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The Relationship Between Pathological Gambling and Sensation Seeking: The Role of Subscale Scores

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Abstract Research investigating the relationship between gambling and sensation seeking has yet to establish conclusively whether pathological gamblers (PGs) are more or less sensation seeking than nonpathological gamblers (NPGs). Sensation seeking is usually measured with the Zuckerman et al. (J Consult Clin Psychol 46:139–149, 1978) SS Scale form V (SSS-V). Whereas previous studies relied on the SSS-V total score, the current study uses two samples to demonstrate the importance of the SSS-V subscales, which include Thrill and Adventure Seeking (TA), Experience Seeking (ES), Disinhibition (DS), and Boredom Susceptibility (BS). In two samples, strong intrascale correlations between DS and BS, and between TA and ES, suggest that certain subscales reflect similar underlying characteristics. In both samples PGs displayed higher scores than NPGs on the DS and BS subscales, with mean differences in Sample 2 reaching significant levels for both DS and BS. Results support the notion that the SSS-V can be divided into concepts reflecting actual behavior, based on the DS and BS subscales, and hypothetical behavior, based on the TA and ES subscales. Furthermore, PGs appear to have a preference for the more behavioral subscales while NPGs show a preference for the more hypothetical subscales. Reasons for the subscale divisions and preferences are discussed.

Keywords Gambling · Pathological gambling · Sensation seeking · Subscale · Meta-analysis

Introduction

Pathological gamblers (PGs) are concerned with the act of gambling to such a degree that they put their personal relationships, occupational status and financial stability at risk. PGs continue to gamble despite increasing family and financial distress; have difficulty controlling the urge to gamble; and are often unable to reduce the amount of time and money that they spend gambling. In fact, PGs frequently gamble with progressively

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larger amounts of money in order to meet their ever-increasing need for excitement and pleasure. PGs' pattern of risking significant personal, occupational and financial well-being for the sake of such stimulation is one reason why PGs might intuitively be predicted to be greater risk-takers or sensation seekers than their non-pathological gambling (NPG) peers.

Consensus has yet to be reached regarding the relationship between sensation seeking (SS) and gambling activity. Some studies support the more intuitive argument that SS is more prevalent in the pathological gambling population than in other groups of individuals, such as nongamblers or social gamblers (Gupta et al. 2006; Kuley and Jacobs 1988; Powell et al. 1999). Studies that find this positive relationship between gambling involvement and SS suggest that increased levels of SS may stem from greater risk taking. Compared with others, high sensation seekers exhibit greater risk taking tendencies, but high sensation seekers do not necessarily view the situations in which they are participating as being overly risky. Thus, if PGs are in fact more sensation seeking, they do not believe that their gambling behavior is risky and gambling situations that would be anxiety provoking for NPGs would not elicit the same anxious feelings in PGs (Kuley and Jacobs 1988). The lack of anxiety experienced by PGs in gambling situations allows them to maintain their pathological gambling behavior.

However, other studies show support for the contrary, with gamblers actually displaying lesser SS characteristics than the general population or their nonpathological gambling counterparts (Blaszczynski et al. 1986; Blanco et al. 1996; Carrasco et al. 1994). Interestingly, for studies that indicate PGs have less SS than controls, there is a trend to recruit gambling participants from treatment facilities. Of the three papers referenced here that report PGs displaying less SS than NPGs, all three recruited PG participants from treatment facilities. On the other hand, of the three papers cited here that show PGs to be more sensation-seeking than NPGs, none drew their participants from treatment facilities. Because there is this clear division between participant groups in these two areas, perhaps treatment-seeking gamblers exhibit different levels of SS than gamblers who are not currently seeking treatment. Treatment programs that focus on controlling gambling urges and risk taking behavior may somehow alter current SS levels in those receiving treatment. Alternatively, treatment seeking populations may reflect differential dispositional tendencies relative to either non-treatment seeking PGs.

Still other studies find that the SS is nearly identical among gamblers as among non-gamblers, with no significant differences identified between the groups (Anderson and Brown 1984; Blaszczynski et al. 1990; Bonnaire et al. 2004; Coventry and Brown 1993; Dickerson et al. 1990; Parke et al. 2004). The results seen in these studies highlight the importance of identifying subgroups of gamblers. Gambling participants in these studies are often drawn from a sample of off-course bettors (only one of the six papers listed here recruited from a treatment facility). Off-course betting has been identified as a more passive type of gambling, as compared to casino and racetrack gambling that are active types of gambling (Bonnaire et al. 2004). It has further been suggested that passive gamblers show less SS than active gamblers (Bonnaire et al. 2004; Coventry and Brown 1993). The various subtypes of gamblers may also exhibit different levels of competitiveness and different motivators for participating in gambling activities, which are also factors that are related to SS levels (Parke et al. 2004). The use of these various subtypes of gamblers as participants may help explain why no relationship was found between SS and gambling in these studies.

Pathological Gambling, Related Disorders, and Sensation Seeking

Pathological gambling is formally categorized as an impulse control disorder (ICD; American Psychiatric Association 2000). PGs often display an inability to control impulses or inhibit certain behaviors, which leads to an expectation that PGs should score higher on measures of SS. Pathological gambling, along with other ICDs (i.e., intermittent explosive disorder, kleptomania, pyromania, and trichotillomania), is marked by behavioral independence in which individuals display a "failure to resist an impulse… an increasing sense of tension or excitement before acting out, a sense of pleasure, and gratification or release at the time of the behavior or shortly thereafter" (Lejoyeux et al. 2000, p. 130). Similar to what is found with pathological gambling research, studies investigating the relationship between other ICDs and SS show mixed results, with some supporting elevated SS scores in those suffering from ICDs (Bayle et al. 2003; Lejoyeux et al. 1998) and others showing no significant differences between SS scores of ICD patients and others (Billieux et al. 2008; Lejoyeux et al. 2002).

In addition to being recognized as an ICD, pathological gambling is also frequently conceptualized as an addictive disorder that mirrors certain qualities seen in other addictive disorders such as alcoholism (Lejoyeux et al. 2000). Studies investigating the relationship between SS behavior and drug and alcohol addiction come to a more consistent conclusion that individuals with drug or alcohol problems display greater SS behavior (D'Alessio et al. 2006; Dom et al. 2006; Dubey and Arora 2008; Sutker et al. 1978; Wagner 2001).

When evaluating SS in relation to gambling activity, research studies typically use the Sensation Seeking Scale Form V (SSS-V; Zuckerman et al. 1978), which is a 40-item scale divided into four subscales: Thrill and Adventure Seeking (TA), Experience Seeking (ES), Disinhibition (DS), and Boredom Susceptibility (BS). The four subscales of the SSS-V represent unique facets of SS activity, which are combined into the total SS score. The SSS-V is intended to be a measure of SS for the general population, and it is possible that PGs could score high on certain subscales of the SSS-V and score low on others. When assessing the relationship between SS and gambling, researchers have usually relied solely upon the overall score and rarely investigate the influence of the individual subscales. To date, the sole exception to this common methodology, of which we are aware, is a study by Blaszczynski et al. (1990) looking at the correlation between boredom susceptibility and gambling. The authors expected to find higher boredom susceptibility scores and depression levels in those participants who identified as PGs, but found no significant differences found between PGs and nonpathological gamblers (NPGs). In the only meta-analytic exploration of the relationship of which we are aware, Hammelstein (2004) concluded that PGs actually display SS to a lesser degree than NPGs, based on analysis of total scores and an effect size of $d = -0.32$, with the negative effect size indicating higher overall scores for NPGs.

SSS-V Subscales and Pathological Gambling

Even though the SSS-V total scores from past literature do not establish a clear connection between SS and pathological gambling, the individual subscales could be useful in doing so. It has previously been suggested that "before abandoning SS as having no predictive value, the four factors of the trait could perhaps be separated and used as independent variables in multiple regression" (Parke et al. 2004, p. 209). It has also been suggested that based on similarity and content, the four subscales pair off to form two different constructs of SS with one including DS and BS and the other including TA and ES. The construct

including the DS and BS subscales has been identified as "excitement seeking" in the substance abuse literature and was shown to account for a large amount of the variance in alcohol use, with Beta weights ranging between 0.52 and 0.60 (Finn et al. 2000; Justus et al. 2000). In particular, the DS and BS subscales showed strong correlations with the frequency, quantity, and density of alcohol use.

Genetic analysis in twin studies also indicates that strong genetic correlations exist between DS and BS (an average correlation of $r = 0.545$ for men and women) and between TA and ES (and average correlation of $r = 0.480$ for men and women). Although the genetic analysis reveal that there are also correlations seen for the other subscale pairs, they are not as strong, with average correlations of $r = 0.355$ for TA and DS and $r = 0.410$ for ES and BS (Koopmans et al. 1995). The relationships between the TA and ES subscales, and between the DS and BS subscales, are also validated with the correlations seen in the original Zuckerman et al. (1978) paper. They acknowledge that while TA and ES show strong correlations across sex and culture with *r*-vales ranging from 0.27 to 0.42 ($P < 0.01$), TA demonstrates a weak relationship with DS and BS, especially in male samples. Furthermore, the DS and BS subscales correlations consistently represent the most robust correlations with *r*-values ranging from 0.37 to 0.48 ($P < 0.01$).

In previous studies, especially those showing NPGs to have greater SSS-V total scores than PGs, the NPGs have tended to display higher TA and ES scores, even when these differences do not reach significant levels (see Table 1). However, PGs are likely to have BS and DS scores that are equal to or higher than those seen in NPGs. Several studies that investigate pathological gambling and SS only report the SSS-V total score and do not report subscale values (e.g., Anderson and Brown 1984; Dickerson et al. 1987; Parke et al. 2004).

Due to the relatively small number of studies that report subscale scores, only a portion of the studies included in Hammelstein's (2004) meta-analysis (7 of 16) could be used in a new meta-analysis of the four subscale scores. As can be seen in Table 1, the average effect size of the total SSS-V score across the included studies ($d = -0.37$) reaffirms Hammelstein's major finding. However, only two of the four subscales show an average effect size of greater than 0.2: TA, with an average effect size of $d = -0.32$, and ES, with an average effect size of $d = -0.22$. Again, with the negative effect sizes indicating that NPGs score higher on these subscales than PG groups. The combination of Hammelstein's conclusion regarding the total SSS-V score and the new information gathered from the smaller, more specified meta-analysis indicate that there may be some type of relationship at play between gambling behavior and subscale scores, which would in turn influence the total score.

SSS-V scores tend to be highest in the 16- to 19-year-old age group (Ball et al. 1984; Zuckerman et al. 1978) and these elevated levels of SS behavior may be expressed through gambling related activities. According to Petry (2006), the prevalence of pathological gambling in adolescents is 3.9%, compared to the 1.6% prevalence rate for adults. Other studies have indicated even higher rates of pathological gambling for adolescents, with some as high as 4.7% (Gupta and Derevensky 1998), 5.8% (Adlaf and Ialomiteanu 2000), 16% (Gerdner and Svensson 2003), or even as high as 19.3% (Ladouceur et al. 2005). Although the idea has not been extensively explored, Gupta et al. (2006) suggest that probable pathological gambling in adolescents can be best predicted when utilizing models that include DS and BS among other factors unrelated to SS (i.e., conformity, cheerfulness, self-discipline, and excitability). The primary purpose of the current study is to investigate how the individual subscale scores of the SSS-V could be affecting the total score in such a

Table 1 Means, standard deviations, and effect sizes for SSS-V total and subscale scores from previous gambling studies

	Total			DS			BS			TA			ES		
	PG	NPG	*d*	PG	NPG	*d*	PG	NPG	*d*	PG	NPG	*d*	PG	NPG	*d*
1.	14.60 (4.90)	17.33 (5.28)	−0.54	3.15 (3)[a]	4.22 (6)[a]	–	2.89 (1.63)	2.52 (2)[a]	–	3.93 (2.50)	5.48 (6)[a]	–	4.63 (1.98)	5.11 (6)[a]	–
2.	17.45 (5.85)	20.20[b] (6.9)	−0.43	4.98 (2.26)	4.8 (2.7)	0.07	3.51 (1.60)	3.5 (2.1)	0.00	4.90 (2.55)	6.4 (2.8)	−0.56	4.09 (2.30)	5.4 (2.2)	−0.58
3.	14.8 (4.4)	21.8 (4.4)	−1.59	2.4 (1.2)	3.9 (1.5)	−1.10	3.9 (1.7)	6.2 (1.5)	−1.43	4.3 (2.4)	6.07 (2.03)	−0.80	4.2 (1.09)	5.6 (2.05)	−0.85
4.	17.54 (7.01)	17.54 (5.98)	0.00	4.67 (1.70)	5.12 (2.18)	−0.23	4.52 (2.80)	5.25 (4.52)	−0.19	3.33 (1.89)	2.87 (1.85)	0.25	5.00 (2.46)	5.02 (2.46)	−0.00
5.	20.91 (5.72)	21.40[c] (5.97)	−0.08	4.64 (2.36)	4.47 (2.02)	0.08	4.28 (1.84)	3.95 (1.89)	0.18	6.61 (2.34)	7.17 (2.30)	−0.24	5.28 (1.87)	5.87 (1.71)	−0.33
		23.20[d] (5.92)	−0.39		5.53 (2.26)	−0.39		4.02 (2.09)	0.13		7.55 (2.07)	−0.43		6.26 (2.05)	−0.50
6.	16.86 (7.38)	17.53 (7.96)	−0.09	4.59 (2.91)	4.64 (2.73)	−0.02	3.91 (2.24)	3.48 (2.24)	0.19	4.25 (2.74)	5.23 (7.96)	−0.16	4.10 (2.04)	4.26 (1.96)	−0.08
7.	22.07 (22.95)	18.53 (19.57)	0.17	6.23 (6.56)	4.16 (4.62)	0.36	3.53 (1.41)	1.80 (1.36)	1.25	NR	NR	–	6.17 (1.87)	4.67 (2.01)	0.77
Mean *d*			−0.37			−0.18			0.02			−0.32			−0.22

Notes: Only studies that reported subscale scores for the SSS-V are included. Negative *d* values indicate greater NPG scores as compared to PG scores

The table is divided in such a way that studies 1–3 represent those in which NPGs have greater SSS-V total scores, studies 4–6 represent those in which NPGs have SSS-V total scores equal to PGs, and study 7 represents studies in which PGs have greater SSS-V total scores

1. Blanco et al. (1996); 2. Blaszczynski et al. (1986); 3. Carrasco et al. (1994); 4. Blaszczynski et al. (1990); 5. Bonnaire et al. (2004); 6. Coventry and Brown (1993); 7. Kuley and Jacobs (1988)

NR value not reported in original paper

[a] Median value reported instead of SD reported in original paper. Therefore, effect sizes are not calculated for these values

[b] General population scores taken from Ball et al. (1984)

[c] NPG group represents "regular gamblers"

[d] NPG group represents "nongamblers"

way that creates a misrepresentation of the relationship between SS and gambling behavior.

Methods

Participants

We utilized diagnostic gambling measures and a general measure of SS to identify how self-reported SS behavior may be associated with pathological gambling status, in two separate samples.

Sample 1. The sample consisted of 81 undergraduate students (86% male) aged 17–29 ($M = 18.76$, SD = 1.49) from the Psychology department research pool at the University of Georgia who participated in exchange for class credit. When volunteering for this study online, participants read a brief description of the study that indicated that those signing up should be "frequent gamblers", defined as participating in gambling-related activities at least once a week.[1]

Sample 2. Participants included 212 men (71.9%) and 83 women (28.1%) ranging in age from 17- to 27-years-old ($M = 19.17$, SD = 1.28) from the Psychology department research pool at the University of Georgia who participated in exchange for class credit. The recruiting message informed participants that they should be frequent gamblers according to the same standard as Sample 1.

Measures

Diagnostic Interview for Gambling Severity (*DIGS*; Winters et al. 1996). The DIGS assesses gambling involvement by using questions that require participants to indicate whether each scenario regarding their personal gambling behavior is very true, somewhat true, or false (e.g., "Have you frequently thought about ways of getting money with which to gamble?"). Questions are grouped into pairs and any combination of answers other than false-false results in the participant receiving a point. The total score is assessed on a scale of 1 to 10, with a score of 5 or higher indicating pathological gambling status.

The South Oaks Gambling Screen (*SOGS*; Lesieur and Blume 1987). As with the DIGS, individuals are considered to be PGs if they obtain a score of 5 or higher on the SOGS. Although originally developed according to the DSM-III criteria, the SOGS continues to sustain a strong relationship with DSM-IV criteria (Stinchfield 2002). The SOGS has also recently been identified as the best measure for identifying pathological gambling in college students, as compared to the DIGS and MAGS-DSM-IV (Weinstock et al. 2007), and shows good test–retest reliability of 0.71 (Lesieur and Blume).

Sensation Seeking Scale Form V (*SSS-V*; Zuckerman et al. 1978). The SSS-V measures SS interests with 40 questions divided into four subscales: Thrill and Adventure Seeking (TA), Experience Seeking (ES), Disinhibition (DS), and Boredom Susceptibility (BS). A total SS score is calculated as well as scores for the individual subscales. Participants can earn a score of 0–10 on each of the four subscales, with the total score ranging from 0 to 40.

[1] We recruited this relatively small sample as part of a longitudinal study with the intention of testing hypotheses regarding changes in gambling severity over time, which were not supported. The data reported here were obtained in the first wave of data collection.

Procedure

Participants were seated at individual computer stations divided by partitions, where they completed the designated measures in the MediaLab environment. Plans for data analysis focused on identifying the underlying relationship between SSS-V scores and PG measures (i.e., DIGS and SOGS scores). With the main purpose of the research being to uncover the influence of the individual subscales on the SSS-V total score, we planned to run *t*-tests to assess mean differences between PG and NPG groups on each of the four subscales. Correlational analyses were also planned in order to observe the relationships among the subscales and how these relationships might impinge on the relationship between PG and SS.

Results

Sample 1

PG status. The two measures of pathological gambling, the DIGS and SOGS, showed strong correlations with one another with Pearson's $r = 0.72$, $P < 0.001$. For the purpose of this study, PG status of the participants was based on the combination of their DIGS and SOGS scores. In order to be classified as a PG, a participant had to earn a score of 5 or higher on *both* the DIGS and the SOGS. Using this diagnostic criterion, 16 of the 81 participants, nearly 20% of the sample, were identified as PGs. The large number of PGs acquired in this sample can be attributed to two factors: the higher prevalence of PG seen in college-aged samples and the specific recruitment of frequent gamblers. Although not all frequent gamblers are PGs, recruiting frequent gamblers increases the likelihood of finding PGs in the sample.

SSS-V. Kurtosis and Skewness values for all scales remained between ± 1, indicating that the data most likely conformed to a normal distribution and were amenable to parametric testing. Correlations among subscales are similar to those found in the original Zuckerman et al. (1978) study (see Table 2). While the TA and ES subscales had a relatively strong relationship ($r = 0.406$, $P < 0.001$), the TA subscale did not show significant correlations with DS or BS. As can be seen in Table 3, the total SSS-V score significantly correlated with both DIGS and SOGS scores. However, after taking multiple comparisons into account, the correlation between the DIGS score and SSS-V total score no longer met significance at the corrected Bonferroni *P*-value ($P < 0.005$). The DS and BS subscales also had significant

Table 2 Correlations among SSS-V subscale scores for Samples 1 and 2

	Sample 1				Sample 2			
	TA	ES	DS	BS	TA	ES	DS	BS
ES	0.406**	–	–	–	0.302**	–	–	–
DS	0.175	0.364**	–	–	0.270**	0.324**	–	–
BS	0.192	0.262*	0.409**	–	0.145*	0.106	0.294**	–
Total	0.675**	0.718**	0.738**	0.615**	0.671**	0.655**	0.751**	0.540**

Note: After accounting for multiple comparisons, the BS and ES correlation in Sample 1 and the BS and TA correlation in Sample 2 no longer meet significance

* $P < 0.05$; ** $P < 0.001$

Table 3 Correlations between SSS-V subscale and total scores and diagnostic gambling measures

	TA	ES	DS	BS	SSS total
Sample 1[a]					
DIGS	0.037 (NS)	0.043 (NS)	0.344**	0.290**	0.258*
SOGS	0.026 (NS)	0.163 (NS)	0.358***	0.343**	0.313**
Sample 2[b]					
DIGS	0.109 (NS)	0.049 (NS)	0.194***	0.299***	0.240***
SOGS	0.047 (NS)	0.141*	0.243***	0.266***	0.259***

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$

[a] After accounting for multiple comparisons, the BS and SSS total correlations with DIGS no longer met significance

[b] After accounting for multiple comparisons, the correlation between ES and SOGS no longer met significance

Table 4 SSS-V subscale reliabilities (Cronbach's alpha)

	Zuckerman et al. (1978)[a]	Sample 1	Sample 2
TA	0.77	0.78	0.76
ES	0.61	0.50	0.60
DS	0.74	0.79	0.75
BS	0.57	0.31	0.48
Total	0.84	0.80	0.79

[a] Based on the male American sample

correlations with both the DIGS and the SOGS; however, with a *P*-value of 0.009, the DS correlation with the DIGS did not remain significant at the corrected alpha. Neither the TA nor the ES subscales correlated with the pathological gambling measures. The internal consistencies of the subscales as measured by Cronbach's alpha were also similar to those found in the original Zukerman et al. study (see Table 4), especially for the TA and DS subscales and the total SSS-V score. The internal consistencies for the ES and BS subscales were slightly lower than those seen in the original paper.

Differences between PGs and NPGs are depicted in Table 5. There was no significant difference between the means for PGs and NPGs for the total SSS-V score. There was also

Table 5 Means, standard deviations, *t* values, and effect sizes (*d*) for PG and NPG SSS-V subscale and total scores

	Sample 1				Sample 2			
	PG	NPG	*t*	*d*	PG	NPG	*t*	*d*
TA	6.75 (2.77)	7.00 (2.65)	0.738	0.09	7.56 (2.12)	7.37 (2.52)	0.550	0.08
ES	4.18 (2.29)	4.29 (1.98)	0.855	0.05	5.44 (2.29)	4.89 (2.11)	1.98*	0.25
DS	6.69 (2.94)	5.82 (2.75)	0.265	0.31	6.62 (2.23)	5.72 (2.71)	2.72**	0.36
BS	4.50 (1.67)	3.88 (1.75)	0.201	0.36	4.56 (2.20)	3.30 (1.64)	5.38**	0.65
Total	22.13 (7.02)	20.98 (6.25)	0.638	0.17	24.17 (5.77)	21.29 (5.94)	3.82**	0.49

Note: After accounting for multiple comparisons, the mean difference for ES and DS no longer meet significance

* $P < 0.05$; ** $P < 0.01$

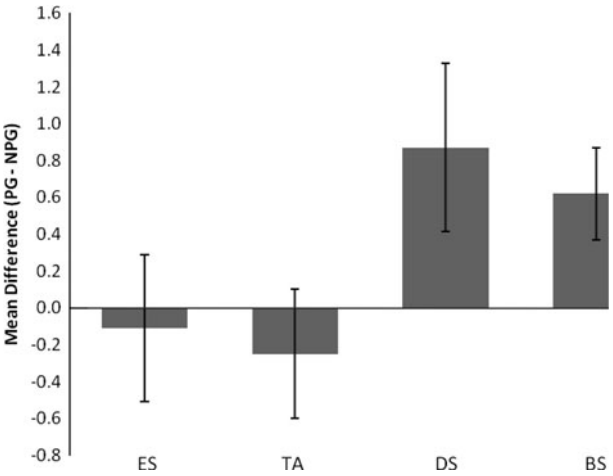

Fig. 1 Mean differences across SSS subscales between PG and NPG groups for Sample 1

no significant difference between NPGs and PGs on any subscales. There was a significant main effect for subscales (SD = 23.2, $P < 0.001$) but there was not a significant interaction between subscale and PG status. However, it is clear in Fig. 1 that mean differences between PGs and NPGs were greater for the DS and BS subscales than for the TA and ES subscales.

Although *t*-tests did not reveal significant categorical differences, a connection between pathological gambling and SS is supported by the significant correlations seen between the SSS-V total score and DIGS and SOGS scores with the correlation between SSS and SOGS remaining significant even when correcting for multiple comparisons, as shown in Table 3. The DS and BS subscales show a strong correlation, which mirrors results seen in Zuckerman et al.'s work.

Sample 2

The purpose of Sample 2 was to replicate the results from Sample 1 with a larger sample in hopes of achieving more reliable results. It was hypothesized that PGs would display greater SSS-V total scores than NPGs and that this would be attributable to inflated DS and BS scores seen in that group. Although the samples were acquired approximately one year apart, which could introduce inter-sample variability due to temporal factors, recruiting methods were identical and the sample demographics remained relatively stable over time. Therefore, any identifiable differences between Sample 1 and Sample 2 results should reflect the larger sample obtained in the second sample.

PG status. As in Sample 1, PG status of the participants was based on the combination of their DIGS and SOGS scores with a score of 5 or higher on *both* the DIGS and the SOGS establishing a PG status. The percentage of PGs in the Sample 2 was greater than that seen in Sample 1, with 86 participants (29%) meeting the criterion. Of those labeled as PGs, the mean scores were clearly greater than the cut-off score of 5 on both the DIGS ($M = 6.80$, SD = 1.55) and the SOGS ($M = 8.17$, SD = 2.60).

SSS-V. As with Sample 1, the SSS-V data appear to correspond to a normal distribution as based upon Kurtosis and Skewness values near zero. The internal consistency of the

total score and the subscales is again consistent with reliability values seen in Zuckerman et al.'s (1978) article (see Table 4). The inter-subscale correlations are similar to those seen in Sample 1, in that the TA and ES subscales and the DS and BS subscales still show the strongest correlations (see Table 2). However, whereas in Sample 1 the TA subscale only correlated with the ES subscale, in Sample 2 the TA subscale correlated with DS and BS as well, although the strongest correlation remained that between TA and ES. Furthermore, after correcting *P*-values to reflect multiple comparisons, the correlation between TA and BS no longer met significance. The correlations between the SSS-V subscales and the pathological gambling measures are similar to those seen in Sample 1. The DS and BS subscales and the total SSS-V score significantly correlated with the DIGS and SOGS scores even after correcting for multiple comparisons (see Table 3).

These relationships are further reflected in the significant mean differences seen in the total SSS-V score between PGs and NPGs (see Table 5). We hypothesized that the higher total score for PGs suggests that there should also be significant mean differences for the DS and BS subscales, with PGs scoring higher than NPGs in these areas. As predicted, the DS and BS scores for PGs were significantly higher than those seen for NPGs. However, the *P*-value of 0.007 for the mean difference for the DS subscale did not meet significance at the familywise corrected alpha value. As in Sample 1, there was no significant mean difference for PGs and NPGs on the TA subscale ($t = 0.598$, $P = 0.55$), although there was a significant mean difference for the ES subscale, with PGs scoring higher than NPGs. It can be seen that the effect size was smaller than those of DS and BS (see Table 5), and in the direction of greater SS for PGs, contrary to the findings of the meta-analysis presented earlier. Furthermore, after correcting for familywise error, this mean difference for ES was no longer significant.

In Sample 2 there was also a significant interaction between subscale and PG status ($F = 3.28$, $P < 0.05$). As can be seen in Fig. 2, the greatest subscale differences between PGs and NPGs were on the DS and BS subscales. We created composite scores, with TA and ES representing one composite and DS and BS representing another. A multivariate test of the composite scores also reveals in a significant interaction with PG status ($F = 7.09$, $P < 0.01$).

As predicted, utilization of a larger sample led to mean differences reaching significance in the crucial comparisons. For the most part, the SSS-V scores mirrored those seen in

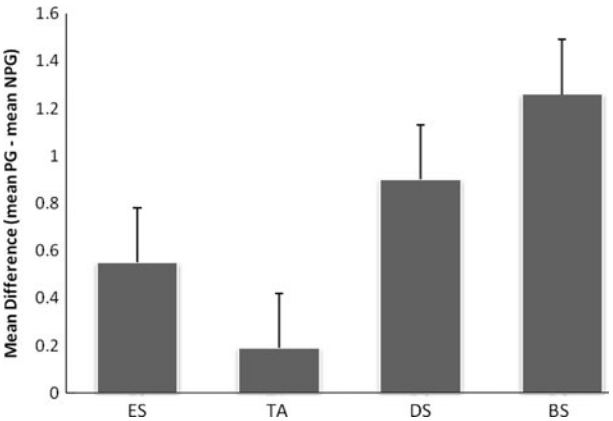

Fig. 2 Mean differences across SSS subscales between PG and NPG groups for Sample 2

Sample 1, with PGs having higher total scores and higher BS and DS scores than NPGs. The replication of the results from Sample 1 suggest that the DS and BS subscales play particularly important roles in the total SSS-V score for PGs.

Discussion

Historically, research on the relationship between SS and PG is divided and has reached all three of the possible conclusions: a positive relationship, a negative relationship, or no relationship at all. Based on Hammelstein's meta-analysis, which concluded that NPGs are more sensation seeking than PGs overall, Sample 1 set out to implicate the power of the TA and ES subscales in the elevation of the total SSS-V score for those individuals classified as NPGs. However, results from both Sample 1 and Sample 2 showed that PGs were greater sensation seekers than NPGs, which, although different from Hammelstein's conclusion, is consistent with a portion of the prior research. In addition to having higher total scores, PGs also displayed greater DS and BS subscale scores. These mean differences approached significance in Sample 1, which was fettered by a small sample size, and were highly significant in Sample 2. The strong correlations seen between the designated subscales in Sample 1 speak to the strength of their relationship despite nonsignificant *t*-test results. These results give rise to two important questions: First, why does it appear in the prior literature that the higher SSS-V total scores in NPGs are connected to higher ES and TA scores and higher SSS-V total scores in PGs are connected to higher DS and BS scores? Second, what accounts for the diversity of findings regarding whether PG and SS are positively related, negatively related, or unrelated?

The first question focuses on the relationship seen between certain subscales and PG status. Literature on SS and addiction as well as genetic research on the SSS-V lends support to the idea that there is a connection between the DS and BS subscales. PGs appear to score higher on these subscales, but why is this the case? We suggest that the four SSS-V subscales diverge into two separate constructs, as indicated by previous alcohol and substance abuse literature (Finn et al. 2000; Justus et al. 2000; Koopmans et al. 1995). One construct, expressed by the DS and BS subscales, highlights past experiences whereas the other, expressed by TA and ES, highlights desires that may or may not be reflected in behaviors. In the DS subscale, most items focus on past behaviors or actual experiences in which the person has participated, including declarations such as "I like" or "I enjoy" (e.g., "I like to get high."). The BS subscale also focuses on actual life experiences and feelings regarding those experiences (e.g., "I get very restless if I have to stay around home for any length of time."), which leads to DS and BS being joined together in a construct reflecting SS *behavior* (see Appendix for a complete listing of subscale items).

In contrast, eight of the ten items on the TA subscale are hypothetical in nature, including declarations such as "I would" or "I wish" (e.g., "I would like to take up the sport of water skiing."). The ES scale encompasses a mixture of statements based on hypothetical situations and those based on past behaviors. We propose that the ES scale is more closely related to the TA subscale, and therefore is viewed as belonging to the construct reflecting hypothetical SS behavior. This is based partly on the original correlations for the SSS-V subscales listed in Zuckerman et al.'s (1978) study and partly on correlations from the current studies, which show that the TA subscale is most highly correlated with the ES subscale. Because pathological gambling is conceptualized as both an ICD and an addictive disorder, intuitively one would expect PGs to display more SS behavior. However, if certain subscales of the SSS-V reflect hypothetical scenarios rather

than actual experiences and behaviors, then NPGs may score the same or higher than PGs on the more hypothetical subscales. This may help to explain why research investigating the relationship between SS and gambling thus far is inconsistent. The hypothetical nature of the questions included in the TA and ES subscales allow for speculative interpretation, meaning that those who interpret the data must assume that the participants' noted desire to participate in certain activities accurately reflects behaviors that those participants have displayed or will display in the future. Even when people indicate that they would "like to try parachute jumping" (a statement from the TA subscale), this does not necessarily mean that they would actually follow through with this behavior if given the opportunity.

When defining the concepts of TA and DS, Zuckerman et al. (1978) use the term "desire" in both definitions, but one key word sets them apart. Whereas TA is "a desire to engage in sports or other activities involving speed or danger", DS is "the desire for social and sexual disinhibition as *expressed* [emphasis added] in social drinking, partying, and variety in sexual partners" (p. 140). Even though both of these subscales reflect a desire to participate in certain SS activities, only DS manifests or expresses that desire through defined behavior. The lack of behavioral expression in the TA subscale allows its statements to remain hypothetical in nature. Because the inability to control desires and suppress action largely defines the distinction between PGs and NPGs, ambiguity regarding the difference between actual and hypothetical behavior in TA and ES may account for the low scores in these subscales that have led some researchers to the unintuitive conclusion that PG is associated with lower SS.

Why would NPGs endorse hypothetical sensation seeking behaviors more than PGs? Some evidence exists as to why PGs would be unlikely to score high on the TA subscale, but it is less clear why NPGs would be likely to score high on the ES subscale. Perhaps PGs do not score high on this scale because the types of activities incorporated in the scale (e.g., scuba diving, waterskiing, etc.) do not appeal to them. These types of activities may not incorporate the *type* of excitement that PGs are looking for. Specifically, PGs may be especially motivated by the lure of potential monetary gain (Dzik 2006), and these types of activities would certainly not cater to that need. The motives that PGs cite for participating in other recreational activities that are unrelated to gambling provide some insight into what stimulates them. While winning moves to the bottom of the list as a motive for NPGs to participate in various recreational activities, winning is still indicated as the sixth leading motive out of 23 possible motives for PGs to participate in a recreational activity (Platz and Millar 2001). If PGs know that the types of activities mentioned in the TA subscale will not provide the type of thrill that they are looking for, they will have no problem indicating that they would not like to participate in them. Also, the studies in which PGs expressed lower TA and ES scores were typically those in which the PG groups were seeking treatment. Individuals who are actively seeking treatment may be indirectly attenuating their subjective perceptions of engagement in future risk taking related to the expression of thrill, adventure, and excitement seeking, even as they continue to have difficulty with abstaining from activities related to disinhibition and boredom susceptibility.

Another possible explanation for the elevated DS and BS scores seen for the PG group in the current research could be related to the narrow age range of the samples, which is to be expected when utilizing an undergraduate research pool at a university. It is possible that the differences seen between PGs and NPGs on the total SSS-V score and the BS and DS subscale scores are specific to that age group, such that elevated BS and DS scores would not be found in older PGs. The elevated scores for PGs in these two behaviorally-based subscales could be an artifact of a more active and risky lifestyle typical of college-aged individuals.

Limitations and Future Directions

The diverging implications of considering pathological gambling as both an ICD and an additive disorder are ripe for consideration in future research. Perhaps characteristics from one of these classification groups have more bearing on SS personality than the other. For example, perhaps the inability to control impulses is more responsible for the specific type of SS seen in PGs than the characteristics identified by addictive disorders. Although past research has investigated the relationship of SS to alcohol and drug addictions, as with pathological gambling research, they typically focus on the SSS-V total score and neglect the impact of the individual subscales. The proposal that the SSS-V subscales may be grouped together to identify behavioral and hypothetical SS needs to be further explored. Perhaps being put in a situation where the participants may actually have to take part in risky activities such as bungee jumping or skydiving would make them re-evaluate their responses.

Research on the relationship between SS and gambling has devoted insufficient focus to the diverse facets of SS, as represented by the SSS-V subscales, and how and why these may differ for PGs and NPGs. The typical traits of PGs, which are characteristic of ICDs and addiction disorders, make it likely that they would represent a distinctive type of sensation seeker that may be best identified by particular SS dimensions, like those outlined by the DS and BS subscales. Future research should consider the possibly divergent patterns of SS and its subscales in different PG populations. Furthermore, it might prove useful to investigate the SS differences, if any, that might exist between PGs and subthreshold PGs (i.e., individuals who have scores ranging from 2 to 4 on the DIGS or SOGS). Just as there are unique SS aspects identified for PGs, there may also be unique SS aspects seen in subthreshold groups. A longitudinal study would be an excellent means for exploring this concept; this would give researchers the ability to track increasing and decreasing scores on the DIGS and SOGS that correspond to similar changes in SS scores. This is an important concept to explore, especially when using samples that include college-aged individuals who are frequent gamblers and who could easily make the transition from a subthreshold PG group to a PG group.

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Appendix

Thrill and Adventure Seeking (TA)

I often wish I could be a mountain climber.
I sometimes like to do things that are a little frightening.
I would like to take up the sport of water skiing.
I would like to try surfboard riding.
I would like to learn to fly an airplane.
I would like to go scuba diving.
I would like to try parachute jumping.
I like to dive off the high board.
I would like to sail a long distance in a small but seaworthy sailing craft.
I think I would enjoy the sensations of skiing very fast down a high mountain slope.

Experience Seeking (ES)

I like some of the earthy body smells.
I like to explore a strange city or section of town myself, even if it means getting lost.
I have tried marijuana or would like to.
I would like to try some of the new drugs that produce hallucinations.
I like to try new foods that I have never tasted before.
I would like to take off on a trip with no preplanned or definite routes or timetables.
I would like to make friends in some of the "far-out" groups like artists or "hippies."
I would like to meet some persons who are homosexual (men or women).
I often find beauty in the "clashing" colors and irregular form of modern painting.
People should dress in individual ways even if the effects are sometimes strange.

Disinhibition (DS)

I like wild "uninhibited" parties.
I enjoy the company of real "swingers."
I often like to get high (drinking liquor or smoking marijuana).
I like to have new and exciting experiences and sensations even if they are a little unconventional or illegal.
I like to date members of the opposite sex who are physically exciting.
Keeping the drinks full is the key to a good party.
A person should have considerable sexual experience before marriage.
I could conceive of myself seeking pleasures around the world with the "jet set."
I enjoy watching many of the "sexy" scenes in movies.
I feel best after taking a couple of drinks.

Boredom Susceptibility (BS)

I can't stand watching a movie that I've seen before.
I get bored seeing the same old faces.
When you can predict almost everything a person will do and say, he or she must be a bore.
I usually don't enjoy a movie or a play where I can predict what will happen in advance.
Looking at someone's home movies or travel slides bores me tremendously.
I prefer friends who are excitingly unpredictable.
I get very restless if I have to stay around home for any length of time.
The worst social sin is to be a bore.
I like people who are sharp and witty even if they do sometimes insult others.
I have no patience with dull or boring persons.

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