



Changes in negative urgency, positive urgency, and sensation seeking across adolescence



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ABSTRACT

The development and potential co-development of traits related to impulsivity and sensation seeking across adolescence has garnered substantial attention within the extant literature. Some prior research suggests that facets show distinct patterns of change across adolescence and that intraindividual changes in these traits may be unrelated. However, the extant literature is somewhat hampered by measurement issues and inconsistent findings. Using an accelerated longitudinal design in a sample of adolescents ($n = 1018$; ages 11–16), changes in negative urgency, positive urgency, and sensation seeking were examined. The three facets showed similar trajectories across time (i.e., increasing during early adolescence before leveling off). Across all facets, there was strong evidence of correlated change, suggesting these traits are, developmentally, strongly related phenomena.

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1. Introduction

Spanning multiple research domains and disciplines, there has been extensive interest in trait “impulsivity” and its relation to various outcomes. As noted by Cyders (2015), impulsivity is the most common criterion in the Diagnostic and Statistical Manual (DSM-5; APA, 2013) and is considered to be a key transdiagnostic endophenotype of risk for numerous clinical disorders (see Berg, Litzman, Bliwise & Lilienfeld, *in press*; Cyders, Coskunpinar & VanderVeen, *in press*; Verdejo-García, Lawrence, & Clark, 2008).

Although multiple approaches to defining and assessing impulsivity exist (see Evenden, 1999), recent research has increasingly focused on defining and assessing more narrow-band measures of impulsivity-like traits. This is based on the recognition that many measures of “impulsivity” appear to tap different behavioral tendencies (Cyders, 2015). Perhaps the clearest example of designing more refined measures of impulsivity is the work by Whiteside and Lynam (2001) and subsequently Cyders et al. (2007), which identified five distinct impulsivity facets (assessed via the UPPS-P Impulsive Behavior Scale; Lynam, Smith, Whiteside, & Cyders, 2006), including negative urgency (the tendency to act rashly in response to distress), positive urgency

(the tendency to engage in rash actions when in an unusually positive mood), and sensation seeking (the tendency to seek out novel and thrilling experiences). Negative and positive urgency appear to load on a higher-order factor reflecting emotion-based rash action, whereas sensation seeking appears to be a distinct trait that correlates moderately with trait urgency in undergraduate samples (Cyders & Smith, 2007). Notably, negative urgency, positive urgency, and sensation seeking have been linked to various outcomes related to psychopathology (see Berg et al., *in press*, for a recent meta-analytic review focused on the UPPS-P). Given the extensive psychometric evaluation of this scale, the UPPS-P is the recommended measure to assess “disinhibiting behaviors/impulsivity” for both the adolescent and adult protocols from the National Human Genome Research Institute funded PhenX Toolkit (Hamilton, Strader, Pratt, et al., 2011), which “provides the research community with a core set of high-quality, well-established, low-burden measures.” (Hamilton et al., 2011, p. 1).

Concurrently, there has also been extensive interest in documenting the development and potential co-development of traits related to sensation seeking and “impulsivity” during adolescence across various research domains (e.g., Burt, Sweeten, & Simons, 2014; Collado, Felton, Macpherson, & Lejuez, 2014; Harden & Tucker-Drob, 2011; Pedersen, Molina, Belendiuk, & Donovan, 2012; Quinn & Harden, 2013; Romer, 2010; Romer & Hennessy, 2007; Shulman, Harden, Chein, & Steinberg, 2014; Settles, Zapolski, & Smith, 2014; Steinberg et al., 2008). Neurodevelopmental changes evident during adolescence in both the prefrontal cortex and the limbic system appear to influence changes in

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phenomena related to impulsivity during adolescence (see Casey et al., 2010; Romer, 2010 for overviews). Further, cross-sectional, self-reported data indicate that sensation seeking increases through early adolescence before declining in later adolescence (e.g., Steinberg et al., 2008; Romer & Hennessy, 2007; see Collado et al., 2014, for a recent review), though the peak age of sensation seeking varies across studies (e.g., approximately at age 15 in Steinberg et al. and approximately age 17 in Romer and Hennessy). Steinberg et al. (2008) also demonstrated that a trait labeled impulsivity (in this work, a heterogeneous measure that included motor impulsivity, delayed gratification, and lack of perseverance) showed mean-level patterns distinct from sensation seeking, with a monotonic decline with age, such that impulsivity tended to be lower on average among older participants. Based on their findings regarding mean-level change in cross-sectional data, Steinberg et al. (2008) concluded that impulsivity and sensation seeking are distinct traits and hypothesized that they are strongly influenced by distinct neurodevelopmental processes in adolescence.

However, prospective studies that have examined the development and co-development of measures related to impulsivity and sensation seeking across adolescence (Burt et al., 2014; Collado et al., 2014; Harden & Tucker-Drob, 2011; Pedersen et al., 2012) suggests a more complicated picture regarding change in impulsivity and sensation seeking. In part reflecting different measurement approaches, findings for “impulsivity” appear to vary across studies, with some data indicating mean-level stability in impulsivity across adolescence (Pedersen et al., 2012), other work indicating decreases (Harden & Tucker-Drob, 2011), whereas other findings suggest a quadratic pattern similar to that of sensation seeking in earlier cross-sectional work (Burt et al., 2014; Collado et al., 2014). Not surprisingly given the relative consistency in measurement across studies, findings for sensation seeking appear to be more reliable, such that this trait appears to increase during adolescence (Collado et al., 2014; Harden & Tucker-Drob, 2011; Pedersen et al., 2012). Notably, data from Burt et al. (2014) indicated that sensation seeking *decreased* from ages 11 to 24 in a sample of 775 African American participants.

The extent to which individual differences in “impulsivity” and sensation seeking overlap varies across studies. Harden and Tucker-Drob (2011) demonstrated that linear growth in impulsivity and sensation seeking showed modest overlap ($r = .21$) that was not statistically significant. Linear slopes for sensation seeking and impulsivity were significantly but moderately correlated in the Pedersen et al. data ($r = .27$, $p < .01$; Pedersen, personal communication). Using the data also utilized in the aforementioned Harden and Tucker-Drob study, Quinn and Harden (2013) modeled a non-linear slope of impulsivity and sensation seeking (rather than modeling linear and quadratic slopes, the approach used in Harden & Tucker-Drob, 2011) using identical measures across a similar timeframe (age 15–26) and found a strong correlation ($r = .67$) between changes in sensation seeking and impulsivity. As opposed to prior work, the high magnitude correlation between sensation seeking and impulsivity slopes found in Quinn and Harden suggests individual differences in intraindividual change are strongly linked.

In sum, there has been an increasing interest in better understanding the development of traits associated with impulsivity and sensation seeking and whether individual differences in development are related across these traits. Overall, substantive conclusions from the extant literature examining change in impulsivity and sensation seeking appear to be influenced by approaches to design (cross-sectional vs. prospective), measurement (various operationalizations of “impulsivity”), and analysis (e.g., specific modeling approach for latent growth modeling). Although traits related to urgency (both positive and negative) seem to be the most predictive of numerous risky behaviors (see Berg et al., *in press*) compared to other impulsivity facets, only one prospective study (to our knowledge) has examined the urgency measures during adolescence. Settles et al. (2014) reported means of positive urgency, but these spanned a very short interval, from spring of 5th grade through spring of 6th grade.

Thus, using a sample of adolescents assessed from ages 11–16, we examined mean-level changes in negative urgency, positive urgency, and sensation seeking and the extent to which intraindividual changes in these traits correlate across time. We hypothesized that changes in positive and negative urgency would be strongly related, though we did not offer any hypotheses regarding the relation between changes in sensation seeking and these urgency facets given the limited extant literature.

2. Method

2.1. Participants

Data were drawn from an ongoing three-year study on alcohol initiation and progression (see Jackson et al., 2014, for more details) involving 1023 students from six Rhode Island middle schools; five participants did not complete UPPS-P measures, resulting in an overall sample size of 1018. In the current sample, 52% of participants were female, and 76% participants were White, 5% were African American, 8% were mixed race/ethnicity, and 11% were other race/ethnicity; 12% self-identified as Hispanic ethnicity.

Participants were recruited through the schools (see Jackson et al., 2014). Interested youth who had informed parental consent were scheduled to attend an in-person orientation session and complete a 45-min computerized baseline survey (Wave 1). Participants completed five subsequent web-based surveys, with a six-month interval between Waves 2–5 and the Wave 6 survey administered at the end of the three-year period. Data for the present study were taken from Waves 1, 3, 5, and 6, which were spaced annually; personality data were not available at Waves 2 and 4. Response rates for a given survey ranged from 92% (Wave 2) to 81% (Wave 6). The Institutional Review Board approved all project procedures.

2.2. Measures

2.2.1. UPPS-P impulsive behavior scale (Lynam et al., 2006)

A set of 18 items assessed the following three traits (6 items each): negative urgency (e.g., “I often get involved in things I later wish I could get out of”), positive urgency (e.g., “Others are shocked or worried about the things I do when I am feeling very excited”), and sensation seeking (e.g., “I quite enjoy taking risks”). Due to concerns regarding participant burden, the UPPS-P facets of lack of planning and lack of perseverance were not assessed in this dataset. Coefficient alphas ranged across the four waves from $\alpha = .84$ to $\alpha = .90$ for negative urgency, $\alpha = .85$ to $\alpha = .91$ for positive urgency, and $\alpha = .82$ to $\alpha = .88$ for sensation seeking.

2.3. Analytic approach

Because data were cohort-sequential and prospective, we created a person-period dataset, where each person contributed data for up to four of six waves, with a separate row for each person for each period observed (Singer & Willett, 2003). Due to sparse cells, assessments corresponding to age 10 and ages 17–18 were dropped. This resulted in dropping 60 of 3261 (2%) assessments; thus, age ranged from age 11 to age 16.

Piecewise latent growth modeling (PW-LGM), an extension of latent growth modeling (Baltés & Nesselrode, 1979; Li, Duncan, & Hops, 2001), was implemented. In this analytic framework, discrete patterns of change (e.g., increases in sensation seeking across early adolescence vs. relative stability in later adolescence) are modeled as separate change processes by estimating growth/slope factors for each process.

We chose this approach for several reasons. In addition to providing excellent fit to these data (see below), piecewise growth models allow for more nuanced examinations of developmental processes (e.g., examining whether correlated change between two traits is relatively general or specific to a certain timeframe). Compared to models

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