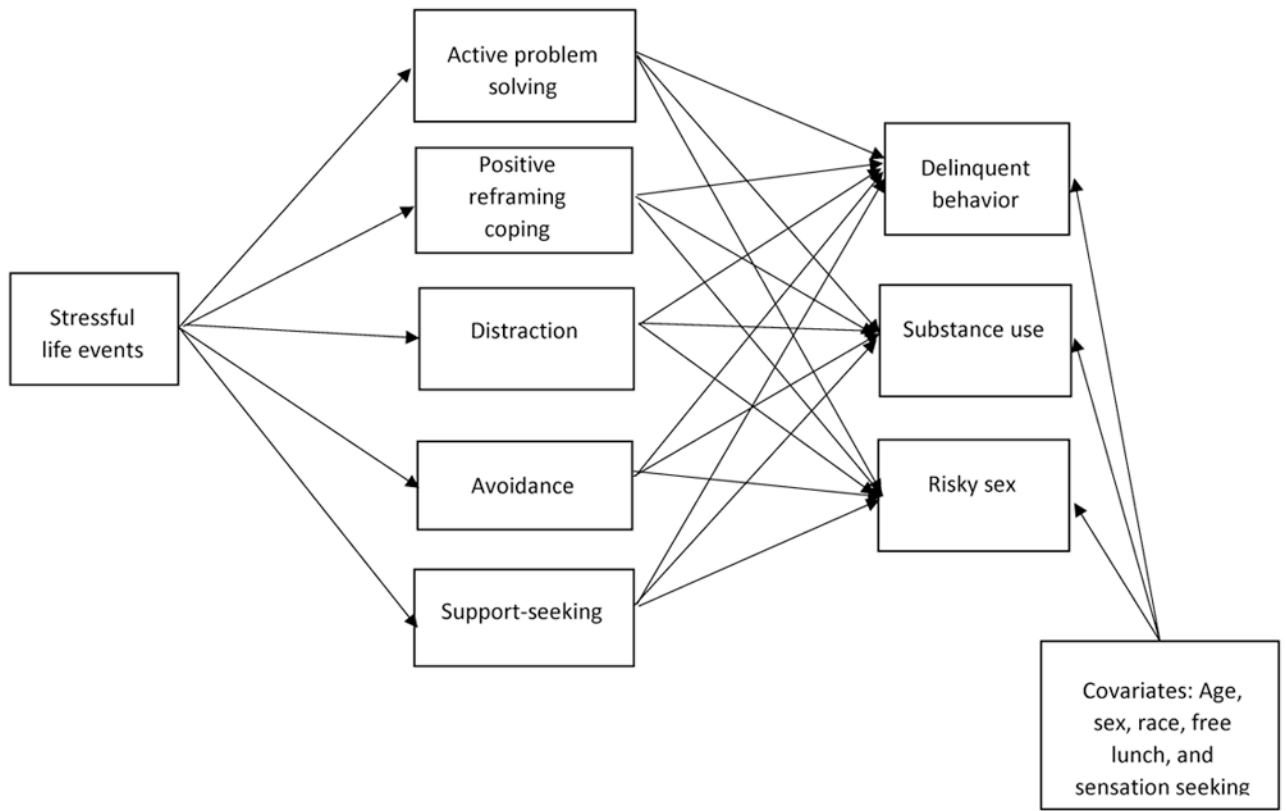
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**Fig1.**  
Study Timeline

Notes. At the first in-person visit (T1), participants completed measures for risky sex, illicit drug use in their lifetime. They also assessed their delinquent behavior and stressful life events in the past 12 months along with their perceived stress and coping in the previous one month. Various covariates are included that were assessed at T1 in-person visit, including free/reduced lunch eligibility, age, sex, race and sensation seeking. Delinquency was measured one year later at the second in person visit (T2), yet it was not related to the stressful life events measured at T1. We examined delinquency and substance use collected via weekly texting data for three months post the first in-person visit to establish the temporal order for stressful life events, coping strategies and risk-taking behavior outcomes.



**Fig2.** Parallel mediators of five coping strategies for the effect of stressful life events on delinquency, substance use and risky sex (direct paths from stressful life event to risky behavior are omitted in the illustration)

Table 1.

Means, standard deviations, and correlations among main variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1 Age	1																
2. Sex	-.02	1															
3. Race	.02	.02	1														
4. Free lunch	.06	-.01	.65**	1													
5. Stressful life events	.01	.00	.15	.16	1												
6. Perceived stress	.23*	-.01	-.08	.00	.43**	1											
7. Sensation seeking	.05	.37**	-.18*	-.07	.19*	.12	1										
8. Active problem solving	-.04	-.07	-.14	-.14	.07	-.12	.01	1									
9. Positive reframing	.06	-.17	-.02	.08	-.11	-.22*	-.05	.61**	1								
10. Distraction	-.09	.17	.00	.01	.20*	.00	.29**	.33**	.20*	1							
11. Avoidance	.09	-.18*	.10	.18*	.26**	.34**	.06	.27**	.35**	.33**	1						
12. Support-seeking	-.03	-.17	-.11	-.03	-.04	-.11	-.11	.54**	.51**	.32**	.30**	1					
13. Delinquent behavior (baseline)	.04	.20*	-.06	-.10	.36**	.24**	.28**	.06	-.11	.01	.06	-.16	1				
14. Substance use (baseline)	.18*	.14	-.33**	-.23**	.33**	.23*	.32**	.05	-.06	.12	.19*	.01	.47**	1			
15. Risky sex (baseline)	.18*	.30**	.00	.00	.33**	.28**	.30**	-.12	-.19*	.04	.14	-.13	.39**	.36**	1		
16. Delinquent behavior (follow up)	.04	.02	-.30**	-.23*	.18*	.16	.17	.04	-.06	.01	.16	.05	.24**	.57**	.20*	1	
17. Substance use (follow up)	.08	.17	-.06	-.10	.31**	.23*	.21*	.08	-.05	-.01	.07	-.06	.37**	.31**	.14	.11	1
Mean	21.34	0.44	0.52	0.54	7.37	16.94	2.73	2.79	2.70	2.01	2.35	2.45	1.37	1.71	0.53	1.72	0.48
Standard deviation	1.88	0.50	0.50	0.50	5.94	6.18	0.62	0.61	0.66	0.50	0.50	0.71	1.81	1.89	0.83	1.35	0.76
Proportion of zero for behavior	-	-	-	-	-	-	-	-	-	-	-	-	0.49	0.32	0.63	0.64	0.24

Note.

\*\*  
p < .01

\*  
p < .05

Effects of perceived stress and stressful life events on risk-taking behavior measured at baseline and via texting (N = 126)

Table 2.

Parameter estimation	Model 1: Baseline data		Model 2: Texting data	
	Delinquent behavior <sup>a</sup>	Risky sex	Delinquent behavior	Substance use
	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)
Age	.005 (.16)	.33* (.14)	.14 (.21)	.08 (.22)
Sex	.33* (.13)	.51*** (.13)	.39* (.17)	.03 (.22)
Race	-.13 (.18)	-.61*** (.12)	.09 (.26)	-.69** (.26)
Free lunch	-.20 (.17)	-.09 (.13)	-.33*** (.22)	-.20 (.29)
Sensation seeking	.34* (.17)	.27* (.12)	.25 (.26)	.18 (.24)
Perceived stress	.35 (.20)	.02 (.13)	.28 (.31)	.10 (.21)
Stress life events	.51** (.18)	.54*** (.12)	.55** (.20)	.50* (.24)
Dispersion (Unstandardized coefficient)	.83** (.25)	-	-	-
<b>Model fit indices</b>				
AIC		2166.55	2168.12	
BIC		2265.81	2315.61	
Adjusted BIC		2155.13	2151.17	

Note.

<sup>a</sup>Negative binomial regression was used for delinquent behavior measured at baseline, result remains the same when using the delinquent behavior taken at one-year follow up; all other behavior outcomes were modeled with Poisson regressions.

$\beta$ , standardized coefficient. SE, standard error.

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

+  $p < .10$ .

**Table 3.** Stressful life events direct and indirect (via coping strategies) effects on risk-taking behaviors - baseline and texting (N = 126)

Parameter estimation	Model 3: Baseline data		Model 4: Texting data		
	Delinquent behavior <sup>a</sup>	Substance use	Risky sex	Delinquent behavior	Substance use
	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)	$\beta$ (SE)
Age	.005 (.16)	.24* (.12)	.29* (.12)	.13 (.17)	.04 (.17)
Sex	.36** (.13)	.30** (.11)	.51*** (.11)	.42** (.15)	.13 (.20)
Race	-.19 (.16)	-.56*** (.11)	-.12 (.17)	-.14 (.21)	-.55** (.22)
Free lunch	-.13 (.16)	-.14 (.11)	-.06 (.15)	-.23** (.21)	-.21 (.23)
Sensation seeking	.33* (.17)	.21 <sup>†</sup> (.11)	.31* (.14)	.28 (.23)	.16 (.21)
Stress life events <sup>b</sup>	.60*** (.17)	.48*** (.10)	.37** (.11)	.56** (.17)	.36 <sup>†</sup> (.20)
Coping strategies					
Active problem solving	.21 (.18)	-.07 (.16)	-.20 (.18)	.21 (.23)	-.03 (.23)
Positive reframing	-.01 (.16)	-.01 (.13)	-.11 (.16)	-.02 (.19)	-.19 (.19)
Distraction	-.30* (.15)	-.07 (.13)	-.20 (.13)	-.39* (.17)	-.26 (.18)
Avoidance	.12 (.18)	.28* (.10)	.34** (.12)	.15 (.20)	.42* (.16)
Support-seeking	-.21 (.16)	.05 (.15)	.03 (.16)	-.05 (.21)	.18 (.21)
Stress life events → Coping strategies					
Stress life events → Active problem solving		.07 (.07)		.07 (.07)	
Stress life events → Positive reframing		-.11 (.08)		-.11 (.08)	
Stress life events → Distraction		.20* (.09)		.22* (.09)	
Stress life events → Avoidance		.26*** (.09)		.26*** (.08)	
Stress life events → Support-seeking		-.04 (.07)		-.04 (.07)	
Indirect effect of coping (Bootstrap) <sup>c</sup>					
via active problem solving	.20 (-.17, .147)	-.07 (-1.06, .25)	-.25 (-2.16, .20)	.18 (-.21, 1.77)	-.02 (-.58, .28)
via positive reframing	.02 (-.60, .88)	.02 (-.38, .71)	.22 (-.44, 1.72)	.03 (-.69, 1.01)	.14 (-.12, .83)
via distraction	-.82 (-2.72, .06)	-.17 (-1.39, .49)	-.71 (-2.65, .31)	-.98 (-3.11, .12)	-.35 (-1.40, .12)
via avoidance	.42 (-1.07, 2.04)	.95 (.16, 2.29)	1.57 (.18, 3.70)	.49 (-1.13, 2.25)	.75 (.13, 1.88)
	<b>B (95% CI)</b>	<b>B (95% CI)</b>	<b>B (95% CI)</b>	<b>B (95% CI)</b>	<b>B (95% CI)</b>



Parameter estimation	Model 3: Baseline data			Model 4: Texting data		
	Delinquent behavior <sup>a</sup> $\beta$ (SE)	Substance use $\beta$ (SE)	Risky sex $\beta$ (SE)	Delinquent behavior $\beta$ (SE)	Substance use $\beta$ (SE)	
via support-seeking	.11 (-.21, 1.13)	-.03 (-.62, .21)	-.02 (-.78, .31)	.02 (-.32, 2.25)	-.05 (-.59, .12)	
Dispersion (Unstandardized)	.73 <sup>***</sup> (.24)	-	-	-	-	
Total effect	<b>B (95% CI)</b> 8.00 [3.33, 12.70]	<b>B (95% CI)</b> 6.85 [3.96, 9.94]	<b>B (95% CI)</b> 7.10 [2.75, 10.63]	<b>B (95% CI)</b> 6.66 <sup>***</sup> [2.11, 10.32]	<b>B (95% CI)</b> 2.93 [0.15, 5.78]	
<b>Direct effect</b>	8.06 [3.85, 13.42]	6.14 [3.15, 9.25]	6.30 [2.17, 10.63]	6.90 <sup>***</sup> [2.18, 10.95]	2.45 [-0.39, 5.51]	
<b>Total indirect effect</b>	-0.08 [-2.80, 1.94]	0.71 [-0.67, 2.17]	0.81 [-2.01, 3.00]	-0.25 [-2.60, 1.99]	0.48 [-0.75, 1.70]	
<b>Significant Indirect effect</b>		0.95 <sup>*</sup> [0.16, 2.29]	1.57 <sup>*</sup> [0.18, 3.70]	-	0.75 <sup>*</sup> [0.13, 1.88]	
<b>Model fit indices</b>						
AIC		2168.12				1635.62
BIC		2315.61				1774.60
Adjusted BIC		2151.17				1619.65

Note.

<sup>a</sup>Negative binomial regression was used for delinquent behavior measured at baseline, all other behavior outcomes were modeled with Poisson regressions.

<sup>b</sup>The variable stress life event was divided by a factor of 100 to bring variables to a similar scale.

<sup>c</sup>bootstrapped indirect effect is with unstandardized estimates,  $\beta$ , standardized estimates,  $SE$ , standard error,  $B$ , unstandardized coefficient,  $CI$ , Confidence Interval.

\*\*\*  $p < .001$

\*\*  $p < .01$

\*  $p < .05$

+  $p < .10$ .