



# The personality of pathological gamblers: A meta-analysis

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## ABSTRACT

This review summarizes studies of pathological gambling and personality. Meta-analyses were conducted on 44 studies that reported personality traits of pathological gamblers (N = 2134) and nonpathological gambling control groups (N = 5321). Effect size estimates were calculated for 128 comparisons and organized according to the factors associated with two integrative accounts of personality. Four of the meta-analyses examined traits that have previously been found to load on the Urgency, Premeditation, Perseverance, and Sensation Seeking aspects of impulsivity (Whiteside & Lynam 2001). Substantial effects were found for traits associated with Negative Urgency (Cohen's  $d = .99$ ) and Low Premeditation ( $d = .84$ ), but not for Low Perseverance or Sensation Seeking. A second set of meta-analyses examined broad domains of personality that have previously been found to load on Negative Affect, Positive Affect, Disagreeable Disinhibition, and Unconscientious Disinhibition (Markon, Krueger, & Watson, 2005). Substantial effects were found for Unconscientious Disinhibition ( $d = .79$ ), Negative Affect ( $d = .50$ ), and Disagreeable Disinhibition ( $d = .50$ ), but not Positive Affect. It was concluded that these individual personality characteristics may be important in the etiology of pathological gambling. The personality profile implicated in the etiology of pathological gambling is similar to that found in a recent meta-analysis of substance use disorders (Kotov, Gamez, Schmidt, & Watson, 2010). These results suggest that pathological gambling may be part of a broad cluster of externalizing psychopathology, and also call into question the current classification of pathological gambling as an Impulse Control Disorder in the DSM-IV.

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## 1. Introduction

Problem gambling is the inability to resist recurrent urges to gamble excessively despite harmful consequences to the gambler or others. The *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2000) classifies pathological gambling (PG) as an Impulse Control Disorder that is defined by the presence of at least five symptoms that cause significant distress or impairment in social, family or occupational areas of life and that are not otherwise explained. Some of the symptoms are similar to phenomena seen in substance use disorders (i.e., mood alteration, tolerance, withdrawal, loss of control and preoccupation with gambling), and some are more specific to gambling behavior and consequent financial difficulties (i.e., chasing losses, lying about losses, harm to relationships or occupation, seeking a financial bailout, and committing illegal acts to obtain money). Symptoms of PG may be assessed as part of a clinical diagnostic interview or by psychometrically validated self-report scales. These include the National Opinion Research Center DSM-IV Screen for Gambling Problems (NODS) (Gerstein et al., 1999), the South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987), the Gamblers' Anonymous Scale (GA20) (Ursua & Uribealarea, 1998), and the Canadian Problem Gambling Severity Index (PGSI) (Ferris & Wynne, 2001).

In recent years, the trend toward increased access to gambling as a legal form of entertainment has contributed to incidence of PG. Estimates of the lifetime prevalence of PG in countries with legalized gambling range from 0.15 to 2.1% according to DSM-IV criteria, from 0.2 to 3.5% when symptoms are reported with the SOGS, and 0.5–1.4% with the PGSI (Stucki & Rihs-Middel, 2007). In one national representative survey, 54.5% of 9282 American adults reported gambling at least ten times in their lives, with 10.1% having gambled more than 1000 times, and 0.6% had at some point met the DSM-IV criteria for PG (Kessler et al., 2008).

General population surveys have found a high comorbidity of PG and other Axis I clinical syndromes. Pathological gamblers have elevated rates of substance use disorders (Bland, Newman, Orn, & Stebelsky, 1993; Cunningham-Williams, Cottler, Compton, & Stipznagel, 1998; Gerstein et al., 1999; Welte, Barnes, Wiczorek, Tidwell, & Parker, 2001) as well as mood and anxiety disorders (Kessler et al., 2008; Petry, Stinson, & Grant, 2005). Individual characteristics such as Negative Affect and disinhibition are strongly associated with these syndromes and with externalizing behavior generally (Krueger, Markon, Patrick, Benning, & Kramer, 2007). When present in unusual combinations, these personality traits may be symptomatic of a dimension that ranges from normality to dysfunction. Extremes of personality may be considered a form of psychopathology in their own right, and are currently described by the DSM-IV as Axis II personality disorders (Widiger, Livesley, & Clark, 2009). These individual characteristics have been studied extensively in the context of PG, and are the focus of the present study.

### 1.1. Personality and PG

Antisocial and Borderline personality disorders occur at disproportionately high rates in clinical PG samples (Bagby, Vachon, Bulmash, & Quilty, 2008; Blaszczynski & Steel, 1998; Fernandez-Montalvo & Echeburua, 2004; Pietrzak & Petry, 2005; Sacco, Cunningham-Williams,

Ostmann, & Spitznagel, 2008), and the excessive reward-seeking behavior that is typical of these conditions may be an important contributor to PG. This is illustrated by the 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions. Among the 43,093 American adults surveyed, a tiny percentage (0.42%) had PG, but 60.8% of those with PG also had features indicating at least one of the Axis II personality disorders, including 23.3% with Antisocial personality disorder (Petry et al., 2005). No assessments were made of Borderline, Narcissistic, or Schizotypal features, so these figures likely *underestimate* the total prevalence of people with PG who also have symptoms of personality disorder.

Antisocial and Borderline personality disorders are debilitating conditions that are characterized by low Agreeableness and low Conscientiousness in the Five-Factor Model of personality (FFM) (Costa & McCrae, 1992), as well as non-normative scores on four facets of impulsivity (Samuel & Widiger, 2008). A recent meta-analysis has also found this same combination of traits to coincide with alcoholism and other substance use disorders (Kotov, Gamez, Schmidt, & Watson, 2010). If some trait or combination of traits is a mechanism linking PG with these personality and substance use disorders, then the most likely candidates might be impulsive and antagonistic traits. Current classification of PG as an Impulse Control Disorder would suggest some form of impulsiveness as the critical trait, but an alternative view would include PG as part of a wider cluster of externalizing behaviors that co-vary with the traits that typify substance use and cluster B personality disorders.

Classification of PG as an Impulse Control Disorder may be called into question if its temperamental risk profile is more similar to that of externalizing behaviors. Antagonistic personality traits have long been recognized to play a role in substance use and in Borderline and Antisocial personality disorders (Ball, 2005), but not in Impulse Control Disorders. The present review tested adequacy of these two conceptions in a series of meta-analyses of studies that measured the personality traits of pathological gamblers. These meta-analyses were organized around two integrative accounts of adult personality: the Whiteside and Lynam (2001) model of impulsivity, and the Markon, Krueger, and Watson (2005) Hierarchical Structural Model (HSM) of personality. We hypothesized that PG would be associated with some aspects of impulsivity because these traits are known to be common to both Impulse Control Disorders as well as substance use and cluster B personality disorders. We further hypothesized that disagreeable disinhibitory traits would be associated with PG, and that such a finding would support the conception of PG as a condition more akin to other externalizing syndromes rather than to the behaviors that are classed as Impulse Control Disorders.

### 1.2. The Urgency, Premeditation, Perseverance and Sensation Seeking model of impulsivity

There are several well-established self-report measures of impulsivity that have been used in the study of PG. The UPPS model of impulsivity (Whiteside & Lynam, 2001) integrates many of these measures into an empirically derived set of four dimensions. These dimensions were identified in a seminal factor analytic study of 10 prevalent impulsivity scales and their subscales. The scales loaded onto four different factors, each one reflecting a somewhat different

aspect of impulsivity. In addition, Whiteside and Lynam identified individual questionnaire items that had the strongest loadings on each of the four factors and used these to develop the UPPS scales. Both the UPPS scales, as well as the original scales from which they were derived, indirectly tap latent constructs that correspond to four aspects of individuals' predisposition toward impulsive behavior. These constructs are assumed to reflect objectively real individual differences, but their measurement is atheoretical in the sense that no specific psychological or biological mechanisms are explicitly assumed to underlie them.

The four factors of the UPPS model are Negative Urgency, Low Premeditation, Low Perseverance, and Excitement Seeking. A fifth factor, Positive Urgency, has more recently been proposed (Cyders & Smith, 2008), but it is not considered in the current review because no studies have been published that compared the Positive Urgency of people with PG against that of nonpathological gamblers. UPPS Negative Urgency is the tendency toward rash and emotionally motivated action. According to the Whiteside and Lynam factor analysis, it is statistically associated with the Urgency facet of Neuroticism in the FFM and with the Attentional Impulsivity subscale of the Barratt Impulsiveness Scale (BIS) (Patton, Stanford, & Barratt, 1995). UPPS Low Premeditation is the tendency to act without adequate consideration of consequences. It is associated with the Nonplanning Impulsiveness subscale of the BIS, with high scores on the Eysenck Impulsivity scale (Eysenck, Pearson, Easting, & Allsopp, 1985), the Impulsiveness scale of the Temperament and Character Inventory (TCI) (Cloninger, Przybeck, Svrakic, & Wetzel, 1994), and with low scores on the Deliberation facet of FFM Conscientiousness. UPPS Low Perseverance is the tendency toward the quick extinction of nonrewarded behavior. It is associated with high scores on the Boredom Susceptibility subscale of the Sensation Seeking Scale (SSS-V) (Zuckerman, 1994), and with low scores on the Self-Discipline facet of FFM Conscientiousness. UPPS Sensation Seeking is the tendency toward behavior that results in novel and varied sensory stimulation and psychomotor arousal, and it is associated with high scores on the SSS-V Disinhibition subscale, Eysenck's Venturesomeness scale, and the Excitement Seeking facet of FFM Extraversion.

### 1.3. The hierarchical structural model of personality

Several attempts have been made to identify a limited set of traits that may parsimoniously encompass the full variety of human emotion, cognition, and behavior. The most influential of these models assumes the number of factors necessary to explain individual variation to be two (Gray & McNaughton, 2000), three (Eysenck & Eysenck, 1976) or five (Costa & McCrae, 1992). These and other trait taxonomies (e.g., Cloninger et al., 1994; Digman, 1997; Krueger, 1999; Tellegen, 1982; Zuckerman, Kuhlman, Joireman, Teta, & Kraft, 1993), may all be objectively correct to some extent, even though they emphasize different psychobiological mechanisms. These disparate views were integrated into a unified model by Markon et al. (2005). This Hierarchical Structural Model (HSM) was tested both meta-analytically and by factor analysis, and included a variety of widely used personality trait inventories, as well as two measures of personality disorder. These measures, the Schedule for Nonadaptive and Adaptive Personality (SNAP) (Clark, 1993) and the Dimensional Assessment of Personality Pathology (DAPP) (Livesley & Jackson, 2002) are quite different from the other instruments. They were originally derived from clinical observations of psychiatric patients rather than factor analytic studies of questionnaires given to samples drawn from normative populations, and their inclusion broadens the scope of the HSM. The HSM is an attempt to integrate several important models of personality structure, and to expand their scope to cover the abnormal range of behavior as well as normality.

In the HSM, there are four levels of analysis and each level specifies individual differences using a different number of traits. The first level

includes two factors, which Markon et al. (2005) referred to as Alpha and Beta after Digman (1997). At this level, Alpha includes traits from various instruments that all share some similarity with Eysenck and Eysenck's (1976) notion of Psychoticism and Neuroticism, while Beta includes traits similar to Extraversion. At the second level of the HSM, Alpha is referred to as Positive Emotionality, while Beta is split into two sub-traits: Negative Emotionality and Disinhibition. This second level is similar to Tellegen's (1982) model of personality (i.e., Positive Affect, Negative Affect, and Constraint). At the third level of the HSM, Disinhibition is further subdivided into Unconscientious Disinhibition and Disagreeable Disinhibition. At this level, the three Alpha traits are approximately the same as Neuroticism, low Agreeableness, and low Conscientiousness in the FFM, as Harm Avoidance, low Cooperativeness, and Novelty Seeking in Cloninger's psychobiological model (Cloninger et al., 1994), and as Neuroticism-anxiety, Aggression-hostility, and Impulsive Sensation Seeking in the Alternative Five model of Zuckerman et al. (1993). Finally, at the lowest level of the HSM, Beta divides into FFM Extraversion and Openness to Experience.

Two features of the HSM are important for the present review. First, because the UPPS impulsivity traits are very similar to four of the FFM facets, and the HSM includes the FFM domains, all four of the UPPS impulsivity traits are ultimately subsumed within the HSM. Urgency (Negative Urgency in the UPPS) is a facet of FFM Neuroticism (Negative Emotionality in the HSM). Excitement Seeking (UPPS Sensation Seeking) is a facet of FFM Extraversion (HSM Positive Emotionality). Self-Discipline (UPPS Low Perseverance) and Deliberation (UPPS Low Premeditation) are both facets of FFM Conscientiousness (HSM Unconscientious Disinhibition). The HSM factors include the impulsivity facets but they are not equivalent to them, since each of the FFM domains includes a total of six facets. For instance, an individual might have elevated Urgency, but a Neuroticism score that is not atypical. Likewise, PG might be characterized by elevations on some of the UPPS impulsivity traits, but does not necessarily show elevations on the respective FFM domains or their respective HSM factors.

The second important feature of the HSM is that it allows personality to be modeled at one of four different levels of specificity. Because of the high comorbidity of PG and personality disorders, the appropriate level of analysis for the present review is the level at which the HSM most parsimoniously allows the Axis II personality disorders to be characterized. According to a meta-analysis of the FFM and personality disorders (Samuel & Widiger, 2008), these conditions can be specified as combinations of non-normative scores on four of the FFM domains: Neuroticism, Extraversion, Agreeableness and Conscientiousness. This corresponds closely to the third level of the HSM, which includes Negative Emotionality, Positive Emotionality, Disagreeable Disinhibition, and Unconscientious Disinhibition. None of the DSM-IV personality disorders was reliably associated with high or low scores on Openness or any of its facets. For the present review, we adopted the four-factor level of the HSM.

### 1.4. Predictions of the current study

Pathological gambling is an Impulse Control Disorder that has high comorbidity with personality disorders, especially Antisocial and Borderline. Both Antisocial and Borderline personality disorders are characterized by very high impulsivity and they both were found to have elevations on all four of the UPPS-related facets in the Samuel and Widiger meta-analysis. It is possible that the association between PG and the personality disorders may be an artifact of the impulsivity that is symptomatic of these conditions. If that is true, then the present meta-analyses might show elevations in the UPPS traits in PG groups relative to NPG groups, but no significant differences on other traits that are known to be associated with personality disorder (i.e., low FFM Agreeableness and other Disagreeable Disinhibition traits). Since Neuroticism (HSM Negative Emotionality) and low Conscientiousness

(HSM Unconscientious Disinhibition) are both typical of Antisocial and Borderline personality disorders, and since both have impulsivity traits as facets, we predicted these to show group differences across studies comparing PG to NPG. This pattern of results would support an impulsivity–PG hypothesis and would be consistent with the current diagnostic classification of PG as an Impulse Control Disorder.

An alternative view to the impulsivity–PG hypothesis is that traits other than impulsivity may contribute to both PG and to comorbid personality disorder. In the Samuel and Widiger meta-analysis, strong associations were found between low Agreeableness and both Antisocial and Borderline personality disorder. Agreeableness does not contain an impulsivity-related facet in the FFM, nor do any of the Disagreeable Disinhibition traits from other taxonomies. We predicted that PG would be associated with trait scores indicating elevated Disagreeable Disinhibition, in addition to the impulsivity and Negative Affect that are predicted by the impulsivity–PG hypothesis. Evidence for this notion would support a characterization of PG not as an Impulse Control Disorder, but as part of a broader spectrum of externalizing psychopathologies that have common etiology with features of Antisocial and Borderline personality disorders. We will refer to this set of predictions as the externalizing–PG hypothesis.

It is widely expected that the next edition of the *Diagnostic and Statistical Manual of Mental Disorders* (American Psychiatric Association, 2000) will list PG as a behavioral addiction rather than as an Impulse Control Disorder (Petry, 2010). Justification for such a change would be bolstered by evidence that individual characteristics that contribute to the etiology of PG are similar to those that predict emergence of other addictive behaviors (i.e., the externalizing–PG hypothesis). Maintaining PG as an Impulse Control Disorder would be supported by evidence that pathological gamblers have elevated impulsiveness, but without additional traits known to predict alcoholism and other addictive behaviors (i.e., the impulsivity–PG hypothesis).

## 2. Method

### 2.1. Literature search

An exhaustive search of the PsychInfo database was conducted in July, 2010. Search criteria were the presence of the words Gambling, Gambler, or Gamble anywhere in the articles, plus any of the following: Impulsivity, Impulsiveness, Eysenck Personality Questionnaire, Venturesomeness, Psychoticism, Barratt Impulsivity Scale, Sensation Seeking, SSS-V, ZKQ, NEO-FFI, NEO PI-R, Neuroticism, Extraversion, Agreeableness, Conscientiousness, Tridimensional Personality Questionnaire, TPQ, Temperament and Character Inventory, TCI, Novelty seeking, Reward dependence, Harm avoidance, Cooperativeness, DAPP and MPQ. The reference lists of retrieved articles were searched, as were articles in the PsychInfo database that cited the retrieved articles. Recent volumes of journals that commonly publish articles on personality and problem gambling (*Personality and Individual Differences*, *Journal of Research in Personality*, *Journal of Gambling Studies*, *International Gambling Studies*, *Addictive Behaviors* and *International Journal of Mental Health and Addiction*) were searched for recent articles not yet listed in the PsychInfo database. An initial pool of 159 studies was retrieved by these means.

### 2.2. Inclusion and exclusion criteria

Once the articles were retrieved, they were examined for the presence of the following criteria: 1) publication in an English-language peer-reviewed journal, 2) quasi-experimental comparison of a group of adult problem or pathological gamblers against a control group of nonproblem gamblers or nongamblers (NPG), 3) clearly specified criteria for classifying participants into the PG or NPG groups, 4) classification of participants using DSM-IV criteria,

admission as inpatients for treatment of PG or by a score on a psychometrically validated scale (i.e., SOGS, PGSI, or DSM-IV symptom checklist) and 5) number of participants in the PG and NPG group, as well as the mean and standard deviation of scores on at least one trait measure of interest, had to be reported separately for the PG and NPG group. In a few cases, means and standard deviations were not reported for PG and NPG groups, but sufficient descriptive information was available to allow the necessary statistics to be calculated (e.g., male and female problem gamblers and controls reported separately but collapsed across sex to form the two groups). Correlational studies were not included because PG was conceived as a categorical diagnosis of pathology, not as a continuous variable spanning normal and abnormal gambling behaviors. The age and sex of the PG and NPG groups were recorded when available, but the presence of this information was not required for a study to be included. An explicit statement that the control group included regular gamblers was also not required because gambling is a very common behavior (Petry et al., 2005), although 21 of the retained articles did include such a statement. After these criteria were applied, the number of retained articles was reduced to 44. These articles included 128 effect sizes, with a total of 2134 participants in PG groups and 5321 in NPG control groups.

### 2.3. Meta-analytic procedures

Meta-analyses were conducted using procedures and formulae described by Borenstein, Hedges, Higgins, and Rothstein (2009) and Orwin (1983). Separate meta-analyses were conducted for each of the four traits in the UPPS model of impulsivity (Whiteside & Lynam, 2001), and for each of the traits in the HSM (Markon et al., 2005). Each meta-analysis included no more than one effect size from each article, but each article could contribute effect sizes to the meta-analyses of more than one trait.

Using the number of participants in each PG and control group, and their mean and standard deviation of scores on a personality trait of interest, the pooled standard deviation, Cohen's (1969) effect size  $d$ , and the variance and standard error of  $d$  were calculated. The mean effect size across studies was calculated using the individual effect sizes weighted by the inverse of their variances of  $d$ . This weighting gives more influence to studies with more precise measurement or large samples. A fixed effects model was assumed for each of the meta-analyses.

The standard errors of the eight weighted mean effect sizes were used to estimate the upper and lower 95% confidence limits for each weighted mean effect size assuming a normal sampling distribution of effect size. In this meta-analytic approach to assessing the importance of the personality factors, weighted mean effect sizes with confidence intervals that included  $d=0.00$  were considered to indicate potentially meaningless effects. As a way of comparing the weighted mean effect sizes for any two factors, non-overlapping confidence intervals were taken to indicate the superiority of the predictor with the larger effect size.

As an indicator of the possible influence of publication bias against studies with statistically nonsignificant findings, Orwin's (1983) failsafe  $N$  formula was used to estimate the number of fugitive studies with a mean effect size of  $d=0.00$  that would have to be added in order to reduce significant mean weighted effect sizes to below the level of "small" effects (i.e.,  $d=0.20$ ; Cohen, 1969). Summary statistics for all of the meta-analyses are given in Table 1.

## 3. Results

### 3.1. Four factors of the UPPS model

#### 3.1.1. Negative Urgency

Each of the studies that were included in this analysis reported PG and NPG group means and standard deviations for the UPPS Urgency

**Table 1**

Meta-analyses of problem gambling and personality traits in the UPPS model and the Hierarchical Structural Model.

Trait	PG N	NPG N	k	d	95% C. I.	Failsafe k
<i>UPPS model</i>						
Negative Urgency	363	581	11	0.99	0.69–1.29	44
Low Premeditation	1104	4032	25	0.84	0.65–1.02	80
Low Perseverance	559	793	13	0.23	−0.03–0.49	3
Sensation Seeking	718	1103	20	0.11	−0.11–0.32	n/a
<i>Hierarchical Four-Factor model</i>						
Unconscientious	894	1137	13	0.79	0.54–1.04	40
Disinhibition						
Negative Affect	1240	2728	18	0.50	0.30–0.71	23
Disagreeable Disinhibition	938	1094	14	0.50	0.26–0.74	21
Positive Affect	1019	1230	17	−0.18	−0.41–0.04	n/a

Note: PG N = number of participants in all pathological gambling groups; NPG N = number of participants in all nonpathological gambling groups; k = number of comparisons; d = Cohen's mean weighted effect size; C. I. = 95% confidence interval for d; Failsafe k = number of nonincluded studies with average d = 0.0 that would need to be added to reduce the mean effect size to d = 0.20.

scale, the BIS Attentional Impulsivity subscale or the NEO PI-R Impulsiveness facet or its public domain counterpart, NEO-IPIP Immoderation. These measures were included because they loaded most heavily onto the factor identified as Negative Urgency by Whiteside and Lynam (2001). These 11 studies contained 363 PGs and 581 NPGs (see Table 2). The mean age was similar between the groups in all eight of the studies that reported participants' age, and there were similar proportions of male and female participants in 10 of 11 studies. PG groups scored higher than NPG groups in all 11 studies and the effect sizes ranged from 0.33 to 2.07. The mean weighted effect size was  $d = 0.99$ , with a 95% confidence interval of 0.69–1.29. To reduce this large effect to a small effect (i.e.,  $d = 0.20$ ), additional 44 unpublished studies with an average effect size of  $d = 0.00$  would need to be added. These results are very unlikely to be spurious and it was concluded that Negative Urgency is elevated in PG.

### 3.1.2. Low Premeditation

Studies were included that reported the UPPS Low Premeditation scale, the NEO PI-R Deliberation facet, the NEO-IPIP Cautiousness facet, TCI Impulsiveness, the BIS Nonplanning Impulsivity subscale or some version of an Eysenck Impulsiveness scale. Total scores for the BIS were included in cases where subscale scores were not reported. The BIS Impulsivity subscale was included for one study (i.e., Carlton & Manowitz, 1994) that used an obsolete version of the BIS. Two other studies (i.e., Clarke, 2004; Lawrence, Luty, Bogdan, Sahakian, & Clark, 2009) were included that classified respondents with SOGS scores > 2 in their PG groups instead of using the more typical cutoff of five points. These two studies may have thereby included subclinical

problem gamblers in their samples of pathological gamblers. Each of the impulsivity measures that were included in this analysis was chosen because they loaded most heavily onto the factor identified as Low Premeditation by Whiteside and Lynam (2001). Because of their negative loadings, effect sizes for NEO PI-R Deliberation and NEO-IPIP Cautiousness were multiplied by  $-1$  prior to averaging. These 25 studies contained 1104 PGs and 4032 NPGs (see Table 3). The mean age of PG and NPG groups was similar in all 17 of the studies that reported participants' age for both groups, and there were similar proportions of male and female participants in 13 of 20 studies that reported participants' sex. PG groups scored higher than NPG groups in all 25 studies, and the effect sizes ranged from 0.21 to 2.14. The mean weighted effect size was  $d = 0.84$ , with a 95% confidence interval of 0.65–1.02. To reduce this large effect to a small effect (i.e.,  $d = 0.20$ ), additional 80 unpublished studies with an average effect size of  $d = 0.00$  would need to be added. These results are very unlikely to be spurious and it was concluded that Low Premeditation is elevated in PG.

### 3.1.3. Low Perseverance

Studies were included that reported the UPPS Low Perseverance scale, the NEO PI-R or NEO-IPIP Self-Discipline facet, or the Boredom Susceptibility subscale of the SSS-V. Each of these measures was included in this analysis because they loaded most heavily onto the factor identified as Low Perseverance by Whiteside and Lynam (2001). Because of their negative loadings, effect sizes for the NEO PI-R and NEO-IPIP Self-Discipline facet were multiplied by  $-1$  prior to averaging. These 13 studies contained 559 PGs and 793 NPGs (see Table 4). The mean age of PG and NPG groups was similar in all 10 of the studies that reported participants' age for both groups, and there were similar proportions of male and female participants in 9 of 12 studies that reported participants' sex. PG groups scored higher than NPG groups in 9 of the 13 studies, and the effect sizes ranged considerably from  $-1.46$  to 1.25. The mean weighted effect size was  $d = 0.23$ , with a 95% confidence interval of  $-0.03$ –0.49. It was concluded that Low Perseverance is not elevated in PG.

### 3.1.4. Sensation Seeking

Studies were included that reported the UPPS Sensation Seeking scale, the NEO PI-R or NEO-IPIP Excitement Seeking facet, EPQ Venturesomeness or the SSS-V Disinhibition subscale. Total scores on the SSS-V were used when the subscales were not reported separately. One study reported ZKPQ Impulsive Sensation Seeking and its two components, Nonplanning Impulsivity and Sensation Seeking, so the Sensation Seeking component was used in that case. Each of these measures was included in this analysis because they loaded most heavily onto the factor identified as Sensation Seeking by Whiteside and Lynam (2001). These 20 studies contained 718 PGs and

**Table 2**

Studies contributing effect sizes to meta-analysis of PG status and Negative Urgency.

First author	Year	PG			NPG			Criterion	Measure	Cohen's d
		N (% male)	Age	Sample	N (% male)	Age	Sample			
Bagby et al.	2007	106 (52.8)	43.1	Community	177 (54.2)	38.75	Community	DSM-IV	NEO PI-R impulsiveness	0.47
Hammelstein and Roth	2010	30 (90.0)	38.3	Clinical	30 (90.0)	39.1	Convenience	DSM-IV, SOGS	BIS attentional impulsivity	1.24
Kaare et al.	2009	33 (93.9)	33.9	Clinical	42 (85.7)	33.1	Convenience	DSM-IV, SOGS	NEO-IPIP immoderation	2.07
Lawrence	2009	21 (100.0)	37.0	Community	27 (100.0)	41.5	Community	SOGS	BIS attentional impulsivity	0.99
Ledgerwood et al.	2009	30 (46.7%)	48.4	Community	41 (41.5)	45.7	Community	NODS	BIS attentional impulsivity	1.26
Potenza et al.	2003	10 (100.0)	36.2	Community	11 (100.0)	30.1	Community	DSM-IV, SOGS	NEO PI-R impulsiveness	1.66
Rodriguez-Jimenez	2006	39 (100)	34.62	Clinical	40 (100.0)	32.0	Convenience	DSM-IV, SOGS	BIS attentional impulsivity	1.26
Skitch and Hodgins	2004	36 (52.8)	nr	Student	76 (50.0)	nr	Student	SOGS	BIS attentional impulsivity	0.69
Voon et al.	2007	21 (71.0)	60.2	Clinical	42 (50.0)	65.7	Clinical	DSM-IV	BIS attentional impulsivity	0.33
Whiteside et al.	2005	29 (72.4)	nr	Clinical	29 (28.6)	45.3	Convenience	SOGS	UPPS negative urgency	0.97
Wohl et al.	2008	8 (87.5)	nr	Student	66 (47.0)	20.3	Student	DSM-IV	BIS attentional impulsivity	0.83

Note: nr = not reported; BIS = Barratt Impulsivity Scale; NEO-IPIP = Neuroticism, Extraversion and Openness International Personality Item Pool; NEO PI-R = Neuroticism, Extraversion and Openness Inventory-Revised; NODS = National Opinion Research Center DSM-IV Screen for Gambling Problems; SOGS = South Oaks Gambling Screen; UPPS = Urgency, Premeditation, Perseverance and Sensation Seeking Scales.

**Table 3**  
Studies contributing effect sizes to meta-analysis of PG status and Low Premeditation.

First author	Year	PG			NPG			Criterion	Measure	Cohen's <i>d</i>
		N (% male)	Age	Sample	N (% male)	Age	Sample			
Allcock and Grace	1988	10 (100)	30.9	Clinical	25 (31.6)	28.4	Convenience	Inpatients	BIS total	0.52
Bagby et al.	2007	106 (52.8)	43.11	Community	177 (54.2)	38.75	Community	DSM-IV	NEO PI-R deliberation (–)	0.43
Carlton	1994	12 (100)	48.9	Clinical	15 (100)	43.3	Convenience	GA20	BIS impulsivity	1.02
Clarke	2004	25 (nr)	nr	Students	122 (nr)	nr	Students	SOGS (>2)	Eysenck impulsiveness	0.58
Forbush et al.	2008	25 (56)	46.9	Community	34 (26.5)	41.9	Community	DSM-IV, SOGS	BIS total	1.58
Fuentes et al.	2006	52 (47.7)	40.1	Clinical	82 (54.9%)	40.9	Convenience	DSM-IV, SOGS	BIS total	2.18
Hammelstein and Roth	2010	30 (90)	38.3	Clinical	30 (90)	39.1	Convenience	DSM-IV, SOGS	BIS nonplanning impulsivity	0.79
Kaare et al.	2009	33 (93.9)	33.9	Clinical	42 (85.7)	33.1	Convenience	DSM-IV, SOGS	NEO-IPIP cautiousness (–)	0.92
Kim and Grant	2001	33 (57.6)	48.3	Clinical	40 (72.5)	41.1	Convenience	DSM-IV	TCl impulsiveness	0.85
Lawrence	2009	21 (100)	37.0	Community	27 (100)	41.5	Community	SOGS (>2)	BIS nonplanning impulsivity	1.41
Ledgerwood et al.	2009	30 (46.7)	48.4	Community	41 (41.5)	45.7	Community	NODS	BIS nonplanning impulsivity	0.77
Loxton et al.	2008	30 (nr)	nr	Community	59 (nr)	nr	Community	SOGS	BIS total	1.33
MacKillop et al.	2006	24 (nr)	nr	Students	41 (nr)	nr	Students	SOGS	Eysenck impulsiveness	0.92
Madden et al.	2009	19 (100)	37.7	Community	19 (nr)	37.2	Community	DSM-IV, SOGS	Eysenck impulsiveness	0.56
McCormick	1993	279 (>87%)	nr	Clinical	1863 (>98%)	nr	Clinical	SOGS	BIS total	0.44
Myrseth et al.	2009	90 (73.3)	37.9	Clinical	66 (65.2)	40.2	Community	DSM-IV, SOGS	Eysenck impulsiveness	0.79
Nordin and Nylander	2007	38 (81.6)	35.4	Community	76 (nr)	nr	Community	DSM-IV	TCl impulsiveness	0.56
Nower et al.	2004	55 (78.2)	19.4	Students	984 (46.8)	18.2	Students	DSM-IV-J	Eysenck impulsiveness	0.54
Petry	2001	39 (59)	44.0	Clinical	26 (65)	39.0	Community	DSM-IV, SOGS	Eysenck impulsiveness	1.06
Rodriguez-Jimenez	2006	39 (100)	34.6	Clinical	40 (100)	32.0	Convenience	DSM-IV, SOGS	BIS nonplanning impulsivity	2.14
Skitch and Hodgins	2004	36 (52.8)	nr	Students	76 (50)	nr	Students	SOGS	BIS nonplanning impulsivity	0.88
Tanabe et al.	2007	20 (60)	35	Clinical	10 (50)	35	Clinical	SOGS	BIS total	0.21
Voon et al.	2007	21 (71)	60.2	Clinical	42 (50)	60.2	Clinical	DSM-IV	BIS nonplanning impulsivity	1.16
Whiteside et al.	2005	29 (72.4)	nr	Clinical	29 (28.6)	45.3	Convenience	SOGS	UPPS low premeditation	0.74
Wohl et al.	2008	8 (87.5)	nr	Students	66 (47)	20.3	Students	DSM-IV	BIS nonplanning impulsivity	0.22

Note: GA20 = Gambler's Anonymous Scale; TCI = Temperament and Character Inventory; DSM-IV-J = Diagnostic and Statistical Manual Junior checklist for adolescents.

1103 NPGs (see Table 5). The mean age of PG and NPG groups was similar in all 15 of the studies that reported participants' age for both groups, and there were similar proportions of male and female participants in 13 of 18 studies that reported participants' sex. PG groups scored higher than NPG groups in 13 of the 20 studies and the effect sizes were highly variable across studies, ranging from  $-1.07$  to  $1.13$ . The mean weighted effect size was  $d=0.11$ , with a 95% confidence interval of  $-0.11-0.32$ . It was concluded that the Sensation Seeking factor, as it is conceived within the UPPS model, is not elevated in PG.

Because there has been some disagreement among experts (Hammelstein, 2004; Zuckerman, 2005), as to the relationship between PG and Sensation Seeking as traditionally conceived by Zuckerman (2007), a second meta-analysis was conducted. This analysis included only studies that compared PG versus NPG groups on the total scores of the SSS-V. These 14 studies, all of which are included in Table 1, contained 503 participants in PG groups and 703 in NPG groups. The mean weighted effect size was  $d=0.04$ , with a 95% confidence interval of  $-0.22-0.30$ . It was concluded that total scores on the SSS-V are not elevated in PG.

**Table 4**  
Studies contributing effect sizes to meta-analysis of PG status and Low Perseverance.

First author	Year	PG			NPG			Criterion	Measure	Cohen's <i>d</i>
		N (% male)	Age	Sample	N (% male)	Age	Sample			
Bagby et al.	2007	106 (52.8)	43.1	Community	177 (54.2)	38.8	Community	DSM-IV	NEO PI-R Self discipline (–)	0.44
Blaszczynski et al.	1990	48 (89.6)	39.0	Clinical	40 (87.5)	37.3	Convenience	DSM-III	SSS-V Boredom susceptibility	$-0.20$
Bonnaire et al.	2004	57 (100)	32.4	Convenience	40 (100)	32.7	Convenience	DSM-IV, SOGS	SSS-V Boredom susceptibility	0.18
Brand et al.	2005	25 (100)	40.1	Clinical	25 (100)	40.7	Convenience	DSM-IV	SSS-V Boredom susceptibility	0.15
Carrasco et al.	1994	15 (100)	35.0	Clinical	25 (100)	29.0	Convenience	DSM-III-R	SSS-V Boredom susceptibility	$-1.46$
Fortune and Goodie	2010	102 (nr)	nr	Students	274 (nr)	nr	Students	SOGS	SSS-V Boredom susceptibility	0.62
Hammelstein and Roth	2010	30 (90)	38.3	Clinical	30 (90)	39.1	Convenience	DSM-IV, SOGS	SSS-V Boredom susceptibility	$-0.05$
Kaare et al.	2009	33 (93.9)	33.9	Clinical	42 (85.7)	33.1	Convenience	DSM-IV, SOGS	NEO-IPIP Self discipline (–)	0.29
Kuley and Jacobs	1988	30 (100)	34.3	Convenience	30 (100)	33.4	Convenience	GA20	SSS-V Boredom susceptibility	1.25
Leiserson and Pihl	2007	12 (100)	26.4	Community	19 (100)	22.9	Community	SOGS	SSS-V Boredom susceptibility	$-0.24$
Linnert et al.	2006	61 (88.5)	35.3	Clinical	39 (20.2)	26.6	Students	SOGS	SSS-V Boredom susceptibility	0.14
Powell et al.	1999	11 (90.9)	nr	Convenience	23 (69.6)	nr	Convenience	SOGS	SSS-V Boredom susceptibility	0.53
Whiteside et al.	2005	29 (72.4)	nr	Clinical	29 (28.6)	45.3	Convenience	SOGS	UPPS Low perseverance	0.35

Note: SSS-V = Sensation Seeking Scale.

### 3.2. Four factors of the Hierarchical Structural Model

#### 3.2.1. Unconscientiousness Disinhibition

Each of the studies that were included in this analysis reported PG and NPG group means and standard deviations for the NEO PI-R or NEO-FFI Conscientiousness domain, or Novelty Seeking measured with the TCI or TPQ. These measures were included because they loaded most heavily onto the factor identified as Unconscientious Disinhibition by Markon et al. (2005). Because of their negative loadings, effect sizes for Conscientiousness were multiplied by  $-1$  prior to averaging. These 13 studies contained 894 PGs and 1137 NPGs (see Table 6). The mean age was similar in PG and NPG groups in 10 of the 11 studies that reported participants' age, and there were similar proportions of male and female participants in 8 of the 12 studies that reported participants' sex for both groups. The PG groups scored higher than NPG groups in all 13 studies, and the effect sizes ranged from  $0.32$  to  $1.84$ . The mean weighted effect size was  $d=0.79$ , with a 95% confidence interval of  $0.54-1.04$ . To reduce this large effect to a small effect (i.e.,  $d=0.20$ ), an additional 40 unpublished studies with an average effect size of  $d=0.00$  would need to be added. These

**Table 5**  
Studies contributing effect sizes to meta-analysis of PG status and Sensation Seeking.

First author	Year	PG			NPG			Criterion	Measure	Cohen's <i>d</i>
		N (% male)	Age	Sample	N (% male)	Age	Sample			
Allcock and Grace	1988	10 (100)	30.9	Clinical	25 (31.6)	28.4	Convenience	DSM-III	SSS-V total	0.21
Bagby et al.	2007	106 (52.8)	43.1	Community	177 (54.2)	38.8	Community	DSM-IV	NEO PI-R excitement seeking	−0.01
Blaszczynski et al.	1990	48 (89.6)	39.0	Clinical	40 (87.5)	37.3	Convenience	DSM-III	SSS-V disinhibition	−0.88
Bonnaire et al.	2004	57 (100)	32.4	Convenience	40 (100)	32.7	Convenience	DSM-IV, SOGS	SSS-V disinhibition	0.08
Brand et al.	2005	25 (100)	40.1	Clinical	25 (100)	40.7	Convenience	DSM-IV	SSS-V disinhibition	−0.36
Carrasco et al.	1994	15 (100)	35.0	Clinical	25 (100)	29.0	Convenience	DSM-IIIIR	SSS-V disinhibition	−1.07
Clarke	2004	25 (nr)	nr	Students	122 (nr)	nr	Students	SOGS (>2)	EPQ venturesomeness	−0.18
Fortune and Goodie	2010	102 (nr)	nr	Students	274 (nr)	nr	Students	SOGS	SSS-V disinhibition	0.34
Hammelstein and Roth	2010	30 (90)	38.3	Clinical	30 (90)	39.1	Clinical	DSM-IV, SOGS	SSS-V disinhibition	−0.02
Kaare et al.	2009	33 (93.9)	33.9	Clinical	42 (85.7)	33.1	Convenience	DSM-IV, SOGS	NEO-IPIP excitement seeking	0.28
Kuley and Jacobs	1988	30 (100)	34.3	Convenience	30 (100)	33.4	Convenience	GA20	SSS-V disinhibition	0.37
LaBudda et al.	2007	22 (100)	40.5	Clinical	19 (100)	42.9	Convenience	DSM-IV	SSS-V total	0.10
Ledgerwood et al.	2009	30 (46.7)	48.4	Community	41 (41.5)	45.7	Community	NODS	SSS-V total	−0.03
Leiserson and Pihl	2007	12 (100)	26.4	Community	19 (100)	22.9	Community	SOGS	SSS-V disinhibition	0.16
Linnet et al.	2006	61 (88.5)	35.3	Clinical	39 (20.2)	26.6	Students	SOGS	SSS-V disinhibition	0.18
Parke et al.	2004	42 (95.2)	nr	Convenience	72 (70.8)	nr	Convenience	DSM-IV	SSS-V total	0.54
Potenza et al.	2003	10 (100)	36.2	Community	11 (100)	30.1	Community	DSM-IV, SOGS	ZKPQ sensation seeking	1.13
Powell et al.	1999	11 (90.9)	nr	Convenience	23 (69.6)	nr	Convenience	SOGS	SSS-V disinhibition	0.65
Tanabe et al.	2007	20 (60)	35.0	Clinical	20 (50)	35.0	Clinical	SOGS	SSS-V total	0.18
Whiteside et al.	2005	29 (72.4)	nr	Clinical	29 (28.6)	45.3	Convenience	SOGS	UPPS sensation seeking	0.76

Note: EPQ = Eysenck Personality Questionnaire; ZKPQ = Zuckerman Kuhlman Personality Questionnaire.

results are very unlikely to be spurious and it was concluded that Unconscientious Disinhibition is elevated in PG.

### 3.2.2. Negative Affect

Studies were included that reported Neuroticism measured with the NEO PI-R, NEO-PI, NEO-FFI or EPQ, or Harm Avoidance measured with the TCI or TPQ. These measures were included because they loaded most heavily onto the factor identified as Negative Affect by Markon et al. (2005). These 18 studies contained 1240 PGs and 2728 NPGs (see Table 7). The mean age was similar between PG and NPG groups in 12 of 13 of the studies that reported participants' age, and there were similar proportions of male and female participants in 12 of the 14 studies that reported participants' sex for both groups. PG groups scored more highly than NPG groups in 15 of the 18 studies and the effect sizes ranged from −0.12 to 1.18. The mean weighted effect size was  $d = 0.50$ , with a 95% confidence interval of 0.30–0.71. It was concluded that Negative Affect is elevated in PG.

### 3.2.3. Disagreeable Disinhibition

Studies were included that reported EPQ Psychoticism, TCI Cooperativeness or Agreeableness measured with the NEO PI-R, NEO-PI or NEO-FFI. These measures were included because they loaded most heavily onto the factor identified as Disagreeable

Disinhibition by Markon et al. (2005). Because of negative factor loadings, effect sizes for Cooperativeness and Agreeableness were multiplied by −1 prior to averaging. These 14 studies contained 938 PGs and 1094 NPGs (see Table 8). The mean age was similar between PG and NPG groups in 10 of the 11 studies that reported participants' age for both groups, and there were similar proportions of male and female participants in 11 of the 13 studies that reported participants' sex for both groups. The PG groups scored higher than NPG groups in 13 of the 14 studies and the effect sizes ranged from −0.14 to 1.06. The mean weighted effect size was  $d = 0.50$ , with a 95% confidence interval of 0.26–0.74. To reduce this large effect to a small effect (i.e.,  $d = 0.20$ ), additional 21 unpublished studies with an average effect size of  $d = 0.00$  would need to be added. These results are very unlikely to be spurious and it was concluded that Disagreeable Disinhibition is elevated in PG.

### 3.2.4. Positive Affect

Studies were included that reported Extraversion measured with the NEO PI-R, NEO-FFI or EPQ, or Reward Dependence measured with the TCI or TPQ. These measures were included because they loaded most heavily onto the factor identified as Positive Affect by Markon et al. (2005). These 17 studies contained 1019 PGs and 1230 NPGs (see Table 9). The mean age was similar between PG and NPG groups

**Table 6**  
Studies contributing effect sizes to meta-analysis of PG status and Unconscientious Disinhibition.

First author	Year	PG			NPG			Criterion	Measure	Cohen's <i>d</i>
		N (% male)	Age	Sample	N (% male)	Age	Sample			
Alvarez-Moya et al.	2007	429 (90.2)	38.9	Clinical	96 (63.5)	38.0	Convenience	DSM-IV, SOGS	TCI novelty seeking	0.65
Bagby et al.	2007	106 (52.8)	43.1	Community	177 (54.2)	38.75	Community	DSM-IV	NEO PI-R Conscientiousness	0.55
Cunningham-Williams et al.	2005	21 (54)	29.0	Stratified	404 (59)	47.0	Stratified	DSM-IV-S	TCI novelty seeking	1.03
Forbush et al.	2008	25 (56)	46.9	Community	34 (26.5)	41.9	Community	DSM-IV, SOGS	TCI novelty seeking	0.78
Janiri et al.	2007	25 (64)	39.7	Clinical	35 (66)	38.2	Community	DSM-IV, SOGS	TCI novelty seeking	0.73
Kaare et al.	2009	33 (93.9)	33.9	Clinical	42 (85.7)	33.1	Convenience	DSM-IV, SOGS	NEO-IPIP conscientiousness (−)	0.61
Kim and Grant	2001	33 (57.6)	48.3	Clinical	40 (72.5)	41.1	Convenience	DSM-IV	TPQ novelty seeking	1.07
Martinotti et al.	2006	27 (62.9)	39.3	Convenience	38 (60.5)	37.0	Convenience	DSM-IV, SOGS	TCI novelty seeking	0.98
Myrseth et al.	2009	90 (73.3)	37.9	Clinical	66 (65.2)	40.2	Community	DSM-IV, SOGS	NEO-FFI conscientiousness (−)	0.99
Nordin and Nylander	2007	38 (81.6)	35.4	Community	76 (nr)	nr	Community	DSM-IV, SOGS	TCI novelty seeking	0.73
Potenza et al.	2003	10 (100.0)	36.2	Community	11 (100.0)	30.1	Community	DSM-IV, SOGS	NEO PI-R conscientiousness (−)	0.57
Skitch and Hodgins	2004	36 (52.8)	nr	Student	76 (50.0)	nr	Student	SOGS	TPQ novelty seeking	0.32
Voon et al.	2007	21 (71.0)	60.2	Clinical	42 (50.0)	65.7	Clinical	DSM-IV	TCI novelty seeking	1.84

Note: DSM-IV-S = Diagnostic and Statistical Manual self report checklist of PG; NEO-FFI = Neuroticism, Extraversion and Openness Five Factor Inventory. TPQ = Tridimensional Personality Questionnaire.

**Table 7**  
Studies contributing effect sizes to meta-analysis of PG status and Negative Affect.

First author	Year	PG			NPG			Criterion	Measure	Cohen's <i>d</i>
		N (% male)	Age	Sample	N (% male)	Age	Sample			
Alvarez-Moya et al.	2007	429 (90.2)	38.9	Clinical	96 (63.5)	38.0	Convenience	DSM-IV, SOGS	TCI harm avoidance	0.38
Bagby et al.	2007	106 (52.8)	43.1	Community	177 (54.2)	38.75	Community	DSM-IV	NEO PI-R neuroticism	0.52
Blanco et al.	2001	29 (100)	nr	Clinical	29 (100)	nr	Community	DSM-IIIIR	EPQ neuroticism	0.58
Blaszczynski et al.	1985	60 (100)	31	Clinical	27 (100)	27.2	Convenience	inpatients	EPQ neuroticism	0.87
Carroll and Huxley	1994	26 (100)	nr	Convenience	41 (97.5)	nr	Convenience	DSM-III	EPQ neuroticism	0.02
Cunningham-Williams et al.	2005	21 (54)	29.0	Stratified	404 (59)	47.0	Stratified	DSM-IV-S	TCI harm avoidance	0.27
Forbush et al.	2008	25 (56)	46.9	Community	34 (26.5)	41.9	Community	DSM-IV, SOGS	TCI harm avoidance	1.01
Janiri et al.	2007	25 (64)	39.7	Clinical	35 (66)	38.2	Community	DSM-IV, SOGS	TCI harm avoidance	−0.12
Kaare et al.	2009	33 (93.9)	33.9	Clinical	42 (85.7)	33.1	Convenience	DSM-IV, SOGS	NEO-IPIP neuroticism	1.18
Kim and Grant	2001	33 (57.6)	48.3	Clinical	40 (72.5)	41.1	Convenience	DSM-IV	TPQ harm avoidance	0.40
Martinotti et al.	2006	27 (62.9)	39.3	Convenience	38 (60.5)	37.0	Convenience	DSM-IV, SOGS	TCI harm avoidance	−0.12
McCormick	1993	212 (>83)	nr	Clinical	1476 (>98)	nr	Clinical	SOGS	NEO-PI neuroticism	0.43
Myrseth et al.	2009	90 (73.3)	37.9	Clinical	66 (65.2)	40.2	Community	DSM-IV, SOGS	NEO-FFI neuroticism	1.04
Nordin and Nylander	2007	38 (81.6)	35.4	Community	76 (nr)	nr	Community	DSM-IV, SOGS	TCI harm avoidance	0.81
Potenza et al.	2003	10 (100.0)	36.2	Community	11 (100.0)	30.1	Community	DSM-IV, SOGS	NEO PI-R neuroticism	1.01
Roy et al.	1989	19 (100)	35.9	Clinical	18 (100)	42.3	Community	DSM-III	EPQ neuroticism	2.29
Skitch and Hodgins	2004	36 (52.8)	nr	Students	76 (50)	nr	Students	SOGS	TPQ harm avoidance	0.09
Voon et al.	2007	21 (71)	60.2	Clinical	42 (50)	65.7	Clinical	DSM-IV	TCI harm avoidance	−0.58

in 12 of the 13 of the studies that reported participants' age, and there were similar proportions of male and female participants in 13 of the 16 studies that reported participants' sex for both groups. The results of these studies were highly variable and the effect sizes ranged from −1.2 to 0.90. The mean weighted effect size was  $d = -0.18$ , with a 95% confidence interval of −0.4–0.04. It was concluded that Positive Affect is not elevated in PG.

#### 4. Discussion

Meta-analysis was used to assimilate the results from studies that compared the personality traits of people with PG versus NPG control groups. Studies in these analyses compared PG and NPG groups that were similar in age and gender, that were drawn from a variety of clinical, community, convenience and student samples, and that used a variety of self-report and clinical interview methods of determining PG status. Total numbers of participants in the studies forming each meta-analysis were large and the differences between the PG and NPG groups were substantial. PG was associated with Unconscientious Disinhibition and Low Premeditation, with Negative Affect and Negative Urgency and with Disagreeable Disinhibition. These traits may be important factors in the etiology of PG and future research may focus on the mechanisms by which these individual characteristics present increased vulnerability to PG. We found no evidence of reliable associations between PG and Positive Emotionality or the Low Perseverance and Sensation Seeking forms of impulsivity.

#### 4.1. Limitations due to pathological gambler subtypes and selection bias

Pathological Gamblers may not be a homogenous group and reliability of any statistical associations between PG and the UPPS or HSM traits is limited by the degree to which all subtypes of PG are represented. There appear to be three subtypes of PG (Milosevic & Ledgerwood, 2010), which correspond to the “behaviorally conditioned,” “emotionally vulnerable,” and “antisocial-impulsivist” types in Blaszczynski and Nower's (2002) model of PG etiology. These three groups appear to have distinct FFM profiles (Vachon & Bagby, 2009), and the degree to which they are represented in the studies of PG and personality is an important consideration for the interpretation of these meta-analytic results.

The issue of sampling bias is potentially acute in studies comparing clinical PG samples with the nontreatment-seeking community, convenience or student samples. This is because, among people in need of mental health services, those who seek treatment typically have the highest Neuroticism and lowest Conscientiousness (Goodwin, Hoven, Lyons, & Stein, 2002). This creates the possibility of a confound in some studies between the characteristics of treatment-seeking clinical PG samples and those of treatment seekers generally. Gamblers who seek treatment are a minority within the PG population (Slutske, 2006; Slutske, Blaszczynski, & Martin, 2009) and the potential for selection bias is problematic if the “emotionally vulnerable” subtype, which is hypothesized to have high Neuroticism, is overrepresented among the relatively small number of PGs who

**Table 8**  
Studies contributing effect sizes to meta-analysis of PG status and Disagreeable Disinhibition.

First author	Year	PG			NPG			Criterion	Measure	Cohen's <i>d</i>
		N (% male)	Age	Sample	N (% male)	Age	Sample			
Alvarez-Moya et al.	2007	429 (90.2)	38.9	Clinical	96 (63.5)	38.0	Convenience	DSM-IV, SOGS	TCI cooperativeness (−)	0.13
Bagby et al.	2007	106 (52.8)	43.1	Community	177 (54.2)	38.75	Community	DSM-IV	NEO PI-R agreeableness (−)	0.26
Blanco et al.	2001	29 (100)	nr	Clinical	29 (100)	nr	Community	DSM-IIIIR	EPQ psychoticism	−0.14
Blaszczynski et al.	1985	60 (100)	31	Clinical	27 (100)	27.2	Convenience	inpatients	EPQ psychoticism	0.55
Carroll and Huxley	1994	26 (100)	nr	Convenience	41 (97.5)	nr	Convenience	DSM-III	EPQ psychoticism	0.55
Cunningham-Williams et al.	2005	21 (54)	29.0	Stratified	404 (59)	47.0	Stratified	DSM-IV-S	TCI cooperativeness (−)	0.73
Forbush et al.	2008	25 (56)	46.9	Community	34 (26.5)	41.9	Community	DSM-IV, SOGS	TCI cooperativeness (−)	0.88
Janiri et al.	2007	25 (64)	39.7	Clinical	35 (66)	38.2	Community	DSM-IV, SOGS	TCI cooperativeness (−)	1.06
Kaare et al.	2009	33 (93.9)	33.9	Clinical	42 (85.7)	33.1	Convenience	DSM-IV, SOGS	NEO-IPIP agreeableness (−)	0.43
Martinotti et al.	2006	27 (62.9)	39.3	Convenience	38 (60.5)	37.0	Convenience	DSM-IV, SOGS	TCI cooperativeness (−)	1.06
Myrseth et al.	2009	90 (73.3)	37.9	Clinical	66 (65.2)	40.2	Community	DSM-IV, SOGS	NEO-FFI agreeableness (−)	0.35
Nordin and Nylander	2007	38 (81.6)	35.4	Community	76 (nr)	nr	Community	DSM-IV, SOGS	TCI cooperativeness (−)	0.69
Potenza et al.	2003	10 (100.0)	36.2	Community	11 (100.0)	30.1	Community	DSM-IV, SOGS	NEO PI-R agreeableness (−)	0.71
Roy et al.	1989	19 (100)	35.9	Clinical	18 (100)	42.3	Community	DSM-III	EPQ psychoticism	0.73



**Table 9**  
Studies contributing effect sizes to meta-analysis of PG status and Positive Affect.

First author	Year	PG			NPG			Criterion	Measure	Cohen's <i>d</i>
		N (% male)	Age	Sample	N (% male)	Age	Sample			
Alvarez-Moya et al.	2007	429 (90.2)	38.9	Clinical	96 (63.5)	38.0	Convenience	DSM-IV, SOGS	TCI reward dependence	−1.27
Bagby et al.	2007	106 (52.8)	43.1	Community	177 (54.2)	38.75	Community	DSM-IV	NEO PI-R extraversion	−0.22
Blanco et al.	2001	29 (100)	nr	Clinical	29 (100)	nr	Community	DSM-III-R	EPQ extraversion	0.30
Blaszczynski et al.	1985	60 (100)	31	Clinical	27 (100)	27.2	Convenience	inpatients	EPQ extraversion	−0.06
Carroll and Huxley	1994	26 (100)	nr	Convenience	41 (97.5)	nr	Convenience	DSM-III	EPQ extraversion	−0.61
Cunningham-Williams et al.	2005	21 (54)	29.0	Stratified	404 (59)	47.0	Stratified	DSM-IV-S	TCI reward dependence	−0.22
Forbush et al.	2008	25 (56)	46.9	Community	34 (26.5)	41.9	Community	DSM-IV, SOGS	TCI reward dependence	0.62
Janiri et al.	2007	25 (64)	39.7	Clinical	35 (66)	38.2	Community	DSM-IV, SOGS	TCI reward dependence	−0.24
Kaare et al.	2009	33 (93.9)	33.9	Clinical	42 (85.7)	33.1	Convenience	DSM-IV, SOGS	NEO-IPIP extraversion	−0.09
Kim and Grant	2001	33 (57.6)	48.3	Clinical	40 (72.5)	41.1	Convenience	DSM-IV	TPQ reward dependence	0.05
Leiserson and Pihl	2007	12 (100)	23.4	Community	20 (100)	22.9	Community	SOGS	EPQ extraversion	0.90
Martinotti et al.	2006	27 (62.9)	39.3	Convenience	38 (60.5)	37.0	Convenience	DSM-IV, SOGS	TCI reward dependence	−0.15
Myrseth et al.	2009	90 (73.3)	37.9	Clinical	66 (65.2)	40.2	Community	DSM-IV, SOGS	NEO-FFI extraversion	−0.36
Nordin and Nylander	2007	38 (81.6)	35.4	Community	76 (nr)	nr	Community	DSM-IV, SOGS	TCI reward dependence	0.69
Potenza et al.	2003	10 (100.0)	36.2	Community	11 (100.0)	30.1	Community	DSM-IV, SOGS	NEO PI-R extraversion	0.20
Roy et al.	1989	19 (100)	35.9	Clinical	18 (100)	42.3	Community	DSM-III	EPQ extraversion	0.16
Skitch and Hodgins	2004	36 (52.8)	nr	Students	76 (50)	nr	Students	SOGS	TPQ reward dependence	−0.04

seek treatment. These people might be disproportionately represented in clinical studies comparing them to nontreatment seekers, and so their personality traits might likewise be overrepresented. However, we found no evidence for the low Positive Affect that would be predicted to reflect inclusion of emotionally vulnerable problem gamblers in these studies, since Introversion and similar traits are known to characterize depression and anxiety disorders (Kotov et al., 2010). Furthermore, one correlational study of gambling behavior and the FFM corroborated results of the present meta-analysis of studies that used between-group designs (MacLaren, Best, Dixon, & Harrigan, 2011).

#### 4.2. Pathological gambling as an Impulse Control Disorder

Strong effects of Unconscientious Disinhibition and Low Premeditation are equally consistent with the notion of PG as an Impulse Control Disorder or as a behavioral addiction, since impulsive traits are common to both types of disorder. Common neurophysiological mechanisms are conceivable for PG and Impulse Control Disorders, namely some form of diminished prefrontal inhibition of prepotent behavior (Rodríguez-Jimenez et al., 2006). Likewise, there is evidence that dysregulation of the dopaminergic system (Robinson & Berridge, 2000) is common to both PG and stimulant drug abuse (van Holst, van den Brink, Veltman, & Goudriaan, 2010; Zack & Poulos, 2009) and that dopaminergic reward sensitivity underlies trait impulsivity (Gray & McNaughton, 2000). This converging evidence suggests that impulsive drug use and gambling are both undercontrolled behaviors that are motivated by a final common pathway that normally underlies reward-seeking and the enjoyment of natural reinforcers.

People may abuse psychoactive drugs or gamble for a variety of reasons, and heterogeneous subtypes have been proposed for both alcoholism (Epstein, Labouvie, McCrady, Jenson, & Hayaki, 2002) and PG (Milosevic & Ledgerwood, 2010). In alcoholics, drinking may be motivated by the hedonic value of inebriation and relief from withdrawal, and also because intoxication provides a distraction from negative emotional states that is valued by people who tend toward Negative Affect (Stewart & Devine, 2000). The same might be true for some pathological gamblers, especially Blaszczynski and Nower's (2002) "emotionally vulnerable" subtype. For people who are emotionally labile and generally unhappy, gambling may provide a sense of escape from negative emotional states or an enhancement of positive mood (Stewart & Zack, 2008). Negative Urgency might contribute to this by reducing their ability to resist gambling as a reaction to unpleasant events or dysphoric states. These results are consistent with the impulsivity-PG hypothesis.

Clinical observations suggest that people with Impulse Control Disorders have high impulsivity. Beyond that, the personality traits that characterize Impulse Control disorders such as Intermittent Explosive Disorder, Kleptomania, and Pyromania are presently unknown. Although Intermittent Explosive Disorder has been associated with Borderline personality disorder (Coccaro, Kavoussi, Berman, & Lish, 1998), the links between personality disorder and other Impulse Control Disorders are far less clear (Grant, 2004; Lindberg, Holi, Tani, & Virkkunen, 2005). Our findings of elevated Negative Urgency and Low Premeditation are consistent with the concept of PG as an Impulse Control Disorder, but this view may not be sufficient to account for our finding of a link between PG and Disagreeable Disinhibition. Future research into the personality of people with other Impulse Control disorders may reveal the role, if any, that is played by Disagreeable Disinhibition in these syndromes.

#### 4.3. Pathological gambling as an externalizing behavioral addiction

Substance use disorders are the prototype addictive behavior and the personality of substance abusers has been well characterized (Kotov et al., 2010). Comorbid Antisocial and Borderline personality disorders are frequently found in populations of substance abusers, and there are strong associations between substance use disorders and the Unconscientious and Disagreeable Disinhibition that characterize these conditions (Ball, Kranzler, Tennen, Poling, & Rounsaville, 1998). Disagreeableness is a well-established characteristic of the dramatic personality disorders (Samuel & Widiger, 2008) and their tendency toward externalizing psychopathology (Krueger et al., 2007). Critically, we found evidence of a moderately sized association between PG and Disagreeable Disinhibition that supports the externalizing-PG hypothesis.

Together with results of the meta-analyses of Unconscientious Disinhibition and Low Premeditation, as well as Negative Affect and Negative Urgency, the results of the Disagreeable Disinhibition meta-analysis support the idea that the personality traits of pathological gamblers are similar to those of people with substance use disorders and Borderline personality features. It is possible that people with PG gamble excessively for reasons that are similar to those of substance abusers who, despite a similar personality style, choose consumption of psychoactive drugs instead of gambling. These differences may be due to availability and exposure to drugs or access to opportunities for gambling. Symptoms of these conditions parallel one another in several important ways (i.e., tolerance, preoccupation, etc.) and although they may contribute to very different medical, financial and social harms, they are both potentially devastating conditions.

Vulnerability to PG appears to be increased by the same individual characteristics that predispose some people toward substance use disorders, and these traits may be an important component of the etiology of PG and other behavioral addictions.

#### 4.4. Conclusions

The personality profile of people at risk for PG is very similar to the profile that has been found in meta-analyses of Borderline personality disorder (Samuel & Widiger, 2008), and substance use disorders (Kotov et al., 2010). The combination of Negative Affect with Unconscientious and Disagreeable Disinhibition is a risk factor for all three of these conditions. This combination of traits bears a striking resemblance to the Impulsive Antisociality dimension of psychopathy (Gaughan, Miller, Pryor, & Lynam, 2009; Ross, Benning, Patrick, Thompson, & Thirston, 2009). Atypical personality can range from normality to dysfunction along this antisocial dimension, perhaps with gambling and other potentially addictive behavior as sequelae of the abnormality. This converging evidence supports our conception of PG as a symptom of psychopathology that goes beyond a simple deficit of impulse control, and we contend that PG should be treated as a behavioral addiction along with other externalizing behaviors.

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