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A REVIEW OF SENSATION SEEKING AND ITS EMPIRICAL CORRELATES: DARK, BRIGHT, AND NEUTRAL HUES

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DEFINITION AND BACKGROUND

Sensation seeking, as defined by Zuckerman (1979), represents "the need for varied, novel, and complex sensations and experiences and the willingness to take physical and social risks for the sake of such experiences" (p. 10). Individuals who score high on measures of this trait are thought to seek these kinds of experiences to maintain or attain optimal levels of arousal. The initial theory surrounding investigations of sensation seeking was based in optimal level of stimulation theory, which posits that a continuum of intensity of sensation exists in which there is an optimal point at which the stimulus is regarded as most pleasurable, as well as optimal level of arousal theory (Breuer & Freud, 1895/1955), in which individuals are posited to vary with regard to the level of arousal that is optimal.

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Sensation seeking is a fundamental component of several comprehensive models of general personality, including Eysenck's three-factor model (Eysenck & Eysenck, 1985), Costa and McCrae's description of the five-factor model (FFM; Costa & McCrae, 1992), and Cloninger's seven-factor model (Cloninger, Svrakic, & Przybeck, 1993). This trait can also be found in pathological trait models, including Livesley's four-factor model (Livesley, Jackson, & Schroeder, 1989) and the *Diagnostic and Statistical Manual of Mental Disorders*' (5th ed.; *DSM–5*) new trait model of personality disorders (PDs; American Psychiatric Association, 2013). Although the *International Statistical Classification of Diseases and Related Health Problems* (10th rev.; *ICD–10*; World Health Organization [WHO], 1992) does not explicitly identify trait sensation seeking because it does not include a pathological trait model, both the *ICD–10* and the *DSM–5* include multiple categorical PD diagnoses that have been shown to relate to trait sensation seeking, such as dissocial PD/antisocial PD and histrionic PD (e.g., Samuel & Widiger, 2008).

In many cases, sensation seeking traits are "housed" within the extraversion domain (e.g., FFM), although the manner in which scales measuring this trait load with other traits in factor analyses varies across studies and measures, such that this trait sometimes loads with facets of extraversion and other times with facets of disinhibition (e.g., Markon, Krueger, & Watson, 2005). Biological accounts of extraversion (e.g., Eysenck, 1967) and sensation seeking (Zuckerman, 1979) overlap such that it has been argued that both are related to differing levels of physiological arousal. Zuckerman (1979) theorized that individuals high in sensation seeking may be chronically underaroused and require additional stimulation to reach their optimal level of arousal. As such, underaroused individuals may engage in sensation seeking behaviors as a means of increasing their arousal to their preferred level.

As part of Zuckerman's seminal research on the conceptualization and assessment of sensation seeking (using the Sensation Seeking Scale [SSS]; Zuckerman, Kolin, Price, & Zoob, 1964), he identified four subfactors of sensation seeking. As defined by Zuckerman (2008), thrill and adventure seeking involves "the intent or desire to engage in physical activities or sports involving unusual sensations," whereas experience seeking involves "the intent or desire to have new sensations and experiences through the mind and senses as in music, travel, and an unconventional lifestyle." Disinhibition is conceptualized as "seeking excitement through other people in parties, sex, and alcohol," and boredom susceptibility involves "an aversion to sameness and routine in activities and people, and a restlessness when little variety is present" (Zuckerman, 2008, p. 380). Correlations among these subfactors range from .22 to .57 for males and .21 to .62 for females (Zuckerman, Eysenck, & Eysenck, 1978).

There are a variety of ways to assess sensation seeking-related traits in addition to Zuckerman's SSS, including the use of the Novelty Seeking scale from the Tridimensional Personality Questionnaire (Cloninger, Przybeck, & Svrakic, 1991), the Excitement Seeking subscale of the revised NEO Personality Inventory (Costa & McCrae, 1992), and the Sensation Seeking scale from the UPPS model (Whiteside & Lynam, 2001; U = Urgency; P = lack of Perseverance; P = lack of Premeditation; S = Sensation Seeking). Whiteside and Lynam (2001) argued that the dimensions of the UPPS model represent specific pathways through which traits from a number of different personality domains (Sensation Seeking = extraversion; Urgency = neuroticism; lack of Premeditation and Perseverance = low conscientiousness) can lead to impulsive behavior (for a discussion of urgency, see Chapter 8, this volume). Although small differences likely exist between the various sensation seeking scales, for the sake of this chapter, they are grouped together to provide a review of the literature on sensation seeking.

REVIEW OF THE RELEVANT LITERATURE

Demographic Differences

Men generally score higher on sensation-seeking scales than women, although these differences tend to be small and may vary depending on participant age and measure used (Costa & McCrae, 1992; Zuckerman et al., 1978). Racial differences in sensation seeking have been suggested across several studies. A study using latent growth curve modeling on seven waves of data from a sample of 447 African American and European American individuals suggested higher initial levels of sensation seeking in European Americans, as well as greater growth in sensation seeking over time compared with African Americans (S. L. Pedersen, Molina, Belendiuk, & Donovan, 2012). With respect to age and development, a study using a large sample of twins demonstrated a linear decrease in sensation seeking over time for both sexes, suggesting that sensation seeking decreases over the lifespan (Zuckerman et al., 1978). More recently, data from a diverse sample of 935 individuals found a curvilinear pattern over the lifespan, with sensation seeking increasing between ages 10 and 15 and declining thereafter (Steinberg et al., 2008). These changes over time may not characterize all people; there is some evidence that some individuals' scores remain stably high or low whereas others change over time (e.g., Lynne-Landsman, Graber, Nichols, & Botvin, 2011).

Heritability

Sensation seeking, like most traits (e.g., Bouchard, 2004), is moderately heritable. The SSS subscales manifested heritability estimates that ranged from .48 to .63 in a Dutch sample of twins (Koopmans, Boomsma, Heath, & van Doornen, 1995). In a follow-up study that extended this sample to include nontwin siblings, heritability estimates for the SSS subscales ranged from .29 to .65 for females and .34 and .60 for males (Stoel, De Geus, & Boomsma, 2006). Most recently, a study of 2,562 sibling pairs found evidence of substantial genetic influences on both initial levels and change in sensation seeking over early adolescence, with more than 80% of the change due to genetic factors (Harden, Quinn, & Tucker-Drob, 2012).

Animal Models

Meaningful variations in levels of sensation seeking have been found in nonhuman animal species, supporting its evolutionary and biological basis (Roberti, 2004). Indeed, recent work in affective neuroscience has indicated that sensation seeking is one of six primary emotional traits that are present across species (Davis & Panksepp, 2011). Research using animal models has been useful in elucidating the neurobiological underpinnings of sensation seeking. For example, rats demonstrate varying levels of preference for novelty and activity in new environments, and these differences are related to dopamine activity (Blanchard, Mendelsohn, & Stamp, 2009). Animal models of sensation seeking have indicated an increased dopamine response in the nucleus accumbens similar to that found to reinforce drug intake (e.g., Olsen & Winder, 2009), suggesting that sensation seeking is likely related to reward processing.

Neuroscience

Consistent with these animal models, research with humans provides support for the hypothesis that the dopaminergic system underlies individual variability in sensation seeking because it is associated with genetic differences at certain dopamine receptors (D2 and D4; Derringer et al., 2010). Accumulating evidence suggests that this relationship may be nonlinear, such that healthy males with low or high levels of sensation seeking demonstrate lower dopamine availability than those with average levels (Gjedde, Kumakura, Cumming, Linnet, & Møller, 2010). It is likely that sensation seeking may be polygenetic in nature or related to multiple genes. Consistent with this notion, four dopamine receptor genes account for 5.25% of the variance in Novelty Seeking (Comings, Saucier, & MacMurray, 2002). The relation between sensation seeking and reward circuitry has also been supported using

functional magnetic resonance imaging methodology. For instance, changes in the nucleus accumbens, a key component in reward circuitry in the brain, during anticipation of rewards correlated positively with sensation-seeking scores in children of alcoholics (Bjork, Knutson, & Hommer, 2008), providing further support for the relationship between trait sensation seeking and biological processes related to reward pathways and sensitivity.

The Risk-Taking Continuum

Both prosocial and antisocial behaviors are associated with sensation seeking, suggesting that this trait can be manifested in adaptive, neutral, and maladaptive ways. Gomà-i-Freixanet (2001) proposed a *risk-taking continuum* that includes antisociality at one pole, prosociality at the other, and more "neutral" behaviors (e.g., risky sports, aesthetic preference) near the center of the spectrum. Gomà-i-Freixanet (1995) provided support for this notion by comparing risk takers from different categories including prisoners, risky sportsmen, prosocial risk takers (e.g., firefighters, prison warden), and a control group; the only variable that differentiated the control group from all of the other groups in discriminant analyses was the Thrill and Adventure Seeking subscale of the SSS. This finding suggests that sensation-seeking individuals may find a wide array of activities and professions—prosocial, neutral, and antisocial—to satisfy their need for excitement, novelty, and danger. Therefore, a thorough elucidation of the consequences of sensation seeking requires study of its adaptive, neutral, and maladaptive correlates.

ADAPTIVE FEATURES

Civic Engagement

Sensation seeking is related to prosocial behavior such as volunteerism, leadership, and civic participation. Sensation seekers are more likely to be politically progressive and prefer societal change to the status quo (Zuckerman, 1994). Relatedly, sensation seeking-related traits are also positively related to political participation (Kam, 2012) and a preference for leadership positions (Wymer, Self, & Findley, 2008).

Military Service

In a 2008 survey of 28,546 active duty military personnel in the U.S. Armed Services, 78% were classified as high sensation seekers on the basis of their self-report scores, suggesting that this construct is strongly related to voluntary enlistment (Bray et al., 2009). These same data speak to the

maladaptive aspects of this trait; sensation seeking among these military personnel was linked to alcohol, drug, and tobacco use and to on-the-job accidents.

Exploration

Consistent with animal models of sensation seeking suggesting its relation to increased preference for novel environments and exploratory behavior (e.g., Blanchard et al., 2009), research in humans suggests a link between trait sensation seeking and a preference for activities related to exploration. For instance, in a study comparing climbers from the 1985 Mount Everest expedition to elite mountain climbers, collegiate sport students, and military recruits, the Mount Everest climbers demonstrated higher levels of sensation seeking (Breivik, 1996). Additionally, in a study of 2,320 individuals from 39 populations and their migration patterns, populations that engaged in long-distance migration had a higher proportion of long alleles for the D4 dopamine receptor, which has been demonstrated to relate to levels of trait sensation seeking (Chen, Burton, Greenberger, & Dmitrieva, 1999). This finding suggests that it may be adaptive, at the societal level, for cultures to contain individuals with varying levels of sensation seeking as individuals with high scores on this trait may, at times, be responsible for monumental shifts in important paradigms (e.g., where to live, how to live).

Creativity

Sensation seeking is related to various tests of cognitive innovation, variety, and originality, suggesting that sensation seekers tend to tolerate ambiguity and are original and innovative in their approach to problem solving (Zuckerman, 1994). Sensation seeking is also associated with a common creativity factor comprising aspects of fluency, flexibility, originality, and elaboration (Okamoto & Takaki, 1992).

NEUTRAL FEATURES

Aesthetic Preference

Gomà-i-Freixanet's (2001) concept of a spectrum of sensation-seeking outcomes suggests the value of investigating this trait not only at its poles but across a continuum. The literature linking sensation seeking to individual differences in aesthetic preference reveals neutral correlates of this trait, positioned at the center of the continuum. With regard to music, sensation seeking is related to a preference for certain genres, such as hard rock (Dollinger,

1993), which may be due to a preference for emotionally evocative and arousing music. For example, Rawlings and Leow (2008) demonstrated that high scorers on the Impulsive Sensation Seeking Scale reported being sadder and less happy than low scorers when listening to relaxing/peaceful music. These findings are consistent with the optimal levels of arousal theory that suggests individuals high in sensation seeking may pursue complex, discordant, or intense stimuli as a means of optimizing their level of arousal. Similar findings have been found with regard to preferences for art and humor. Carretero-Dios and Ruch (2010) demonstrated that sensation seeking-related traits were related to less appreciation of incongruity–resolution humor (i.e., jokes that have punch lines that resolve the incongruity introduced in the setup of a joke) and greater appreciation of nonsense humor, or humor that did not provide resolution. The affinity of those high in sensation seeking for incongruous stimuli is also reflected in studies demonstrating their preference for art that is abstract or surrealistic (Furnham & Avison, 1997).

Extreme Sports

Engagement in "extreme" sports, characterized by such qualities as defiance of gravity, speed, and unusual experiences in unfamiliar environments, comprises both adaptive and maladaptive consequences because these sports may simultaneously serve to increase an individual's physical fitness while also subjecting him or her to heightened risk of physical harm. As such, extreme sports have been posited to lie conceptually at the center of the sensation-seeking spectrum and have received much attention via empirical investigation (Gomà-i-Freixanet, 2001). Several reviews have reported a correlation between sensation seeking and the riskiness of sport activities (e.g., Gomà-i-Freixanet, 2004). Skydiving, hang gliding, white-water rafting, rock-climbing, surfing, and downhill skiing are sports linked to high levels of sensation seeking, whereas moderate levels of the trait appear to be better predictors of engagement in competitive sports (e.g., automobile racing, hockey). Athletic activities that require endurance and commitment (e.g., long-distance running) or are played for an extended period of time at a slower pace (e.g., golf) are negatively associated with sensation seeking.

MALADAPTIVE FEATURES

Aggression and Antisocial Behavior

Sensation seeking is related to a host of maladaptive externalizing behavioral outcomes, although the effects are relatively small and sometimes

inconsistent. For instance, two recent meta-analyses examined the relations between sensation seeking and aggression, with one finding a small positive effect ($d = .19$; Wilson & Scarpa, 2011) and the other finding no effect ($r = -.02$; Jones, Miller, & Lynam, 2011). Jones and colleagues (2011) did, however, find a small positive relation between sensation seeking as assessed by measures of FFM Excitement Seeking and antisocial behavior ($r = .14$). To the extent that there is some link between sensation seeking and behavior that is aggressive or antisocial, it may be explained by level of arousal theories. Low resting heart rate, which is a prospective predictor of sensation-seeking scores (Raine, Venables, & Mednick, 1997), is the single best replicated psychophysiological correlate of aggression (Ortiz & Raine, 2004).

Riskier Sex

Given Zuckerman's conceptualization of sensation seeking as a trait defined by desire for varied, novel, and complex sensations and experiences, riskier sexual behavior has been a regular outcome of interest in research on sensation seeking. In a meta-analytic review of the personality correlates of sexual risk taking, small positive effects were found for sensation seeking-related traits ($rs = .15$ to $.19$; Hoyle, Fejfar, & Miller, 2000) and these relations appear to hold across a wide array of samples (e.g., high school students, community participants, gay and straight participants; Zuckerman, 2007). Engagement in these higher risk behaviors may be due, in part, to differences in how risk is appraised because high sensation seekers rate dangerous activities as less risky in hindsight than do low sensation seekers (Zuckerman, 1994).

Risky Driving Behavior

Driving is a readily accessible opportunity for arousal and excitement for individuals predisposed to seek such sensations. In a review of 40 studies (Jonah, 1997), sensation seeking manifested a moderate relation (with correlations in the .30–.40 range) with risky driving behavior (e.g., driving at speeds far beyond the legal limit, driving while intoxicated or high). Risky driving has also been explored using multidimensional trait models of impulsivity; data suggest that all four subfactors of the UPPS, including sensation seeking, predict increased levels of risky driving acts (Bachoo, Bhagwanjee, & Govender, 2013).

Gambling

Although not all forms of gambling are harmful, gambling can become problematic when it exceeds economic means or interferes with occupational

or social functioning. Engagement in high-stakes gambling appears to differ from other forms of sensation-seeking behavior. For pathological gamblers (i.e., gamblers who engage in "chasing behavior" in which they continue to place bets, often with increased wagers, after a sequence of losing bets), level of risk appears to be the primary reinforcing factor, whereas for many behaviors discussed thus far (e.g., sex, driving, substance use) level of risk is secondary to the rewarding sensations conferred by stimulating activities (Zuckerman, 1994). The anticipatory arousal involved in gambling appears to be most meaningful for those who engage in the behavior in repetitive or problematic ways. For example, the level of arousal exhibited by gamblers is correlated with the size of bets placed such that higher stakes bets were associated with heart rate increases (Anderson & Brown, 1984). Other studies have focused specifically on the link between trait impulsivity and gambling, as it is plausible that impulsivity may better explain why pathological gamblers continue to place risky bets despite potential negative consequences. Barrault and Varescon (2013) found that although sensation seeking is elevated for online poker players, it did not differentiate nonpathological players from pathological ones. A recent study investigated the relation between pathological gambling, as assessed via a semistructured clinical interview of *DSM* symptoms, and an array of 19 impulsivity-related measures (MacKillop et al., 2014). Factor analytic techniques identified four latent factors from these impulsivity indices, and the factor related to sensation seeking, titled reward sensitivity, manifested a small positive correlation with pathological gambling ($r = .17$), although the individual UPPS Sensation Seeking subscale was itself uncorrelated with pathological gambling ($r = -.03$). In a study that investigated a semistructured clinical interview of pathological gambling symptoms from the *ICD–10* (WHO, 1992), pathological gamblers did not demonstrate higher average levels of sensation seeking compared with matched controls (Michalczuk, Bowden-Jones, Verdejo-Garcia, & Clark, 2011). Future research should simultaneously assess both *DSM* and *ICD–10* pathological gambling symptoms to directly compare their relations with trait sensation seeking.

Substance Abuse

A meta-analysis of studies that used the SSS to assess the association between sensation seeking and alcohol across a range of different types of samples (e.g., patients, college students, adolescents, community members) and alcohol use outcomes (e.g., frequency of drinking, problem drinking, binge drinking, *DSM*-based alcohol use disorders) reported a small to moderate effect size ($r = .26$; Hittner & Swickert, 2006). In a more recent meta-analytic review of both cross-sectional and prospective studies, Stautz and

Cooper (2013) examined the relations between impulsivity-related traits and alcohol use and found nearly identical effect sizes. For cross-sectional studies, these authors reported small to medium effect sizes between sensation seeking and both alcohol consumption ($r = .28$) and problematic use ($r = .24$). These two meta-analyses provide consistent evidence of an association between sensation seeking and alcohol involvement, although there appear to be important moderators such that sensation seeking is more strongly associated with initiation/onset than pathological alcohol use (Stautz & Cooper, 2013) and is more strongly associated with alcohol use among Caucasians than African Americans (Hittner & Swickert, 2006; Stautz & Cooper, 2013). Hittner and Swickert (2006) hypothesized that sociocultural factors may explain why Caucasian individuals with high levels of sensation seeking are more inclined to engage in heavier alcohol use. It also does not appear that the relation between sensation seeking and alcohol use is limited to one diagnostic system: A previous study that assessed both *ICD-* and *DSM*-based substance use disorders identified elevated levels of this trait in hospital patients diagnosed with a lifetime history of alcohol abuse or dependence (Liraud & Verdoux, 2000). Sensation seeking is a consistent predictor of drug use as well, demonstrating medium to strong effect sizes across many studies (Roberti, 2004). In a sample of adolescents, sensation seeking predicted alcohol, tobacco, and marijuana use (Baker & Yardley, 2002). Sensation-seeking scores have been shown to predict drug use over a 20-month period, with the Disinhibition subscale of the SSS emerging as the strongest predictor (W. Pedersen, 1991). Peers' sensation seeking scores have also been shown to predict adolescents' marijuana and alcohol use (Donohew et al., 1999), suggesting that the level of sensation seeking within social networks may affect drug use, in addition to individual-level personality variables.

Relations With PDs

Sensation seeking is a central component of a number of PDs related to externalizing behaviors. Experts view sensation seeking (using FFM Excitement Seeking as the marker) to be a defining characteristic of prototypical cases of psychopathy (Miller, Lynam, Widiger, & Leukefeld, 2001), as well as *DSM–5* Cluster B PDs that are also part of the *ICD–10*, including antisocial, borderline, histrionic, and narcissistic PDs (Lynam & Widiger, 2001; Samuel & Widiger, 2008). Meta-analytic reviews of the FFM-PD literature support most of these hypothesized relations with significant correlations between FFM Excitement Seeking and psychopathy ($r = .31$; Decuyper, DePauw, DeFruyt, DeBolle, & DeClercq, 2009), antisocial PD ($r = .25$), and histrionic PD ($r = .27$; Samuel & Widiger, 2008). The evidence for the role of sensation seeking in narcissistic ($r = .16$) and borderline PD ($r = .06$) is more mixed (Samuel & Widiger,

2008). Although this research demonstrates that sensation seeking is related to a number of PDs, it is important to note that this same research indicates that other personality traits are as or more central to understanding these disorders. For instance, within the meta-analytic review of PDs and FFM facets (Samuel & Widiger, 2008), independent weighted mean effect size correlations for antisocial PD ranged from –.17 to –.37 for Agreeableness facets and –.18 to –.38 for Conscientiousness facets, suggesting that these personality domains are likely the driving force behind this disorder and related externalizing outcomes. It is possible that the relations between sensation seeking and externalizing behaviors (e.g., antisocial behavior; crime) may be moderated by other traits that are stronger predictors of these outcomes—namely, traits from the domains of Agreeableness/Antagonism and Conscientiousness/Disinhibition (Jones et al., 2011; Miller & Lynam, 2001). That is, sensation seeking may be a stronger concurrent correlate or prospective risk factor for these outcomes when paired with traits such as callousness, self-absorption, or impulsivity.

DIRECTIONS FOR FUTURE RESEARCH

Although some studies have suggested differences across racial groups in the relations between sensation seeking and maladaptive outcomes (e.g., S. L. Pedersen et al., 2012), future research should strive to elucidate the nomological network of sensation seeking among different racial or ethnic groups. The ability to study this trait in other cultures depends on the existence of culturally sensitive and validated assessment measures. However, a recent study investigating the validity of a brief measure of the SSS scale (BSSS–4; Stephenson, Hoyle, Palmgreen, & Slater, 2003) demonstrated that it manifested more limited reliability and validity among African Americans compared with both White and Hispanic groups (Vallone, Allen, Clayton, & Xiao, 2007). Although the validity and reliability across racial groups of the SSS and other commonly used measures of this trait has not been directly investigated, this finding suggests that existing scales may be culturally biased and the construction of alternative scales may be required.

Future research could focus on gender differences in sensation seeking as well to parse genetic differences versus cultural factors. In a recent meta-analysis of differences in sensation seeking over time, the mean effect size for sex differences was moderate and stable over 35 years for total score sensation seeking, but the sex difference in the Thrill and Adventuring Seeking subscale has decreased significantly due to a decline in male scores (Cross, Cyrenne, & Brown, 2013). These data provide preliminary support for the notion that cultural factors may affect these traits and that gender socialization processes

may affect the likelihood that men or women may engage in specific types of activities. Additionally, the preponderance of research investigating sensation seeking as a risk factor for maladaptive behaviors has used samples of young adults. Future research would benefit from assessing the effects of sensation seeking in older samples to assess the relevance of this trait across the lifespan. Although research suggests that sensation seeking decreases over the lifespan (Steinberg et al., 2008), it is also likely that the trait is expressed differently across various age ranges. Additionally, although research supports a biological underpinning of this trait, future research should focus on demonstrating causality between observed biological differences in individuals high on sensation seeking and risky behaviors. Although single genes and neurotransmitters have been shown to relate to sensation seeking, the inconsistency in findings is likely due to the polygenetic nature of traits, which can be investigated in future studies that use well-powered samples.

The literature reviewed in this chapter demonstrates that sensation seeking is related to multiple maladaptive outcomes, including substance use, risky driving, risky sex, and aggression/antisocial behavior, although these effects tend to be small and can vary across studies (and meta-analytic reviews), in part, depending on how sensation seeking is assessed. Although this idea has received little empirical attention to date, we believe it is possible that sensation seeking's relations with maladaptive outcomes (e.g., problematic risk taking, externalizing behaviors) may be moderated by the level of other relevant personality traits such that sensation seeking is more strongly related to these outcomes when paired with high levels of traits related to interpersonal antagonism or disinhibition. For instance, one study directly investigated whether impulsivity and sensation seeking operate independently or synergistically in relation to risky sexual behaviors and found a significant interaction between these traits in predicting multiple risky sex outcomes (Charnigo et al., 2013). Our understanding of sensation seeking's role in these various outcomes would benefit from future research that examines more systematically whether sensation-seeking relations with maladaptive outcomes are moderated by other known trait correlates of these outcomes.

CLINICAL IMPLICATIONS

Implications for Prevention and Intervention Efforts

Sensation seeking manifests small but relatively reliable positive relations with risky, potentially dangerous, and impairing behaviors, even in prospective studies, which suggests that it is a risk factor that should be included in prevention and intervention strategies attempting to reduce risky

behavior. Lynne-Landsman and colleagues (2011) identified different groups of adolescents with varying levels of sensation seeking across time, including a stably low group, a moderately increasing group, and a stably high group. As such, they suggested a "two-pronged approach" (p. 55), such that efforts targeting the high and stable sensation-seeking group may focus specifically on altering how this trait is expressed. Conversely, for the moderately increasing group, they suggest that it will be important to identify and target the factors associated with this increase to attenuate its effect. It may also be effective to direct individuals high on trait sensation seeking toward more prosocial and adaptive outlets for their sensation seeking rather than attempting to change the underlying trait. For instance, this intervention could involve directing individuals toward activities that increase arousal level such as enrollment in the military or engagement in physical/sporting activities that may serve this same function with lower levels of risk of harm for the participant or those around the participant. In a sample of Israeli war veterans, sensation seeking was related to better performance during war and less posttraumatic stress symptoms after war (Neria, Solomon, Ginzburg, & Dekel, 2000), suggesting that individuals high on sensation seeking can function well in relatively neutral or prosocial environments that allow expression of this trait (cf. Bray et al., 2009). It may also be that individuals who are high on sensation seeking need to be targeted for prevention and intervention via different types of messages that play to these personality tendencies. For instance, Donohew and colleagues (2000) found that sensation-seeking individuals prefer antidrug-related messages that were novel, creative, intense, and unconventional. As such, two different antidrug public service announcements were developed, and individuals high on trait sensation seeking reported a greater intent to call a drug hotline offered in the public service announcement if they viewed the more stimulating version.

Implications for Prognostic Indicators

Traits such as sensation seeking can also be used within the context of treatment to anticipate difficulties that may arise. In a study investigating treatment response among a sample of African American individuals addicted to cocaine, sensation seeking was significantly negatively related to days in treatment and positively related to dropout rate and failed drug screenings (Patkar et al., 2004). Sensation seeking is also related to poor medication compliance (Ekselius, Bengtsson, & von Knorring, 2000). Clinicians may find it helpful to screen for sensation seeking when formulating a treatment plan. For instance, clinicians may use novelty and variation in treatment delivery (e.g., changing the modality or location of treatment) and work to identify prosocial alternatives to maladaptive behaviors.

SUMMARY AND CONCLUSIONS

Overall, sensation seeking has a complicated nomological network that includes largely adaptive and prosocial behaviors (e.g., civic engagement, voluntary enlistment in the military), neutral behaviors (e.g., tastes in music, art, or leisure activities), as well as more maladaptive and antisocial behaviors (e.g., substance use, risky sex, antisocial behavior). The effects for these behaviors, however, tend to be small to moderate and should not be overstated. We believe that it is possible that what directs individuals who are high on sensation seeking to these behaviors of varying levels of adaptivity is likely the presence or absence of other critical personality traits including tendencies toward disinhibition and interpersonal orientation (i.e., agreeable vs. antagonistic). For instance, many individuals who are high on sensation seeking are not impulsive; in fact, many sensation seekers demonstrate a great deal of preplanning and deliberation before engaging in dangerous activities (e.g., skydivers who check their equipment carefully before jumping). Similarly, many individuals who are high in sensation seeking are interpersonally agreeable and express these preferences via prosocial outlets (e.g., firefighter). The spectrum of outcomes related to sensation seeking, which includes both prosocial and antisocial outcomes (Gomà-i-Freixanet, 2004), demonstrates this trait is likely to be "dark" only when matched with more consistently maladaptive traits, such as callousness, affective dysregulation, manipulativeness, egocentrism, narcissism, and deficient impulse control.

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