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Multi-trait Profiles and their Relation to Substance Use Problems and Cluster B Personality Disorder Features: A Replication Study

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Abstract

Substance use disorders (SUDs) and Cluster B personality disorders (PDs) may have shared risk through profiles of personality and motivational traits. The present study sought to replicate in a national sample of adults past research which found multi-trait profiles that were associated with disinhibitory disorders in a college sample. Another aim was to test whether gender differences in the prevalence of disinhibitory disorders are attributable to underlying differences in personality-based risk. Cluster analysis was used to identify multi-trait profiles from impulsivity, constraint, negative emotionality, behavioral activation system (BAS), and behavioral inhibition system (BIS) scale scores. Analyses yielded similar multi-trait profiles to those found in past research, including a "disinhibited" profile with high impulsivity, high BAS, and low constraint, as well as a "high affectivity/impulsive" profile with high negative emotionality, impulsivity, BAS, and BIS. These profiles were associated with elevated drug problems and Cluster B PD features. Results support the validity these trait profiles and their association with disinhibitory psychopathology. Gender was associated with some, but not all, disinhibitory disorders while controlling for cluster membership, suggesting that multi-trait personality clusters may represent a more proximal risk factor than gender for certain disinhibitory disorders.

Keywords: disinhibition; impulsivity; negative emotionality; Cluster B personality disorders; substance use disorder

Substance use disorders (SUDs) and personality disorders (PDs) are highly comorbid (Skodol, Oldham, & Gallaher, 1999; Lenzenweger, Lane, Loranger, & Kessler, 2007). PDs are defined by common features, including persistent and harmful patterns of thinking, feeling, and behaving that often result in pervasive interpersonal difficulties (American Psychiatric Association, 2013). Research suggests that these shared features result in a general pathology factor that is common to all PDs, and this factor is predictive of comorbid SUDs (Jahng et al., 2011). However, SUDs appear to be most associated with Cluster B PDs in particular. This cluster is characterized by behavior that is erratic and dramatic, and it includes borderline PD, antisocial PD, histrionic PD, and narcissistic PD. The rate of comorbidity with SUDs is higher for Cluster B PDs than for other PD clusters (Moran, Coffey, Mann, Carlin, & Patton, 2006; Lenzenweger et al., 2007), and is particularly elevated for antisocial PD (Zimmerman & Coryell, 1989) and borderline PD (Trull, Sher, Minks-Bown, Durbin, & Burr, 2000). Additionally, Cluster B PDs have been found to have a unique pathology factor that is unshared by other PDs, and this factor is more strongly predictive of SUDs than the general PD factor (Jahng et al., 2011). These findings suggest a unique connection between Cluster B PDs and SUDs that is not found for other PDs that may, in turn, indicate a connection at an etiological level.

SUDs and Cluster B PDs share the core feature of erratic, dramatic, or disinhibited behavior. Personality (Krueger, McGue, & Iacono, 2001) and motivational traits (Fowles, 2001; Corr, 2002) have been proposed as general risk factors for disinhibitory pathology. For example, traits such as impulsivity and negative emotionality have been linked to SUDs, borderline PD, and antisocial PD (Coskunpinar, Dir, & Cyders, 2013; Fossati, Barratt, Carretta, Leonardi, Grazioli, & Maffei, 2004; James & Taylor, 2007), and have been theorized to be important shared features of these disorders (Sher & Trull, 2002). Less research has been conducted

examining the relationship between personality/motivational traits and the other Cluster B PDs (especially narcissistic PD and histrionic PD), but they all have common behavioral features and may have shared etiology through certain personality and motivational traits. Furthermore, specific combinations of personality traits are theorized to underlie certain disinhibitory disorders, such as borderline PD, which is characterized by both emotional lability and impulsivity. Some research has demonstrated that traits interact with each other to predict heightened risk for psychopathology. For example, high negative emotionality in conjunction with lower constraint has been associated with SUDs (McGue, Slutske, Taylor, & Iacono, 1997). Although various traits have been linked to disinhibitory psychopathology, most research has examined single traits in relation to these disorders. Risk for SUDs and Cluster B PDs may be better understood by examining personality/motivational traits jointly.

Research has begun to explore the possibility that multi-trait profiles exist which confer risk for disinhibitory psychopathology. The present study sought to replicate the findings from one such study, which explored the existence of a disinhibited personality trait profile in a non-clinical sample of college students (Taylor, Reeves, James, and Bobadilla, 2006). Trait profiles were formed using data on three personality trait dimensions that are related to behavioral control (impulsivity, constraint, and negative emotionality) as well as two relevant motivational dimensions (behavioral activation system [BAS] and behavioral inhibition system [BIS]). The study identified two trait profiles that were predictive of disinhibitory psychopathology. A "disinhibited" profile was found that consisted of high impulsivity, low constraint, low BIS, and high BAS. This profile was significantly associated with drug use problems, histrionic PD, and antisocial PD. The study also found a "high affectivity/impulsive" profile that was characterized by high negative emotionality, high impulsivity, and strong BIS. This profile predicted features

of substance use disorders and all Cluster B PDs. Two profiles characterized by constraint were also identified. The “low affectivity/restrained” group consisted of low negative emotionality, high constraint, low impulsiveness, and low BAS. A “constrained” profile was found that had similar qualities to the “low affectivity/restrained” profile, but with low BIS and a more average level of negative emotionality. These two profiles were associated with low levels of disinhibitory psychopathology features.

The study by Taylor et al. (2006) used cluster analysis to identify multi-trait profiles of personality/motivational traits in a college sample. This approach is useful as it provides an objective method for identifying structure in large amounts of data; however, one criticism of this methodology is that the resulting clusters may be dependent on characteristics of the sample used, and may not generalize to a broader population (Milligan & Cooper, 1987). Taylor et al. used a college sample that they noted may not be representative of the general population. Additionally, cluster analyses are used to identify structure in data that is not otherwise discernable, but may impose arbitrary structure on data (Aldenderfer, & Blashfield, 1984). For these reasons, replication studies are essential in establishing the veracity of profiles obtained through cluster analysis. Furthermore, the low rates of reproducibility in psychological science underscore the importance of replication studies as a means to build certainty in findings (Open Science Collaboration, 2015).

Another limitation to the Taylor et al. (2006) study includes conducting separate cluster analyses within each gender, rather than obtaining clusters for the overall sample. Although there are differences between men and women in the personality dimensions used in the cluster analysis and in the rates of SUDs and Cluster B PDs, there is overlap in the distributions of these traits between genders that may be important in characterizing clusters. Gender differences have

been observed in both disinhibitory personality dimensions and related behaviors, but the role of gender in the development of disinhibitory psychopathology remains unclear. The prevalence of disinhibitory disorders has been shown to differ by gender, with a higher prevalence of SUDs (SAMHSA, 2014) and antisocial PD (APA, 1994) among men and higher rates of borderline PD in women (Corbitt and Widiger, 1995; APA, 2000). Although gender differences in prevalence rates may be due in part to measurement bias, research suggests that these differences also reflect true gender disparities in these disorders (Corbitt and Widiger, 1995).

Gender differences in the prevalence of disinhibitory disorders may be explained by underlying personality domains that vary by gender. Research on gender differences in disinhibitory traits suggests that women are higher in neuroticism (Costa, Terracciano, & McCrae, 2001) and punishment sensitivity (Cross, Copping, & Campbell, 2011), whereas men are higher in sensation-seeking and risk-taking (Matczak, 1990; Cross et al., 2011). Although few studies have examined gender and personality concurrently in models predicting disinhibitory psychopathology, some research has found evidence of considerable overlap in the variance that gender and personality account for in disinhibitory psychopathology (Axelrod, 1999; Weijers et al., 2003). There is also some support for an alternate theory proposing that the same personality-based risk factors for disinhibitory disorders have different symptom manifestations for men and women (Cale & Lilienfeld, 2002; White, 2009). The relationship between gender, personality, and disinhibitory disorders is complex, and additional research is needed to clarify the role of these factors in the prediction of disinhibitory psychopathology. The present study extends this literature by concurrently examining gender and personality trait profiles to determine whether gender contributes unique variance in the prediction of features of SUDs and Cluster B PDs. This design also allows for comparison of differential risk for

disinhibitory disorders by gender within each multi-trait profile. Additionally, this study examines whether the proportion of men and women differs within each cluster. This builds upon the existing literature by exploring whether there are gender disparities in the propensity for certain combinations of personality traits.

This study addresses limitations related to sample and gender in the Taylor et al. (2006) study and offers a robust replication of their empirically derived clusters. Based on the findings of Taylor et al., it was hypothesized that both a "disinhibited" and "high affectivity/impulsive" profile would be found, and they would be associated with significantly higher levels of SUD and Cluster B PD features than other trait profiles that emerged in the sample. Regarding gender differences in cluster membership, it was predicted that there would be significantly more men assigned to the "disinhibited" profile and significantly more women in the "high affectivity/impulsivity" profile. Exploratory analyses were conducted to examine whether gender and multi-trait clusters both contribute unique variance in the prediction of disinhibitory psychopathology by examining these factors concurrently within the same model. Additionally, we explored the possibility that gender-differentiated manifestations of disinhibitory psychopathology arise from common personality-based risk factors by examining whether there are gender differences in disinhibitory features within multi-trait clusters.

Methods

Participants and Procedures

A large national sample of adults was sought for this replication study and participants were recruited through Amazon's Mechanical Turk (MTurk), an online crowdsourcing marketplace. Access to the current survey was restricted to U.S. residents aged 18 years and older who had a Human Intelligence Task rating (indicator of quality work on previous tasks)

greater than 90%. Informed consent was provided by the participants prior to completing a battery of questionnaires via a secure online program. The study took approximately one hour to complete, and the participants were provided $2.00 as compensation. Data collected through MTurk has been shown to be demographically diverse and of good quality (Buhrmester, Kwang, & Gosling, 2011; Paolacci & Chandler, 2014).

A total of 580 individuals completed the online survey. Validity check items (e.g., “Are you reading this questionnaire?”) were included to remove participants who were not paying attention to the survey items. A total of 49 participants were excluded from the current study due to incorrectly responding to one of the two validity items. An additional 23 individuals were excluded from this study for an invalid Multidimensional Personality Questionnaire. The final sample for the current study totaled 508 (303 women) participants between the ages of 18 and 70 (M = 33.66, SD = 11.70). Racial distribution of the sample was approximately 81% White, 8% Black, 6% Asian, less than 1% for both American Indian/Alaskan Native and Native Hawaiian/Other Pacific Islander, and approximately 3% as Other or Mixed. Approximately 91% reported their ethnicity as Non-Hispanic/Latino, 6% as Hispanic/Latino, and 4% did not respond to the item. Compared to the sample used in the Taylor et al. (2006) study, which consisted of college students aged 18-33 years (*M* = 19.18, *SD* = 1.36), the present sample is more diverse in age, income, level of education, occupation, and geographic location.

Measures

UPPS Impulsivity Scale (UPPS)

The UPPS (Whiteside & Lynam, 2003) is a 46-item, 1 (agree strongly) to 4 (disagree strongly) likert scale used to measure four separate dimensions of impulsivity. The four dimensions include Lack of Premeditation (“I am a cautious person”), Urgency (“When I feel

bad, I will often do things I later regret in order to make myself feel better now" [reverse scored]), Sensation Seeking ("I would enjoy water skiing"), and Lack of Perseverance ("Once I get going on something, I hate to stop"). A total score of these subscales was used to measure impulsivity. The internal consistency of the scale was good in the current sample ($\alpha = .92$).

Multidimensional Personality Questionnaire – Brief Form (MPQ-BF)

The MPQ-BF (Patrick, Curtin, & Tellegen, 2002) is a 155-item dichotomous (true/false) questionnaire used to measure three higher-order factors comprising eleven lower-order factors. The current study only utilized the higher-order factors of negative emotionality (a measure of negative emotions, stress reactions, and alienation) and constraint (a measure of behavioral restraint, avoidance of harm, and views on rules and punishment). The internal consistencies for the current sample were .89 and .82 for negative emotionality and constraint, respectively.

Sensitivity to Punishment and Reward (SPSRQ)

The SPSRQ (Torrubia, Avila, Moltó, & Caseras, 2001) is a 48-item dichotomous questionnaire used to measure the dimensions of sensitivity to punishment ("Do you often refrain from doing something because of your fear of being embarrassed?") and sensitivity to reward ("Are there a large number of objects or sensations that remind you of pleasant activities?"). The internal consistency was good for both dimensions of the SPSRQ in the current sample (Sensitivity to Punishment KR-20 = .89; Sensitivity to Reward KR-20 = .82).

Short Michigan Alcohol Screening Test (SMAST)

The SMAST (Selzer, Vinoker, & Van Rooijen, 1975) is a 13-item dichotomous (yes/no) measure used as a quick screen for problematic alcohol use. Scores greater than three indicate clinically significant problems with alcohol use. The SMAST displayed an adequate internal consistency in the current sample (KR-20 = .79).

Drug Abuse Screening Test (DAST)

The DAST (Skinner, 1982) is a 28-item dichotomous (yes/no) measure used as a quick screen for illicit drug abuse problems. Scores greater than six indicate clinically significant problems with drug abuse. The internal consistency of the DAST was excellent in the current sample (KR-20 = .92).

Personality Disorder Questionnaire, 4th Ed. (PDQ-4)

The PDQ-4 (Hyler, 1994) is a 99-item dichotomous (true/false) questionnaire designed to measure features of DSM-IV PDs. The current study only used 34 items that assessed histrionic, narcissistic, borderline, and antisocial PDs. The internal consistencies for the dimensions of the PDQ-4 used in the current study ranged from poor to good (histrionic KR-20 = .53; narcissistic KR-20 = .63; borderline KR-20 = .70; antisocial KR-20 = .63).

Analyses

In order to group participants based on personality and motivational traits, cluster analysis was used. Given that cluster analysis is sensitive to measurement differences across scales and outliers (Hair & Black, 2000), variables were scaled as T-scores and data were examined for outliers that were adjusted to a value within twice the interquartile range. Hierarchical cluster analysis was conducted using Ward's method with the squared Euclidean distance as the proximity measure. Possible cluster solutions were identified based on inspection of the dendrogram and agglomeration schedule, as well as utilizing the K-means analyses. The final cluster solution was then chosen based on interpretability of the data. The sample was then randomly split into two subsamples (sample 1 and sample 2) for the purpose of assessing the validity of the cluster solutions. An n-cluster solution was obtained for sample 1 (based on the number of clusters obtained from the full sample). A K-means analysis was then conducted on

sample 2 and was seeded with the centroids from sample 1. The classification of individual cases to clusters was compared between the full sample and each subsample using the Kappa statistic to determine whether cases were consistently assigned to the same cluster across samples. A chi-square analysis was then used to determine whether a similar proportion of individuals was assigned to each cluster across samples 1 and 2.

A chi-square test was used to examine differences in the proportion of males and females assigned to each cluster. A series of Analysis of Variance (ANOVA) models were then used to determine whether cluster membership was related to features of SUDs and Cluster B PDs. Predictors in the model included gender, cluster membership, sample (1 vs. 2), and the Cluster x Sample interaction. The interaction term was included as an additional validity check for cluster assignment. Dependent variables included alcohol use problems, illicit drug use problems, borderline PD features, histrionic PD features, narcissistic PD features, and antisocial PD features.

Alpha corrections were conducted in order to control the experiment-wise error rate for the present analyses. Analyses were grouped by conceptually related psychopathology for the alpha corrections, such that the alpha level for analyses involving alcohol and illicit drug use was set to 0.025 (0.05/2), and the alpha level for analyses involving Cluster B PDs was set to 0.013 (0.05/4). Significant main effects of cluster were further explored using Tukey's Honestly Significant Difference post-hoc tests.

Results

Descriptive statistics for all variables are presented in Table 1. Men were significantly higher than women in impulsivity, $t(506) = 3.97$, $p < .001$, and sensitivity to reward, $t(506) = 2.98$, $p = .01$. Women were significantly higher in constraint, $t(506) = 3.30$, $p < .01$, and

sensitivity to punishment, $t(506) = 3.99$, $p < .001$, than men. Men reported experiencing significantly more alcohol, $t(349.81) = 4.59$, $p < .001$, and illicit drug use problems, $t(352.09) = 2.15$, $p < .05$, and higher levels of narcissistic PD, $t(506) = 3.71$, $p < .001$, and antisocial PD features, $t(354.09) = 5.34$, $p < .001$, than women. In order to estimate the probable level of pathological substance use and personality disorder features in the present sample, the percentage of individuals who endorsed the minimum number of symptoms necessary to meet diagnostic criteria was calculated (see Table 1). A chi-square analysis was used to compare the proportion of men and women endorsing pathological levels of symptoms. Due to the higher number of females (n=303) than males (n = 205) in this sample, male cases were weighted to represent an equal percentage of the sample to females in this analysis. Men endorsed higher levels of pathological alcohol use ($\chi^2(1) = 11.51$, $p < .001$; 67.7% male), narcissistic PD ($\chi^2(1) = 9.29$, $p < .01$; 67.7% male), and antisocial PD ($\chi^2(1) = 19.06$, $p < .001$; 76.5% male) than women. Correlations among the clustering variables were examined (see Table 2), and most variables were moderately related.

Cluster analyses

Cluster analysis resulted in a 5-cluster solution for the entire sample. In order to test the reliability of these results, the sample was randomly split into two subsamples (sample 1 and sample 2). A 5-cluster solution was selected from sample 1, and the centroids of these clusters were then used to obtain cluster solutions in sample 2. To determine whether similar clusters reliably emerged across samples, the classification of cases into clusters was compared between the full sample and samples 1 and 2. Agreement was good when comparing the full sample to sample 1 (K = .72) and sample 2 (K = .75). Chi-square analyses showed no significant difference

in the number of cases classified to each cluster between samples 1 and 2, $\chi^2(4) = 6.30$, $p = .178$, supporting the validity of these cluster solutions.

Consistent with hypotheses, a trait profile that resembled the hypothesized "disinhibited" profile (n = 78) was observed, which consisted of low constraint, high impulsivity, and high sensitivity to reward (see Figure 1a). The hypothesized "high affectivity/impulsive" trait profile (n = 71) also emerged, which included high negative emotionality, high impulsivity, high sensitivity to punishment, and high sensitivity to reward. Results also yielded a profile described as "constrained" (n = 114), which consisted of high constraint, low impulsivity, and high sensitivity to punishment. A "low affectivity/restrained" profile (n = 149) was found that consisted of high constraint coupled with low scores on all other traits. An "average" profile (n = 96) also emerged, which was characterized by a lack of elevation on any trait.

A chi-square test was conducted to examine differences in the proportion of men and women assigned to each cluster (see Table 3), with male cases weighted to equal the percentage of females in the sample. Results suggested that there was a significant difference in the proportion of men and women assigned to clusters, $\chi^2(4) = 21.34$, $p < .001$. Post hoc pairwise comparisons were used to compare gender proportions using Bonferonni corrections. These comparisons revealed that there was a significantly higher proportion of men assigned to the "Average" cluster (60.5% male) and "Disinhibited" cluster (59.5% male), and a higher proportion of women assigned to the "Constrained" cluster (65.6% female).

Association with substance use problems and personality disorder features

ANOVAs were used to determine whether cluster membership predicted substance use problems and Cluster B PD features over and above gender (see Table 4). The Cluster x Sample interaction was not significant for any dependent variable, suggesting that the clusters replicated

well across samples. There was a significant main effect of cluster membership on all areas of psychopathology examined. The mean level of disinhibitory psychopathology features for each cluster is depicted in Figure 1b. People with the "disinhibited" multi-trait profile demonstrated significantly higher levels of illicit drug use problems and Cluster B PD features than those with the "average," "low affectivity/restrained," or "constrained" profiles. Whereas people with the "disinhibited" multi-trait profile were not significantly elevated on alcohol use problems, people with the "high affectivity/impulsive" profile had significantly more features than those with the "low affectivity/restrained" and "constrained" profiles of both alcohol use problems and illicit drug problems. Those with the "high affectivity/impulsive" profile were also significantly higher in levels of Cluster B PD features than those with the "average," "low affectivity/restrained," and "constrained" profiles. Notably, people with the "disinhibited" profile had significantly higher features of antisocial PD than those with the "high affectivity/impulsive" profile, but those groups did not significantly differ in features of any other disinhibitory disorder.

Gender was included in the ANOVA models to explore its possible contribution to the prediction of disinhibitory disorders in excess of the variance accounted for by personality trait profiles (see Table 4). Gender was predictive of disinhibitory features for some, but not all, disinhibitory domains. Men (M = 2.41, SE = .16) had significantly more alcohol problems than women (M = 1.50, SE = .13; F[4, 493]= 19.61, $p < .001$), but there was no gender difference in drug use problems. Antisocial PD features were significantly higher in men (M = 1.71, SE = .08) than in women (M = 1.17, SE = .07; F[4, 493]= 25.96, $p < .001$). Additionally, men (M = 3.17, SE = .13) had significantly more features of narcissistic PD than women (M = 2.68, SE = .11; F[4, 493]= 8.14, $p < .01$). There were no gender differences for features of borderline PD or histrionic PD.

Exploratory analyses were also conducted to examine whether disinhibitory features manifest differently by gender for individuals with the same multi-trait profiles. To explore this possibility, the interaction between gender and cluster membership was included in the ANOVA models. This interaction reached significance before alpha corrections in predicting features of drug problems, histrionic PD, and narcissistic PD, but did not remain significant after correcting for multiple comparisons.

Discussion

SUDs and Cluster B PDs have the common feature of poor behavioral control and may have shared risk through personality and motivational traits. Although much research has demonstrated a relationship between personality dimensions and disinhibitory disorders, little research has examined how multiple concurrent personality dimensions combine and contribute risk for these domains of psychopathology. The present study sought to further the extant knowledge of trait-based etiological risk for disinhibitory disorders by demonstrating the replicability of multi-trait profiles found in previous research in a more diverse sample. This study aimed to replicate the "disinhibited" and "high affectivity/impulsive" profiles found by Taylor and colleagues (2006), as well as to determine whether these profiles were associated with elevated features of substance use problems and Cluster B PD features. Another goal of this research was to clarify the nature gender differences in propensity for disinhibitory personality profiles and features of disinhibitory disorders.

Consistent with hypotheses, a "disinhibited" trait profile and a "high affectivity/impulsive" trait profile were found that closely resembled the corresponding profiles identified in the Taylor et al. (2006) study. The differential trait combinations in these profiles provide evidence for two distinct trait patterns that may give rise to disinhibited behavior. The

"disinhibited" profile was marked by heightened impulsivity and reward sensitivity, as well as low constraint. Individuals with this profile displayed average levels of sensitivity to punishment and negative emotionality. This pattern of traits suggests that these individuals are more motivated by hedonic stimuli than by signals of punishment, tend to impulsively pursue reward, and have a low propensity to inhibit impulses. The "high affectivity/impulsive" profile is similarly marked by elevated impulsivity, but consists of a distinct pattern of disinhibitory traits. This profile was characterized by high negative emotionality, impulsivity, sensitivity to reward, and sensitivity to punishment, with average levels of constraint. This profile was similar to the "high affectivity/impulsive" trait profile identified by Taylor et al., although the profile was more elevated in sensitivity to reward in the present study than in the original. The trait pattern in this profile suggests that these individuals exhibit impulsivity not only in pursuit of reward, but also in attempts to alleviate negative emotions and avoid punishment.

In addition to the hypothesized clusters, the other clusters that emerged were also comparable to those found by Taylor et al. (2006). Two of the trait profiles were characterized by high constraint. The "constrained" profile showed high constraint and punishment sensitivity as well as low impulsivity and reward sensitivity. This pattern suggests that these individuals are considerably more motivated to avoid threat than to pursue reward, and accordingly they exercise self-regulation and inhibit impulses. The "low affectivity/restrained" profile was similarly marked by high constraint, but was low in all other disinhibitory traits. This trait pattern suggests a low overall propensity for emotionality and urges, including low responsiveness to both hedonic and threatening stimuli. The elevated constraint in combination with minimal impulsive or neurotic tendencies suggests that these individuals have high levels of behavioral control and minimal difficulties with self-regulation. An "average" profile was also found that

was defined by a lack of elevation in emotionality and impulsivity combined with lower sensitivities to punishment and reward. These individuals are not excessively prone to either inhibit or act upon impulses, and likely exhibit low levels of disinhibition.

The proportion of men and women with each profile was compared to examine whether there are gender differences in propensity for certain disinhibitory trait profiles. Consistent with hypotheses, there was a higher proportion of men in the "disinhibited" profile than women. However, the prediction that there would be a higher proportion of women in the "high affectivity/impulsivity" profile was not supported. This was unexpected given that past research has found negative emotionality to be higher in women (Costa et al., 2001). However, the level of negative emotionality in the profiles does not appear to be associated with gender, as the two profiles associated with high affectivity and low affectivity did not differ in gender composition. Instead, results showed a higher proportion of men assigned to the "average" profile, and a higher proportion of women assigned to the "constrained" profile. Comparing multi-trait combinations across the profiles that differed by gender reveals a notable pattern. The profiles with a higher proportion of men were characterized by low sensitivity to punishment relative to impulsivity, whereas the profile with more women demonstrates the opposite pattern: high sensitivity to punishment relative to impulsivity. This is consistent with findings from a meta-analysis of impulsive traits, which found that women were higher in sensitivity to punishment than men, and that motivational traits differed more by gender than other facets of impulsivity (Cross et al., 2011). These findings taken together may indicate that motivational dimensions are particularly important in conceptualizing gender differences in disinhibited behavior.

The cluster results in the present study were remarkably similar to the findings by Taylor et al. (2006) in both the number of trait profiles identified and the composition of those profiles.

While previous work found evidence for these trait profiles in a college sample, the present study found evidence for similar profiles in a national sample of adults that was more diverse than the Taylor et al. sample in income, occupation, geographic location, and age. Given the sensitivity of cluster analysis methodology to sample composition (Milligan & Cooper, 1987), the replication of results in a different sample provides compelling evidence for the existence of reproducible multi-trait profiles in the general population. The present study and the Taylor et al. study were each cross-sectional, but taken together they suggest that multi-trait profiles are stable across age at a phenotypic level. Future research is needed to show whether the same multi-trait clusters contain the sample people from early to later adulthood or if people change clusters. In addition, it would be helpful to examine the question of multi-trait profiles in a younger sample to see when in development these profiles emerge.

The results of the present study provided support for the hypothesis that the "disinhibited" and "high affectivity/impulsive" trait profiles would be associated with SUDs and Cluster B PDs. These two trait profiles had similar relationships with disinhibitory psychopathology, but with a few notable differences. Overall, the "disinhibited" and "high affectivity/impulsive" profiles were associated with significantly higher features of histrionic PD, narcissistic PD, borderline PD, antisocial PD, and illicit drug use problems than the other trait profiles. The two disinhibitory profiles were no different from one another in predicting these domains of psychopathology, with the exception of antisocial PD. Both disinhibitory profiles were significantly elevated in features of antisocial PD, but the "disinhibited" profile was significantly higher in features than the "high affectivity/impulsive" profile. This is consistent with research indicating that antisocial behavior is associated with low sensitivity to

punishment (Gorenstein & Newman, 1980), whereas the “high affectivity/impulsive” profile is elevated in this dimension.

Regarding alcohol use problems, the “high affectivity/impulsive” profile had significantly elevated features, but the “disinhibited” profile did not significantly differ from any other group. This provides support for prior work showing negative emotionality in combination with impulsive traits as an important risk factor in the development of problematic alcohol use (McGue et al., 1997). It is also important to note that these results depart from the Taylor et al. (2006) findings in that there were no groups differences found for alcohol problems in their college sample. The current study used the same measure of alcohol problems on an older sample, and it may be that trait profiles become more predictive of alcohol problems as people age or that they are simply obscured by the ubiquity of drinking and associated problems when looking at college samples.

Exploratory analyses were conducted to examine whether gender was associated with disinhibitory disorders while accounting for the effects of disinhibitory personality profiles. These analyses revealed an effect of gender on features of alcohol problems, antisocial PD, and narcissistic PD, with men exhibiting more features than women. This suggests that for these areas of disinhibitory psychopathology, there is gender-based risk that is distinct from the contribution of disinhibitory personality traits, such as social aspects of gender. Gender was not related to features of drug problems, borderline PD, or histrionic PD, suggesting that the relationship between these disorders and gender is accounted for by gender differences in the proportion of disinhibitory personality traits. No interaction was found between gender and cluster membership, which suggests that personality-based risk factors for disinhibitory disorders

manifests similarly between men and women. This opposes the theory that gender-differentiated symptom presentations arise from the same underlying personality-based risk factors.

The present study had some limitations that must be considered when interpreting the findings. For instance, the Amazon MTurk crowdsourcing market was used for data collection, and this sample has been demonstrated to differ from the general population in ways that may have influenced the clustering variables. Specifically, MTurk samples tend to have higher levels of social anxiety (Shapiro et al., 2013), which is associated with heightened negative emotionality (e.g., Watson, Clark, & Carey, 1988). This may have caused individuals high in negative emotionality to be over-represented in the present sample, which could have affected the clustering results. However, the successful replication of profiles found by Taylor et al. (2006) suggest that the results are not likely attributable to anomalous characteristics of this sample. Additionally, the presence of disinhibitory psychopathology features was measured by self-report. The use of structured interviews would determine whether participants meet diagnostic criteria for these disorders. It is reasonable to predict that the multi-trait clusters observed in this study would be differentially related to disinhibitory psychopathology among individuals who meet full diagnostic criteria versus those who have only subclinical level features, and future research should examine this possibility. Finally, this study was cross-sectional and longitudinal research is necessary to establish a prospective relationship between multi-trait profiles and the development of disinhibitory psychopathology.

The present findings provide support for the notion that certain constellations of personality and motivational traits may confer particular risk for disinhibitory disorders. These trait profiles may facilitate a better understanding of the etiology for such disorders than examining traits in isolation. Consistent with findings by Taylor et al. (2006), the present results

also indicate that there may be two distinct constellations of disinhibitory traits that lead to risk for these disorders: one that is approach-oriented (i.e., the “disinhibited” profile) and one that is characterized by mood-related impulsivity and avoidance of punishment (i.e., the “high affectivity/impulsive” profile).

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Table 1

Descriptive Statistics for Clustering Variables and Dependent Variables and Percent Meeting Diagnostic Criteria by Gender

Variable	Total (N = 508)		Women (*n* = 303)		Men (*n* = 205)	
			M (SD)		M (SD)	
Negative Emotionality	49.99 (9.98)		49.42 (9.78)		50.86 (10.28)	
Constraint	50.02 (9.92)		51.20 (9.64)		48.23 (10.28)	
Impulsivity	50.01 (9.99)		48.57 (9.99)		52.11 (9.66)	
Sensitivity to Punishment	50.00 (10.00)		51.43 (9.95)		47.87 (9.72)	
Sensitivity to Reward	49.99 (9.96)		48.93 (9.64)		51.59 (10.33)	
	M (SD)	% Met Threshold	M (SD)	% Met Threshold	M (SD)	% Met Threshold
Short Michigan Alcohol Screening Test	1.78 (2.25)	12	1.39 (1.91)	9	2.36 (2.58)	18
Drug Abuse Screening Test	3.66 (4.8)	15	3.26 (4.15)	13	4.24 (5.58)	17
Histrionic PD	2.27 (1.66)	5	2.27 (1.60)	5	2.27 (1.76)	5
Narcissistic PD	2.73 (1.97)	10	2.47 (1.83)	7	3.12 (2.10)	15
Borderline PD	2.84 (2.14)	15	2.85 (2.17)	15	2.81 (2.09)	14
Antisocial PD	1.21 (1.42)	9	0.92 (1.21)	5	1.63 (1.61)	15

Note. Thresholds: Short Michigan Alcohol Screening Test = 3; Drug Abuse Screening Test = 6; Histrionic = 5; Narcissistic = 5; Borderline = 5; Antisocial = 3.

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 2

Correlations between Clustering Variables

	1	2	3	4	5
1. Negative Emotionality	1	-.244***	.379***	.367***	.273***
2. Constraint		1	-.702***	-0.02	-.272***
3. UPPS Impulsivity			1	.111*	.384***
4. Sensitivity to Punishment				1	.220***
5. Sensitivity to Reward					1

*$p < .05$; **$p < .01$; ***$p < .001$.

Table 3

Comparing proportion of males and females assigned to each cluster.

	Row N %	
	Male	Female
Average	60.5%$_a$	39.5%$_b$
High affectivity/impulsive	50.4%$_a$	49.6%$_a$
Low affectivity/restrained	48.4%$_a$	51.6%$_a$
Constrained	34.4%$_a$	65.6%$_b$
Disinhibited	59.5%$_a$	40.5%$_b$

Note: Values in the same row with different subscripts are significantly different at $p < .05$. Male cases were weighted in these analyses to control for the higher proportion of women in the overall sample.

Table 4

Cluster Membership Predicting Substance Use Problems and Personality Disorder Features

	SS	df	MS	F	η^2p
Alcohol					
Gender	94.08	1	94.08	19.61***	.038
Sample	4.58	1	4.58	.96	.002
Cluster	70.74	4	17.69	3.69**	.029
Cluster*Gender	4.41	4	1.10	.23	.002
Cluster*Sample	12.93	4	3.23	.67	.005
Error	2364.78	493	4.80		
Drugs					
Gender	46.07	1	46.07	2.21	.004
Sample	21.25	1	21.25	1.02	.002
Cluster	967.19	4	241.80	11.58***	.086
Cluster*Gender	219.24	4	54.81	2.62	.021
Cluster*Sample	70.57	4	17.64	.85	.007
Error	10296.82	493	20.89		
Borderline					
Gender	1.16	1	1.16	.39	.001
Sample	7.48	1	7.48	2.54	.005
Cluster	757.02	4	189.25	64.16***	.342
Cluster*Gender	12.54	4	3.14	1.06	.009
Cluster*Sample	12.55	4	3.14	1.06	.009
Error	1454.33	493	2.95		
Antisocial					
Gender	32.03	1	32.03	25.76***	.050
Sample	.34	1	.34	.27	.001
Cluster	349.03	4	87.26	70.17***	.363
Cluster*Gender	10.19	4	2.55	2.05	.016
Cluster*Sample	.90	4	.22	.18	.001
Error	613.04	493	1.24		
Narcissistic					
Gender	26.53	1	26.53	8.14**	.016
Sample	.21	1	.21	.07	.000
Cluster	251.45	4	62.86	19.28***	.135
Cluster*Gender	39.23	4	9.81	3.01	.024
Cluster*Sample	3.75	4	.94	.29	.002
Error	1607.41	493	3.26		
Histrionic					
Gender	.93	1	.93	.40	.001
Sample	.30	1	.30	.13	.000
Cluster	209.51	4	52.38	22.34***	.153
Cluster*Gender	24.94	4	6.23	2.66	.021
Cluster*Sample	10.29	4	2.57	1.10	.009
Error	1156.11	493	2.35		

**$p < .01$; ***$p < .001$

(a)

(b)

Figure 1. (a) Mean levels of traits for each trait profile. (b) Mean (± 1 SE) levels of substance use disorder problems and personality disorder features for each multi-trait profile.