



# Longitudinal trajectories of sensation seeking, risk taking propensity, and impulsivity across early to middle adolescence



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## HIGHLIGHTS

- In adolescents, change across disinhibitory constructs was examined over 5 years.
- Sensation seeking increased linearly.
- Risk taking propensity only increased in the first 4 waves of assessment.
- Impulsivity peaked at wave four before subsequently declining.
- Females and males evidenced similar disinhibitory construct trajectories.
- There were no significant differences between White and Black adolescents.

## ARTICLE INFO

Available online 7 February 2014

### Keywords:

Developmental trajectories  
Sensation seeking  
Impulsivity  
Risk taking propensity  
Adolescence

## ABSTRACT

Adolescent substance use and abuse show associations with increases in disinhibitory constructs, including sensation seeking, risk taking propensity, and impulsivity. However, the longitudinal trajectories of these constructs from early to middle adolescence remain largely unknown. Thus, the current study examined these developmental trajectories in 277 adolescents ( $M_{\text{age}} = 11.00$  at Wave 1), over five consecutive yearly waves. Controlling for age, Hierarchical Linear Modeling analyses showed that sensation seeking increased linearly, whereas risk taking propensity and impulsivity demonstrated curvilinear changes. Specifically, risk taking propensity increased in the first four waves of assessment but did not evidence changes at the last assessment wave. Impulsivity, on the other hand peaked at wave four before subsequently declining. A comparison between females and males and Black and White adolescents suggested that these groups' trajectories were similar. Black adolescents' sensation seeking trajectory differed from adolescents who belonged to the "Other" racial group (i.e., adolescents who neither self-identified as Black or White). Generally, the study findings replicate and extend earlier work indicating that these risk factors increase across early adolescence and begin to level-off during middle adolescence. The importance of understanding the natural course of these core constructs is of great importance for directing future relevant prevention and intervention work.

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## 1. Introduction

Adolescence is a developmental period that has received singular attention for presenting unique risk factors that contribute to the initiation, progression, and escalation of substance use. Substance use represents a significant public health concern among youth given strong associations between earlier initiation of use and worse mental and physical health outcomes, as well as increased likelihood of addiction in adulthood (e.g., Brook et al., 2004; Colman, Wadsworth, Croudace, & Jones, 2007; Sourander et al., 2007). However, not all adolescents experiment with substances (Johnston, O'Malley, Bachman, & Schulenberg, 2009a,b), and of those who do, most do not proceed to develop long-

term problematic consumption patterns (e.g., Bachman et al., 2002; Schulenberg & Maggs, 2002). The differential engagement in substance use and variability in developmental trajectories has resulted in a proliferation of models of the emergence of substance use, many rooted in a personality diatheses framework (Chassin, Flora, & King, 2004; MacPherson, Richards, Collado, & Lejuez, 2011; Sher, Bartholow, & Wood, 2000). These models posit that individual differences in personality characteristics produce vulnerabilities that may lead to the development of substance use disorders (Krueger et al., 2002; Sher & Trull, 1994; Vanyukov et al., 2003). Moreover, personality-targeted interventions have demonstrated positive outcomes in preventing the onset and escalation of adolescent substance use (e.g., Conrod, Castellanos-Ryan, & Strang, 2010; Conrod, Stewart, Comeau, & Maclean, 2006). Understanding the trajectories of key personality risk variables associated with substance use in early adolescence is therefore critical to effectively targeting prevention efforts.

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## 2. Associations between facets of adolescent disinhibition and substance use

Disinhibitory-based traits have received particular attention as individual difference constructs associated with a range of substance use and other problem behaviors (e.g., Iacono, Malone, & McGue, 2008; Lejuez et al., 2002; Lejuez et al., 2010; Reynolds, Collado-Rodriguez, MacPherson, & Lejuez, 2013). The umbrella term of “disinhibition” encompasses broadly overlapping, but non-redundant constructs including sensation seeking, risk taking propensity, and impulsivity (Reynolds et al., 2013). A considerable body of literature has linked disinhibition more broadly to risk behavior, but there are several meaningful differences in the core focus of each construct.

Sensation seeking is a personality type that describes individuals' tendency to seek out novel, complex, and intense sensations and experiences and a willingness to take risks to attain these experiences (Zuckerman, 1994). A robust construct, sensation seeking is also considered to have overlap with novelty-seeking and is consistent with the excitement seeking dimension of the five-factor model of personality specific to extraversion (Cloninger, 1986; Stautz & Cooper, 2013). Impulsivity is a multidimensional construct characterized by deficiencies in self-control or delayed gratification, oftentimes resulting in rash and hasty behaviors (Mischel et al. 1989). While there are arguably multiple ways to define the construct, the most common definition describes impulsivity as a trait characterized by the tendency to act on the spur of the moment and to neglect planning for the future (Lejuez, Aklin, Bornovalova, & Moolchan, 2005). Finally, risk taking propensity refers to the appetitive processes underlying a behavioral tendency to take risks in response to cues for potential reward with a probability for undesirable results (Lejuez et al., 2002, 2007; MacPherson, Magidson, Reynolds, Kahler, & Lejuez, 2010).

For each of these personality risk variables, a large body of adolescent research supports their relationship with substance use. Specifically, research indicates consistent significant relationships between sensation seeking and adolescent alcohol use (Hittner & Swickert, 2006), cigarette smoking and marijuana use (Crawford, Pentz, Chou, Li, & Dwyer, 2003; Martin et al., 2002; Romer & Hennessy, 2007). Similar associations have been observed between impulsivity and alcohol use (Dick et al., 2010), cigarette smoking, and illicit drug use (Elkins, King, McGue, & Iacono, 2006) in adolescence. Although a more recent investigational target, risk taking propensity has also garnered strong support for its links to alcohol use, illicit substance use, and cigarette smoking in adolescence (e.g., Aklin, Lejuez, Zvolensky, Kahler, & Gwadz, 2005; Lejuez et al., 2007; MacPherson et al., 2010). In general, the aforementioned facets of disinhibition are well-implicated in contributing to the initiation and progression of adolescent substance use (Chassin et al., 2004; MacPherson et al., 2010; Sher et al., 2000; Steinberg et al., 2006; Zuckerman & Kuhlman, 2000). Research also suggests that adolescents' earlier development of neural pathways associated with disinhibition relative to cognitive control may be associated with the increase in reward-seeking behaviors, such as substance use (e.g., Casey, Getz, & Galvan, 2008; Casey, Jones, & Hare, 2008b; Galvan et al., 2006).

## 3. Trajectories of the facets of disinhibition across adolescence and relevant extensions

Although earlier research regarded personality risk variables such as impulsivity, sensation seeking, and risk taking propensity as stable traits across time, emerging findings from longitudinal and cross-sectional research are beginning to provide evidence of their dynamic nature. Influential findings from cross-sectional cohort study conducted by Steinberg (2008) indicated that between 10 and 30 years old, mean sensation seeking scores reflected a curvilinear pattern; scores were highest for individuals ages 10 to 15 but decreased or stabilized for older participants. Other cross-sectional research is consistent with Steinberg's findings for both impulsivity (Galvan, Hare, Voss, Glover, &

Casey, 2007; Leshem & Glicksohn, 2007) and sensation seeking (Roth, Schumacher, & Brähler, 2005; Russo et al., 1993; Stephenson, Hoyle, Palmgreen, & Slater, 2003; Zuckerman, Eysenck, & Eysenck, 1978). Noticeably absent from these investigations are studies examining the developmental trajectory of risk taking propensity.

The existing literature provides initial evidence that sensation seeking and impulsivity may vary according to age, but the reliance on cross-sectional designs in the existing literature does not allow for examination of within-individual change over time. Using a longitudinal design is critical in light of reports of substantial intra-individual variability in adolescents' personality over time (Donnellan, Conger, & Burzette, 2007; Neyer & Lehnart, 2007; Roberts & DelVecchio, 2000a,b; Vaidya, Gray, Haig, Mroczek, & Watson, 2008). As opposed to assessing disinhibitory constructs using mean-level data, longitudinal investigations are able to capture within-person variability over time. As a result, an important extension of the existing literature involves a longitudinal examination of the course of impulsivity, sensation seeking, and risk taking propensity beginning in early adolescence. Further, it is critical to examine rates of substance use from early to middle adolescence, as evidence suggests dramatic increases in substance use over this developmental period (e.g., Chen & Jacobson, 2012; Windle et al., 2008).

A second important avenue for research is the role of demographic factors in the developmental trajectories of these variables. This extension is particularly relevant given that data from the Centers for Disease Control and Prevention (CDC) indicates that boys and girls differ in their substance use engagement, such that, on average, boys engage in significantly higher rates of use than their female peers (see CDC, 2011). Similarly, CDC statistics suggest that there is significant racial variability in substance use frequency, indicating that White adolescents evidence higher rates of substance use than non-White peers (see CDC, 2011). However, few investigations have examined individual differences on disinhibition variables as a function of gender or of race. An important exception is research by Romer and Hennessy (2007) who, using a national sample of youths 14 to 22 years old, found that sensation seeking peaks earlier in girls than in boys. Among adults, multiple studies indicate higher impulsivity, sensation seeking, and risk taking propensity scores for males compared to females (e.g., Lejuez et al., 2002). Among adolescents, Pedersen, Molina, Belendiuk, and Donovan (2012) found that boys (ages 9 to 15) scored higher than same-aged girls in impulsivity and sensation seeking. In contrast, MacPherson et al. (2010), analyzing three waves of data of the sample utilized in the current five-wave longitudinal study, found no gender difference in risk taking propensity in early adolescence. Racial and ethnic differences in the trajectories of disinhibited personality constructs have also been identified. In the Pedersen et al. (2012) study referenced above, European Americans had higher initial levels and steeper growth in sensation seeking from ages 9 to 15 when compared to African Americans. In this same study, the authors noted that African American adolescents had higher levels of baseline impulsivity. In sum, these findings suggest the importance of examining the influence of gender and race, as each may predict differential divergent trajectories and resultant engagement in substance use.

## 4. Aims of the current research

Given the limitations of the extant literature on adolescent trajectories of disinhibition traits, the current study had two aims. The first aim was to provide a prospective investigation of the course of sensation seeking, impulsivity, and risk taking propensity from early to middle adolescence (a period ranging from 12 to 15 years of age) (Abela & Hankin, 2011). Consistent with longitudinal and cross-sectional studies on disinhibitory trajectories, we expected that sensation seeking, risk taking propensity, and impulsivity would increase across waves. The second aim was to examine factors that are potentially related to both initial levels and changes in these constructs across time, focusing here on the key demographic variables of race and gender. We

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