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An Assessment of the Psychometric Properties of the Brief Sensation Seeking Scale for Children

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ABSTRACT

Sensation seeking is a trait that predicts a wide range of real-life risk behavior, such as substance abuse and gambling problems. Sensation seeking is often assessed with the Sensation Seeking Scale. Several adaptations of this questionnaire have been made, for example, to abbreviate it and to make it suitable for children. However, studies on sensation seeking in children are scarce. The aim of this study was to investigate sensation seeking in children ($N = 158$, M age = 11.4 years). The Brief Sensation Seeking Scale for Children (BSSS-C) was translated into Dutch and psychometric properties were examined. Internal consistency was high, and the factor structure showed close resemblance with previous research. Test-retest and split-half reliabilities were acceptable, as was convergent validity with self-reported symptoms of psychopathology (attention problems and aggressive behavior). Construct validity was adequate, with more sensation seeking in boys than in girls. No effects of age were found. To sum up, sensation seeking can be measured in children in a valid and reliable way. The correlation of sensation seeking with high-risk behaviors emphasizes the importance of assessment early in development.

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Sensation seeking (SS) is “a trait defined by the seeking of varied, novel, complex and intense sensations and experiences, and the willingness to take physical, social, legal and financial risks for the sake of such experience” (Zuckerman, 1994). SS correlates with personality traits like openness to experience, agreeableness, and impulsivity (McCrae & Costa, 1997; Pfefferbaum & Wood, 1994; Stanford, Greve, Boudreaux, Mathias, & Brumbelow, 1996; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993).

Individuals high in SS enjoy unusual art forms (Rawlings, 2003), travel more and to less familiar destinations (Zuckerman, 1994), enjoy high-impact sports (Joireman, Fick, & Anderson, 2002; Zuckerman, 1994), and prefer listening to arousing music (McNamara & Ballard, 1999). However, arousing experiences also include risky, dangerous, or violent behavior (Roberti, 2004). Indeed, SS correlates with alcohol abuse (Cohen & Fromme, 2002; Zuckerman, 1994), drug usage (Donohew et al., 1999; Read, Wood, Kahler, Maddock, & Palfai, 2003), risky sexual behavior (Arnold, Fletcher, & Farrow, 2002; Wiederman & Hurd, 1999), hazardous driving (Arnett, 1996), gambling (McDaniel, 2002), vandalism, and theft (Arnett, 1996).

Moreover, SS is associated with a wide spectrum of psychopathology. SS is related to externalizing disorders as it predicts risky behavior in attention-deficit/hyperactivity disorder (ADHD; Graziano et al., 2015) and is found to be one of the

most frequent complaints in individuals with ADHD (Kooij, Ackerlin, & Buitelaar, 2001). SS is also positively related to disruptive behavioral problems, such as aggression and oppositional defiant disorder and conduct disorder symptoms (Joireman, Anderson, & Strathman, 2003). Furthermore, SS is associated with addiction, as high SS correlates with the usage of cocaine (Ball, Carroll, & Rounsaville, 1994), alcohol (Hittner & Swickert, 2006; Martin et al., 2002), caffeine (Jones & Lejuez, 2005), nicotine (Martin et al., 2002), marijuana (Martin et al., 2002), online gaming (Mehroof, & Griffiths, 2010), Internet dependence (Lin & Tsai, 2002) and, in ADHD, the abuse of stimulant medication (van Eck, Markle, & Flory, 2012). To summarize, SS is an important personality trait, as it is related to different psychiatric disorders and related risk-taking behavior.

In children, similar patterns are observed. SS correlates with conduct disorder (Russo et al., 1993) and children high on SS played more (violent) video games and scored higher on rule-breaking behavior (Jensen, Weaver, Ivic, & Imboden, 2011). Moreover, early risk-taking behavior was not only associated with SS, it was also predictive of future deviant behavior (Newcomb & McGee, 1991). SS typically increases between 10 and 15 years old (Steinberg et al., 2008). For these reasons, studying SS in children is important. Identifying children at risk early in development enables prevention or early intervention of risk-taking behavior.

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SS is most often measured with the Sensation Seeking Scale (SSS-V; Zuckerman, Eysenck, & Eysenck, 1978), for which good validity and reliability have been demonstrated repeatedly in adult samples (Brocke, Beauducel, & Tasche, 1999; Cronin, 1995; Zuckerman, 1994; Zuckerman, Bone, Neary, Mangelsdorff, & Brustman, 1972; see Roberti, 2004, for a review). The SSS-V consists of four subscales: Thrill and Adventure Seeking, Experience Seeking, Disinhibition, and Boredom Susceptibility. This factor structure has been found consistently (Ball, Farnill, & Wangeman, 1984; Loas et al., 2001; Roberti, Storch, & Bravata, 2003; Rowland & Franken, 1986; Zuckerman et al., 1978).

To assess SS in children, the Sensation Seeking Scale for Children (SSS-C) has been developed (Russo et al., 1991; Russo et al., 1993). The test-retest reliability of this scale was adequate and factor analysis yielded two factors, which resembled the Thrill and Adventure Seeking and Boredom Susceptibility subscales (Russo et al., 1991). In a follow-up study, factor analysis identified three factors: Thrill and Adventure Seeking, Drug and Alcohol Attitudes, and Social Disinhibition. Psychometric properties were acceptable and differences in SS according to sex, age, and psychopathology were as expected (i.e., higher SS in boys, in older children, and in children with conduct disorder).

The Brief Sensation Seeking Scale for Children (BSSS-C) was developed as a shorter measurement of SS in children (Jensen et al., 2011). Factor analysis identified four factors, similar to the original factors of the SSS-V (Thrill and Adventure Seeking, Experience Seeking, Disinhibition, and Boredom Susceptibility), and internal consistency was good. There was an effect of sex, with boys scoring higher than girls. No effect of age was found.

The goal of this study was to investigate the psychometric properties of our Dutch translation of the BSSS-C. Based on previous research, we expected (a) high reliability (evidenced by high internal consistency, split-half reliability, and test-retest reliability), and (b) high validity (evidenced by a similar factor structure to that found by Jensen et al., 2011; positive correlations with attention problems; aggressive behavior and age; and a sex difference). Correlations with internalizing symptoms (i.e., anxiety and depression) were investigated in an exploratory manner.

Method

Participants

Participants were 158 children (90 boys) between 9 and 12 years old, with a mean age of 11.4 ($SD = .70$). As one school refused to participate in the retest and some children were absent from class at the second time of testing, 108 of the initial 158 children filled out the BSSS-C again ($M = 11.6$ years, $SD = .74$; 66 boys).¹

Participants were recruited at three regular elementary schools and one school for special education (Grades 7 and 8). Schools were recruited by research assistants and varied in

geographical location (i.e., city and village schools) and socioeconomic background. Children attending the school for special education were characterized by behavioral difficulties and a high prevalence of psychiatric disorders. Parents or other legal caretakers gave active or passive informed consent, depending on the preference of the school. The local ethics review board approved the study.

Materials

Brief sensation seeking scale for children

The BSSS-C (Jensen et al., 2011) was translated into Dutch by three native Dutch speakers who were also proficient in English. Disagreement among the three translations was solved by a debate between the first and third author and a research assistant. The Dutch items were translated back into English by three native English speakers, also fluent in Dutch. Again, disagreement was solved by a discussion.

The BSSS-C consisted of 14 items, which were answered on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An example of an item is "I would like to try sky-diving." The English version has good psychometric properties. In the original version, internal reliability of $\alpha = .82$ and concurrent validity with externalizing behavior were established (Jensen et al., 2011).

Youth self-report

Three subscales of the Dutch translation of the Youth Self-Report (YSR; Achenbach & Rescorla, 2001; Verhulst, Ende, & Koot, 1997) were administered: Attention Problems, Aggressive Behavior, and Anxious/Depressed.² On this self-report questionnaire, children indicated whether a given statement (e.g., "I become angry easily") resembled their behavior or feelings in the last 6 months on a 3-point Likert scale ranging from 0 (*not at all*) to 2 (*clearly/often*). The Attention Problems subscale consisted of 9 items, the Aggressive Behavior subscale consisted of 17 items, and the Anxious/Depressed subscale consisted of 13 items. The reliability of the YSR is good ($\alpha = .79$ for the syndrome subscales; Achenbach et al., 2008). In our sample, the internal consistency was comparable, with $\alpha = .73$ for Attention Problems, $\alpha = .83$ for Aggressive Behavior, and $\alpha = .80$ for Anxious/Depressed.

Procedure

Participants were tested in class by two research assistants in the presence of the teacher. The entire test session lasted approximately 45 min. Apart from the measures previously described, children also performed a cognitive test and a test on curiosity, which are beyond the scope of this article. The order of administration was uniform in all classes. Children started with the curiosity test, then the cognitive test, YSR, and BSSS-C. Reassessment of the BSSS-C, which lasted approximately 10 min, took place in class after 2 to 3 months (minimum = 76 days later, maximum = 92 days).

¹Age information for 4 participants was missing at Time 1, and age information for 1 participant was missing at Time 2.

²One item of the Anxious/Depressed subscale (about suicidal thoughts or feelings) was omitted because of the expected emotional impact in young children.

Data analysis

Reliability was investigated using tests of internal consistency, split-half reliability, and test-retest reliability. The factor structure was investigated with a principal axis factoring analysis, convergent validity by computing correlations between BSSS-C scores and scores on Attention Problems and Aggressive Behavior, and construct validity by computing correlations between BSSS-C scores and age and sex.

A priori power analyses were conducted with G*Power ($\alpha = .05$, Power = .80; Faul, Erdfelder, Lang, & Buchner, 2007). To detect medium effects, a sample size of 82 was sufficient for the correlation analyses and a sample size of 128 (64 participants per group) was sufficient for the independent *t* test.

Average scores were calculated for the BSSS-C but if more than one question on the BSSS-C was omitted, participants' data were excluded from the analyses. Average scores were also calculated for the YSR subscales, with a maximum of 2 out of 17 omitted items on Aggressive Behavior, 1 out of 13 on Anxious/Depressed, and 0 out of 9 on Attention Problems.

Results

Descriptives

Higher psychopathology scores were expected in children attending special education. This was confirmed by YSR scores: Children attending special education scored higher on Aggressive Behavior ($U = 1823.50$, $p < .01$), Attention Problems ($U = 1825.50$, $p = .01$) and, only at trend level, Anxious/Depressed ($U = 1637.50$, $p = .05$) than children attending regular education.

Reliability

In the first wave, 11 participants skipped one item of the questionnaire, resulting in $N = 147$. The BSSS-C showed high internal consistency ($\alpha = .82$). After dividing questions from the same factors over both halves as much as possible, the split-half reliability of the BSSS-C was good ($r_{sh} = .86$; Spearman-Brown coefficient). Also at retest, internal consistency

was high ($\alpha = .75$; 2 participants skipped one item, hence $N = 106$), and split-half reliability was good ($r_{sh} = .81$). The distribution of the first administration was not normal (Kolmogorov-Smirnov $p = .01$), and therefore Spearman's correlation was reported for the test-retest reliability, which was good ($r_s = .72$, $p < .001$).

Validity

A principal axis factoring analysis was conducted to assess the factor structure of the BSSS-C. No multicollinearity was found as there were no correlations above .90 (Field, 2013). An oblique promax rotation was used, as the factors were likely correlated. The sample size was adequate for this analysis ($KMO = .82$), and Bartlett's test was significant, $\chi^2(91) = 779.18$, $p < .001$, indicating the absence of an identity matrix. Using Kaiser's criterion of eigenvalues > 1 , four factors were identified. Overall, the factor structure showed strong similarities with previous research (see Table 1; Jensen et al., 2011). The first factor, with high loadings on Items 1, 2, and 3, represented thrill and adventure seeking (TAS). The second factor represented experience seeking (ES), with high loadings on Items 10, 11, and 12. This factor also had high loadings on Items 4 and 6, which was different from previous research. The third factor, with loadings on Items 13 and 14, represented boredom susceptibility (BS). The fourth factor had high loadings on Items 7, 8, and 9, representing disinhibition (D). Item 5, presumed to tap TAS, did not load high on any of the factors. Altogether, the factor structure seemed robust, as only 5% of the residuals were larger than .05.

To assess convergent validity, correlations between the BSSS-C and different indicators of psychopathology (i.e., YSR subscales) were estimated. Scores on none of the YSR subscales were normally distributed (Kolmogorov-Smirnov $ps < .001$). Therefore, Spearman's correlations were reported. As expected, the total score on the BSSS-C correlated significantly with both Attention Problems and Aggressive Behavior ($r_s = .25$, $p = .002$ and $r_s = .35$, $p < .001$, respectively). There was no

Table 1. Principal axis analysis of the Brief Sensation Seeking Scale for Children, using promax rotation and Kaiser's criterion of eigenvalues > 1 .

	Factors				M	SD
	TAS	ES	BS	D		
1. I would like to try sky-diving ^{TAS}	.988				3.8	1.3
2. I would like to try using a parachute ^{TAS}	.879				3.7	1.3
3. I would like to try bungee jumping ^{TAS}	.858				3.6	1.4
4. I would like to explore strange places ^{TAS}		.421			4.0	1.1
5. I'm the first one in my group of friends to try new things ^{TAS}					3.1	0.9
6. If somebody dares me to do something, I do it ^D		.574			3.0	1.1
7. I like hanging out with older kids ^D				.609	2.9	1.0
8. I like new and exciting experiences, even if I have to break the rules ^D				.461	3.0	1.4
9. I prefer friends who are exciting and unpredictable ^D				.525	3.2	1.2
10. I like telling jokes ^{ES}		.321			3.2	1.2
11. I think bugs and snakes are pretty cool ^{ES}		.522			3.0	1.4
12. I like to do things that scare me a little bit ^{ES/TAS}		.932			3.3	1.2
13. I get bored quickly ^{BS}			.598		3.2	1.3
14. I get restless when I spend too much time at home ^{BS}			.629		2.8	1.3
Explained variance	30.0%	11.2%	3.9%	2.8%		
Eigenvalue	4.61	1.96	1.11	1.04		

Note. Values of the pattern matrix are reported. TAS = Thrill and Adventure Seeking; ES = Experience Seeking; BS = Boredom Susceptibility; D = Disinhibition. Superscripts represent factors identified by Jensen et al. (2011).

significant correlation between SS and the Anxious/Depressed subscale ($r_s = -.04, p = .60$).³

In line with expectations, higher SS was observed in boys than in girls at the first⁴ ($U = 2103.00, p < .001$) and at the second administration, $t(106) = 2.12, p = .04$. No effect of age was observed at the first ($r_s = -.02, p = .85$) and at the second administration ($r_s = -.08, p = .42$).

Discussion

The goal of this study was to establish the psychometric properties of the Dutch translation of the BSSS-C (Jensen et al., 2011). Overall, the psychometric properties of the questionnaire were good. The internal consistency and split-half reliability were high and the four-factor structure of the translation largely resembled the original version (Jensen et al., 2011). Test-retest reliability, which was never investigated for the BSSS-C before, was good after 2 to 3 months. Validity was supported by the positive significant correlation between the total score on the BSSS-C and self-reported attention problems and aggressive behavior. These correlations are in line with previously observed correlations between BSSS-C and aggressive gaming and rule breaking (Jensen et al., 2011). In older samples, the BSSS has also been found to correlate with risky behaviors such as drug usage and risky sexual behavior (Donohew et al., 1999; Hoyle, Stephenson, Palmgreen, Lorch, & Donohew, 2002; Stephenson et al., 1999). Furthermore, the observed correlation with attention problems was expected as well, as SS has been linked to ADHD before (Kooij et al., 2001; Zuckerman, 2002). According to the vigilance regulation model, SS behavior in ADHD serves as an autoregulatory attempt to create a stimulating environment to stabilize vigilance, as unstable vigilance is a basic dysfunction in ADHD (Geissler, Romanos, Hegerl, & Hensch, 2014).

In line with previous studies (Jensen et al., 2011; Martin et al., 2002; Russo et al., 1991; Russo et al., 1993), we found that boys scored higher on SS than girls. However, discordant with some previous findings on SS, no effect of age was found. Earlier studies show that the presence of age effects on SS are dependent of the particular age range. SS seems to peak around the age of 15 (Steinberg et al., 2008). The current nonsignificant correlation might be explained by the fact that we used a preadolescent sample with a limited age range (9–12). A previous study on SS in the same age group also reported no effects of age (Jensen et al., 2011). The relation between age and SS thus far has been established by cross-sectional research (Steinberg et al., 2008). Previous longitudinal research focuses primarily on adolescent samples (Collado, Felton, MacPherson, & Lejuez, 2014; Harden & Tucker-Drob, 2011). We suggest future research could benefit from longitudinal designs, starting in young children, to identify which personality profiles are at risk

for harmful development and, ultimately, to prevent this development.

A limitation of this study is that only self-report measures were used. Self-report measures have limited validity in children, as informant discrepancies are often detected (Achenbach, McConaughy, & Howell, 1987; Waters, Stewart-Brown, & Fitzpatrick, 2003). However, many studies claim that schoolchildren are capable of self-reporting (de Los Reyes & Kazdin, 2005; Riley, 2004; Varni, Limbers, & Burwinkle, 2007). Furthermore, average YSR scores on all subscales were higher for the children attending special education as compared to children attending regular education, which indicates that this self-report was valid at least at the group level.

A related limitation is that the YSR is validated for use with children from 11 years old, but a minority of our sample was younger than 11. However, it was ensured that all children understood the questionnaires, as the teacher and two research assistants were in the classroom while participants were filling out the questionnaires, providing the children with ample opportunity to ask for clarification if necessary. Furthermore, one question of the Anxious/Depressed subscale was omitted because of the expected emotional impact on young children.

It is important to note that this study was performed in the Netherlands. The resemblance of the results with previous studies on SS in children (e.g., Jensen et al., 2011) suggest that the current findings can be generalized to Western populations. Future research is needed to identify potential differences with non-Western populations.

To sum up, this study showed that SS can be measured in children in a reliable way. Moreover, SS correlates with symptoms of psychopathology like attention problems and aggressive behavior. As SS is predictive for a wide range of risk behaviors, such as risky sexual behaviors, rule breaking, Internet dependence, gambling, and substance abuse (Newcomb & McGee, 1991), it is important to assess SS early in development. Application of instruments like the BSSS-C can aid this assessment, ultimately aiming to identify those children with high-risk personality profiles, to prevent potential harmful development.

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³Note that these correlations were not only driven by the children attending special education. For children attending regular education, the correlation with Attention Problems and Aggressive Behavior was similar to that for the entire sample ($r_s = .22, p = .013$ and $r_s = .31, p < .001$, respectively). Correlations were higher for children attending special education ($r_s = .46, p = .043$ and $r_s = .55, p = .012$ for Attention Problems and Aggressive Behavior, respectively).

⁴As BSSS-C was not distributed normally at the first administration, this was tested nonparametrically.

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