Published in final edited form as:

J Pers Disord. 2017 June ; 31(3): 289–305. doi:10.1521/pedi_2016_30_249.

Self-Control Capacity as a Predictor of Borderline Personality Disorder Features, Problematic Drinking, and Their Co-Occurrence

Benjamin N. Johnson, BA, Melinda L. Ashe, BA, and Stephen J. Wilson, PhD

The Pennsylvania State University, University Park, Pennsylvania

Abstract

Borderline personality disorder (BPD) and alcohol use disorder (AUD) share impulsivity as an etiological factor. However, impulsivity is ill-defined, often overlapping with self-control capacity. This study attempts to disentangle these constructs and their associations with alcohol use and BPD. Undergraduates ($N = 192$) completed the Five Factor Model Rating Form, which generated two dimensional scales of BPD, the Self-Control Scale, the UPPS-P (self-reported impulsivity), and the Stop-signal and delay discounting tasks (laboratory-measured impulsivity). Self-control appeared as a major predictor of BPD features and drinking, explaining as much or more variance in outcome than impulsivity. Co-occurrence of elevated BPD features and problem drinking was also best explained by self-control. Laboratory measures of impulsivity were not correlated with BPD scales or alcohol use. Self-regulatory capacity may be an important but overlooked factor in BPD and alcohol use and should be considered alongside impulsivity in future research.

Keywords

alcohol use; borderline personality disorder; comorbidity; five factor model; impulsivity; self-control

Borderline personality disorder (BPD) and alcohol use disorders (AUD) are each deadly and costly mental illnesses. BPD may affect up to 6% of individuals (Grant et al., 2008). Individuals with BPD have at least 10-25 times greater risk for attempted suicide than the general population (Brodsky, Groves, Oquendo, Mann, & Stanley, 2006) and frequently utilize costly healthcare services (Bateman & Fonagy, 2003). AUD is also highly detrimental—it is estimated that up to 8% of deaths and 1% of gross national product worldwide can be attributed to alcohol use (Merikangas & McClair, 2012).

Comorbidity between BPD and AUD is especially problematic. Up to 72% of individuals with BPD have a lifetime comorbid substance use disorder (Tomko, Trull, Wood, & Sher, 2014). Treatment of individuals with this comorbidity may be less successful than that of people with a single diagnosis. For instance, an examination of residential alcohol use treatment revealed that comorbid BPD was associated with increased risk of treatment

dropout (Tull & Gratz, 2012). Similar results have been found in outpatient populations (Krampe et al., 2006).

The field has identified impulsivity as a key factor in the development of BPD and AUD. Crowell, Beauchaine, and Linehan (2009) suggest that early impulsivity gives rise to later maladaptive behaviors and emotional sensitivity in individuals with BPD. Dick and colleagues (2010) posit that, although the specific mechanisms are poorly understood, the link between impulsivity and AUD has been well-established. Empirically supported models also explain the covariation between substance use and personality pathology, and many place impulsivity at the crux of this comorbidity (Trull, Sher, Minks-Brown, Durbin, & Burr, 2000; Verheul & van den Brink, 2005). These models suggest that impulsivity is a unique risk factor and interacts with other clinical correlates, such as emotion dysregulation, to predict the co-occurrence of BPD symptoms and substance use problems.

Impulsivity is a complex construct, comprised of risk-taking, lack of forethought, dysregulated response to emotion, and novelty-seeking. Impulsivity has been measured with both self-report questionnaires and laboratory tasks. A recent meta-analysis of 27 studies found that the relationships between self-reported and laboratory-based measures of impulsivity were negligible to small, indicating that there is likely little overlap between the underlying constructs being measured (Cyders & Coskunpinar, 2011). These findings highlight the multifaceted nature of impulsivity and call for researchers to utilize both modes of measurement to determine which most accurately predicts maladaptive outcomes.

Laboratory and self-report measures of impulsivity have been associated with BPD and AUD. Tragesser and Robinson (2009) found that self-reported affective instability and facets of impulsivity were independently associated with BPD features. Individuals with BPD have also been shown to discount future rewards more steeply than healthy controls (Lawrence, Allen, & Chanen, 2010). Likewise, AUD has been predicted by both self-reported urgency and lack of perseverance (Coskunpinar, Dir, & Cyders, 2013), as well as steeper delayed reward discounting (MacKillop et al., 2011). The complex nature of assessing impulsivity, however, has made it difficult to pinpoint the exact mechanisms by which impulsivity contributes to the development of psychiatric diagnoses (Dick et al., 2010).

Self-control capacity is a social psychological construct intimately related to impulsivity, which may also explain the co-relationship between BPD and AUD. Trait self-control is an ability to inhibit pre-potent responses by navigating potentially tempting situations and delaying gratification (Tangney et al., 2004). The strength model views self-control as a muscle: a finite resource used to delay gratification, depleted through use, or strengthened through exercise (Baumeister, Vohs, & Tice, 2007). Evidence suggests that individual variation in self-control capacity predicts important maladaptive outcomes, including alcohol use and BPD. A recent meta-analysis of 102 studies confirmed that self-control predicts eating behaviors and weight-control, academic achievement, and substance use (Ridder et al., 2011). Specifically, in a study of college students, low levels of trait self-control predicted problematic drinking (Dvorak, Simons, & Wray, 2011). Likewise, the developmental literature points to deficits in self-regulatory capacity as contributing to the formation of personality pathology (Levy, Johnson, Clouthier, Scala, & Temes, 2015).

Although measures of impulsivity and self-control are conceptually related, burgeoning evidence indicates that they are independently associated with behavioral outcomes. A conceptual review argued that the neural regions (e.g., occipitotemporal area) underlying executive function, including abilities related to self-control such as planning, are distinct from those underpinning impulsivity (e.g., inferior frontal gyrus; Bickel, Jarmolowicz, Mueller, Gatchalian, & McClure, 2012). Hofmann, Friese, and Strack (2009) propose a dual-systems model in which individuals high in self-control are better able to resist impulses than those low in self-control, further reinforcing the differentiability of these constructs. Empirical evidence has corroborated these models. Friese and Hoffman (2009) found that affective reactivity to alcohol and potato chips predicted consumption only for individuals low in self-control after accounting for state impulsivity. Likewise, a study by Gunn and Finn (2015) found that negative urgency was more strongly related to performance on a response inhibition task for individuals who had been depleted with a high-load working memory task than for those who had not.

Despite evidence that self-control is relevant to BPD and AUD, it has not been studied as a unique predictor of their comorbidity. The current study addresses this gap by assessing self-control capacity alongside various facets of impulsivity as predictors of co-occurring BPD traits and problem drinking in a nonclinical sample. First, we aim to show that self-control is associated with BPD traits and alcohol use after controlling for impulsivity. Next, we aim to determine if self-control is uniquely predictive of co-occurring elevated BPD traits and problematic alcohol use.

We hypothesize that: 1) Self-control capacity will be negatively associated with scores on dimensional BPD scales and severity of alcohol use, while self-reported and laboratory-measured impulsivity will be positively associated with BPD scales and severity of alcohol use; 2) Self-control capacity will explain unique variance in BPD scale scores, above and beyond measures of impulsivity; 3) Self-control capacity will also explain unique variance in problematic alcohol use, above and beyond measures of impulsivity; 4) Self-control capacity will explain unique variance in the presence of co-occurring BPD-AUD elevations, above and beyond measures of impulsivity.

Method

Participants

Participants were recruited through the undergraduate psychology subject pool of a large rural mid-Atlantic university and received research credit for participation. All participants were age 18 or above.

Procedure

Informed consent was obtained by trained research assistants in accordance with the guidelines of the university's institutional review board. Participants subsequently completed a battery of computerized tasks and questionnaires. All study procedures were completed within two hours and were conducted in a laboratory space in the university psychology department building.

Measures and Tasks

Demographics—Data on age, sex, ethnicity and marital status and income were obtained.

Self-Control Scale—The Self-Control Scale (SCS), which measures stable individual differences in self-regulatory capacity (Tangney et al., 2004), consists of 36 items (e.g., “People would say I have a very strong self-discipline”) rated on a 5-point Likert scale from 1 (“Not at all like me”) to 5 (“Very much like me”). Twenty-four items are reverse-coded. The SCS has demonstrated high internal consistency ($\alpha = .89$), which was replicated in the present sample ($\alpha = .89$), and concurrent validity (Tangney et al., 2004). A total score is obtained by summing all 36 items, with higher scores indicating higher trait self-control.

Alcohol Use Disorders Identification Test—The Alcohol Use Disorders Identification Test (AUDIT) is a 10-item self-report screen for Alcohol Dependence and/or Alcohol Use Disorder (Saunders, Aasland, Babor, De La Fuente, & Grant, 1993). Eight items assess frequency and amount of alcohol consumption and two assess problems associated with drinking. The sum of all items measures hazardous alcohol use. The AUDIT has demonstrated strong internal consistency ($\alpha = 0.75\text{--}0.94$; Allen, Litten, Fertig, & Babor, 1997), which was confirmed in the present study ($\alpha = .82$).

Five Factor Model Rating Form—The Five Factor Model Rating Form (FFMRF; Mullins-Sweatt, Jamerson, Samuel, Olson, & Widiger, 2006) consists of 30 items assessing the 30 facets of the five-factor model (Costa & McCrae, 1995). The five domains (Extraversion, Neuroticism, Openness to Experience, Agreeableness, and Conscientiousness) are each subdivided into six interrelated facets, measured on a 1 (“Extremely Low”) to 5 (“Extremely High”) scale. Items include “Angry Hostility” (*angry to even-tempered*) from the Neuroticism domain and “Assertiveness” (*dominant to unassuming*) from the Extraversion domain. Facets are averaged to obtain an overall domain score. The measure has demonstrated acceptable psychometric reliability or above ($\alpha = .51\text{--}.87$; Mullins-Sweatt et al., 2006), similar to that in the present study ($\alpha = .67\text{--}.77$), and convergent and discriminant validity (Morey, Gunderson, Quigley, & Lyons, 2000).

UPPS-P—Based on the original UPPS Impulsive Behavior Scale (Whiteside & Lynam, 2001), the UPPS-P (Cyders et al., 2007) is a 59-item self-report measure that assesses five components of impulsivity on a 1 (“Agree Strongly”) to 4 (“Disagree Strongly”) scale: Negative Urgency, Positive Urgency, [lack of] Premeditation, [lack of] Perseverance, and Sensation Seeking. The subscales assess disinhibition in the context of intense negative and positive emotion, lack of deliberation, lack of ability to maintain concentration on tasks, and interest and enjoyment in engaging in new experiences, respectively. Subscale scores are created by averaging the items associated with each scale. The UPPS has demonstrated excellent internal reliability ($\alpha = .83\text{--}.94$; Cyders et al., 2007), slightly better than in the present study ($\alpha = .76\text{--}.82$), and has been validated in nonclinical and clinical populations (Whiteside & Lynam, 2001).

Delay Discounting—Participants completed a modified version of the Monetary Choice Questionnaire (MCQ; Kirby, Petry, & Bickel, 1999). Sixty choices presented smaller

immediate and larger delayed hypothetical monetary rewards. Responses are used to estimate k values, which assess how valuation of rewards changes as a function of time; high k values indicate devaluation of future rewards. The measure was scored as described in Kirby et al. (1999), with three additional reward sizes, producing six k values. The MCQ has been validated in non-clinical (Hamilton et al., 2015) and clinical (Amlung & MacKillop, 2011) populations.

Stop-Signal Task—Subjects performed an adjusting Stop-signal task (Lappin & Eriksen, 1966) modified by Thakkar et al. (2014). Subjects were presented with leftward or rightward facing arrows and asked to press the corresponding button as quickly as possible (Go Trials), unless they heard a beep (Stop Trials). As time from arrow to beep onset increases, response inhibition becomes more difficult. Participants practiced with 22 Go Trials and 10 Stop Trials and then completed two blocks of 128 trials each. Scores were produced using the horserace model of response inhibition (Logan & Cowan, 1984) by comparing reaction time across trial types (Stop-Signal Reaction Time; SSRT; Thakkar et al., 2014).

BPD Scales—Two dimensional BPD scales were generated from the five-factor trait literature by averaging items from the FFMRF. The first scale (BPD-Expert) was reproduced from Lynam and Widiger (2001) who asked 24 BPD experts to evaluate the BPD construct in terms of five-factor facets. In two clinical samples, Miller, Bagby, Pilkonis, Reynolds and Lynam (2005) determined diagnostic cutoffs (Sample 1: 3.06, Sample 2: 3.17) for this scale based on receiver operating characteristics. The second scale (BPD-Empirical) is an averaged derivation of a meta-analysis of 16 studies of FFM and personality disorder feature associations (Samuel & Widiger, 2008). No clinical cutoffs have been identified for this scale.

Data Analytic Plan

Missing Data and Outliers—Two cases were dropped from analyses due to <50% of data provided on the UPPS-P, providing unreliable estimates of UPPS-P subscales. Three cases were considered outliers on the SSRT and excluded based on the recommendations of Congdon et al. (2012). Two cases were removed from regression analyses due to standardized residual scores exceeding 3.

Analyses—In order to test the ability of self-control to predict alcohol use and BPD scale scores over and above impulsivity, stepwise linear regressions were carried out in IBM SPSS 22 (Step 1: UPPS-P; Step 2: UPPS-P and SCS). All analyses utilized two tailed tests, $p < .05$.

Relative weights (RW) analyses determined the relative importance of the UPPS-P and SCS scores in predicting alcohol consumption and BPD features (Tonidandel & LeBreton, 2011). Relative importance describes the amount of explained variance in a dependent variable attributed to a predictor. Analyses were conducted with the online R package provided by Tonidandel and LeBreton (2011), with a type 1 error rate set at $\alpha = 0.05$.

In order to assess the independent effect of self-control on BPD-AUD co-occurrence, we utilized binary logistic regression to predict comorbidity status (Block 1: UPPS-P; Block 2:

UPPS-P and SCS). The AUDIT elevations were defined as scores above the clinical cutoff of 8 (Saunders et al., 1993). Given the non-clinical sample, we used the lower cutoff outlined by Miller et al. (2005) to determine elevation on the BPD-Expert scale. Since no validated clinical cutoff for the BPD-Empirical scale exists, we used a median split to identify an elevated subsample. Elevations on both the AUDIT and each BPD scale determined “comorbid” groups.

Results

The sample ($N = 190$) had a mean age of 19.09 ($SD = 1.56$), was 51.1% female, and was predominantly Caucasian (76%); 12.5% identified as Asian, 6.3% African American, 0.5% American Indian/Alaskan Native, and 4.7% multi-racial. Thirty-two (16.7%) participants scored at or above the first cutoff score (Miller et al., 2005) on the BPD-Expert scale, and 50 (26.0%) at or above the second. On the BPD-Empirical scale, 86 (44.8%) participants scored above the median. Based on the AUDIT cutoffs (Saunders et al., 1993), 77 (40.1%) participants scored within the “requires advice” group, 9 (4.7%) in “brief counseling”, and 3 (1.6%) in “dependence.” Thirty (15.6%) participants were classified as comorbid based on the AUDIT and BPD-Expert cutoffs, and 39 (20.3%) based on the AUDIT and BPD-Empirical cutoffs.

Participant age was not significantly associated with the BPD-Empirical scale, the SCS, UPPS-P, MCQ, SSRT, or the AUDIT. Age was positively associated with BPD-Expert, $r(190) = .14, p = .049$. Men scored higher than women on the SCS, $t(190) = 2.27, p = .02, d = .33$. Genders did not differ on either BPD scale, age, MCQ, SSRT, the AUDIT, or UPPS-P Urgency or Perseverance scales. Men scored higher on UPPS-P Sensation Seeking, $t(188) = 2.43, p = .02, d = .35$. Due to small cell sizes, ethnic group differences were not examined.

Table 1 reports associations among all variables. BPD-Expert, but not BPD-Empirical, was significantly associated with the AUDIT. Given the high correlation between the SCS and the UPPS-P Urgency and Perseverance scales, we utilized exploratory factor analysis to confirm that self-control could be differentiated from impulsivity. Results of a Promax rotated four-factor solution (based on scree plot analysis; eigenvalues > 4) suggested that SCS items loaded uniquely onto the third factor. Positive and Negative Urgency scale items loaded on the first factor; since these scales were highly correlated and overlap conceptually (Whiteside & Lynam, 2001), we created a combined Urgency scale for subsequent analyses. Items from the UPPS-P Premeditation subscale loaded onto the second factor and items from the UPPS-P Sensation Seeking subscale loaded onto the fourth factor.

Surprisingly, neither MCQ nor SSRT scores were significantly correlated with either of the BPD scales or the AUDIT. UPPS-P Perseverance was similarly not associated with the AUDIT, and Sensation Seeking was not associated with either BPD scale. Thus, the laboratory measures of impulsivity were not included in subsequent analyses. To ensure that the present findings were not due to measurement or administrative error, we 1) reviewed the protocol of administration, confirming it matched that of prior research, 2) double-checked computations used to generate the results of these measures, and 3) compared descriptive statistics of our results with those of prior research (Amlung & MacKillop, 2011; Amlung &

MacKillop, 2014; Congdon et al., 2012; Kirby et al., 1999; Thakkar et al., 2014). Each of these steps suggested the laboratory measures in our study were used appropriately and generated valid data.

Results of stepwise regressions are reported in Table 2. In Step 1, Urgency significantly predicted the AUDIT and BPD scale scores over and above the remaining UPPS-P scales. In the model predicting the AUDIT scores, Premeditation and Urgency were the only significant predictors. In the model predicting BPD-Empirical scores, Perseverance and Urgency were the only significant predictors. After adding the SCS to Step 2, the combined predictors explained roughly 25% of the variance in each outcome. The SCS was a significant predictor over and above the UPPS-P in all three models. Adding the SCS into the models reduced the effect of all UPPS-P subscales to nonsignificance, except for Perseverance in predicting the AUDIT and BPD-Empirical scores.

In predicting AUDIT scores, the effect of Perseverance increased in magnitude (1% to 5% variance explained) with the addition of the SCS to the model, suggesting the presence of suppression. A suppressor dampens the “noise” inherent in a predictor variable, increasing its effect on Y (MacKinnon, Krull, & Lockwood, 2000). Our results suggested that the SCS suppressed unnecessary variance in Perseverance, thus increasing the predictive power of Perseverance. Given our primary interest in self-control, we also examined the possible suppression effect of Perseverance on the SCS. The addition of Perseverance to a model including the remaining UPPS-P scales and the SCS magnified the effect of the SCS on the AUDIT (Step 1: $B = -.10$, $t(180) = -3.89$, $p < .001$, $R^2 = .07$; Step 2: $B = -.13$, $t(180) = -4.89$, $p < .001$, $R^2 = .10$); an additional 3.3% of the variance in the AUDIT scores was explained by the SCS in Step 2. The effect of the suppressor in improving prediction of the AUDIT was significant, $F(1, 185) = 12.03$, $p = .001$.

Relative weights analyses are presented in Table 3. Overall, the SCS accounted for approximately 50% of variance explained by all measures in the total models. For alcohol consumption, RWs revealed that the SCS accounted for significantly more variance than any UPPS-P subscale. No significant differences were found between UPPS-P subscales. For BPD-Expert, SCS and Urgency each accounted for significantly more variance than the remaining UPPS-P scales, which did not significantly differ from each other. For BPD-Empirical, SCS and Perseverance each accounted for significantly more variance than Premeditation or Sensation Seeking; there were no significant differences between the SCS and either Urgency or Perseverance. There were no significant differences among Urgency, Premeditation, and Sensation Seeking.

Logistic regression results are reported in Table 4. In Block 1, Urgency predicted comorbid BPD-Expert and elevated AUDIT co-occurrence. Adding the SCS reduced this effect to nonsignificance, increasing the total variance explained by 6%. Both blocks of the model predicting BPD-Empirical and elevated AUDIT comorbidity were nonsignificant, although Perseverance was a significant predictor of comorbid group membership. Therefore, we tested a simpler model with UPPS-P Perseverance in Block 1 and SCS added in Block 2. Perseverance was a significant predictor of comorbidity in Block 1, $B = 1.05$, $\text{Wald}(1) = 6.53$, $p = .01$, $OR = 2.85$, 95% CI [1.28, 6.37], and the block predicted 5.5% of the variance.

Adding the SCS decreased this effect to nonsignificance, $B = -.24$, $\text{Wald}(1) = .21$, $p = .64$, $OR = .79$, 95% CI [.29, 2.14]. The SCS significantly predicted comorbidity, $B = -.06$, $\text{Wald}(1) = 18.19$, $p < .001$, $OR = .94$, 95% CI [.92, .97], and the entire model predicted 22.4% of the variability in group status. Although the initial model predicting BPD-Empirical and AUDIT comorbidity was nonsignificant, this supplementary model suggests that self-control remains an important predictor of this comorbidity, with results similar to those of the model predicting BPD-Expert and AUDIT comorbidity.

Discussion

Diminished self-control capacity and heightened impulsivity were associated with BPD features and problematic drinking, confirming our first hypothesis. Results also supported our second and third hypotheses, suggesting that self-control, controlling for self-reported impulsivity, strongly predicts both BPD features and problematic alcohol use in a non-clinical young adult sample. Self-control predicted co-occurring problem drinking and expert-rated BPD traits, above and beyond impulsivity. Perseverance was the only factor which predicted co-occurring problem drinking and empirically derived BPD traits; however, in a model which included only self-control and perseverance, self-control outperformed perseverance in predicting this co-occurrence. Thus, our fourth hypothesis was partially confirmed.

While the field has focused on impulsivity as a core feature of BPD, AUD and their comorbidity, our results suggest that trait self-control may also be an important contributor to these maladaptive conditions. Our findings support a recent conceptualization of impulsivity and self-control as independent systems (Bickel et al., 2012; Hofmann et al., 2009). Self-control and impulsivity, while clearly related, may uniquely elucidate problems of dyscontrol, such as alcohol abuse and BPD symptoms. The strength model has identified self-control as a finite resource (Baumeister et al., 2007). Individuals with these disorders may have low levels of (or restricted access to) this resource, resulting in dangerous impulsive actions. Our results highlight the importance of assessing both self-control capacity and impulsivity in BPD and problematic drinking.

Our findings suggest that self-control may outperform impulsivity in identifying individuals at risk for comorbid AUD and BPD. Although urgency and perseverance may confer risk for comorbidity, our results suggest that a lack of self-regulation may be as important for understanding this confluence of symptoms. Self-control may influence both affective reactivity and disinhibition implicated in shared etiological models of BPD and AUD (Trull et al., 2000).

The expert-consensus and empirically derived BPD scales differed in two key ways. Given that BPD is a heterogeneous construct, with 256 possible ways for individuals to receive a diagnosis, the two BPD scales may focus on different components of the constellation of symptoms. First, only the expert-consensus scale was significantly associated with problematic drinking. Experts may emphasize the importance of BPD features associated with externalizing behaviors such as drinking due to the salience of these behaviors and their potential to interfere with treatment progress (van den Bosch, Verheul, Schippers, & van den

Brink, 2003). Second, unlike expert-consensus ratings, meta-analytically derived BPD features were predicted by perseverance, even when accounting for self-control. By tapping personality facets related to consistency (e.g., “Dutifulness”), this BPD scale may emphasize the identity disturbance unique to BPD. Identity disturbance is comprised, in part, of inconsistent self-concept and difficulty committing to tasks (Wilkinson-Ryan & Westen, 2014), both of which are conceptually related to a lack of perseverance. This emphasis on consistency may help explain the nonsignificant correlation between empirically derived BPD features and problematic drinking, as perseverance was unrelated to alcohol use in the present study.

Interestingly, perseverance emerged as a suppressor in the relationship between self-control and problem drinking. This suggests that removing the overlap of perseverance from self-control produced a “refined” or “pure” version of the latter construct. Examination of correlations between the UPPS-P Perseverance scale and the SCS indicated that this overlap was driven by items assessing work-ethic (e.g., “I am able to work effectively toward long-term goals”). The remaining item content, unique to the SCS, centers on restraint (e.g., “I am self-indulgent at times,” “I spend too much money”). Thus, restraint appears to be at the core of self-regulatory processes implicated in problematic alcohol use, consistent with evidence that depleted self-control capacity predicts less alcohol restraint (Muraven, Collins, & Neinhouse, 2002).

Notably, laboratory measures of impulsivity in our sample were not significantly associated with self-reported alcohol use, BPD trait scales, self-reported impulsivity (aside from a positive relationship between discounting factors and perseverance), or each other. Our findings support a growing body of literature which has demonstrated little overlap between laboratory-assessed and self-reported impulsivity (Cyders & Coskunpinar, 2011). Although it is possible that self-reported, versus laboratory-based, impulsivity was related to alcohol use and BPD scales purely due to similarity in method of assessment, shared response style cannot account for the fact that laboratory-based impulsivity measures were not related to each other. Rather, it is more likely that our results are indicative of the view that self-report and laboratory-based measures of impulsivity assess different underlying processes.

Implications

The present study has implications for the treatment and assessment of BPD and AUD, as well as their comorbidity. The strength model has identified self-control capacity as a characteristic that can be modified, depleted by use, or strengthened by exercise, making it an ideal target for intervention. Treatments for these disorders have traditionally focused on decreasing impulsive behavior through a variety of means. Our findings suggest that strengthening self-control capacity, for instance via practice of planful, self-regulatory, or other behaviors focused on enhancing self-discipline and self-monitoring, may be equally useful as a strategy for intervention. It is possible that techniques of current treatments for BPD and substance use disorders, such as dialectical behavior therapy (DBT; Linehan, 1993) target both self-control and impulsivity. Consider the DBT skill of “opposite action,” in which an individual combats activating urges by engaging in behavior diametric to those urges. This skill may address impulse by bolstering awareness and mindful attention to urges

and simultaneously engage self-controlled processes such as behavior alteration or substitution.

Assessment of self-control (and specifically restraint in the case of AUD) may also allow for early identification of risk for BPD, AUD, and their comorbidity, above and beyond a focus on impulsive behavior alone. Given the ability of self-control to predict features of these disorders, even after accounting for impulsivity, a multifaceted assessment of both self-control and impulsivity may improve detection of at-risk individuals. For example, given significant problematic drinking in college settings (Beck, et al., 2008), assessment of college students' levels of both impulsivity and self-control may help to identify young adults who may be likely to experience negative effects of drinking and target such individuals for educational and other forms of interventions.

Limitations and Future Directions

The present study included several limitations. First, the use of a non-clinical sample limits the generalizability of findings to clinical populations diagnosed with BPD or AUD. It is possible that the predictive effect of trait self-control may differ among populations with more severe symptomatology. The use of a healthy young adult sample, however, provides an understanding of the relationships between self-control and subthreshold BPD features and problematic drinking that may be useful for both prevention and early identification of clinically relevant syndromes. A second limitation is the use of convenience sampling. Subjects were recruited from an undergraduate pool comprised of introductory psychology students who received course credit for participating in research. While future research will need to replicate these findings in more diverse samples, undergraduates serve as a reasonable sample given the prevalence of problematic drinking in college (Beck, et al., 2008) and emergence of personality pathology in young adulthood (Bornoalova, Hicks, Iacono, & McGue, 2013).

As a result of the cross-sectional nature of the study, it is impossible to make firm claims surrounding cause and effect or the directionality of findings. Further research should utilize longitudinal designs to determine if self-control exerts a causal influence on BPD symptoms or alcohol use. While the use of five-factor personality scales allows a multifaceted dimensional assessment of BPD-relevant traits that may prove more reliable than categorical assessment of BPD (Trull & Durrett, 2005), such assessment tools, on their own, do not capture impairment or dysfunction associated with personality styles. Further research should incorporate direct measures of BPD symptomatology in order to assess personality pathology directly and allow comparisons between specific BPD criteria and dimensional BPD trait measures. Finally, although the present study chose to focus on alcohol use and BPD, future research should explore the impact of self-control and impulsivity on other addictive behaviors and personality pathologies.

Conclusion

The results of the present study suggest that self-regulatory capacity may be an important but often overlooked explanatory factor in BPD features, problematic drinking, and their co-occurrence. Alongside impulsivity, low self-regulatory capacity may be an important

underlying mechanism of BPD and AUD comorbidity and an important area of focus in both research on and treatment of these disorders. Interestingly, a restraint component of self-control appeared to drive prediction of alcohol use, specifically. Furthermore, laboratory measures of impulsivity in the current study were not associated with BPD scales or alcohol use, adding support to a growing literature suggesting that laboratory-measured and self-reported impulsivity are separate constructs. Our findings also highlight the heterogeneity of various measures of the BPD construct, as meta-analytically derived and expert-consensus BPD scales generated overlapping but distinct results. Assessment of self-control in future research may serve to further disentangle the construct of impulsivity and the complex processes of related disorders.

References

- Allen JP, Litten RZ, Fertig JB, Babor T. A review of research on the Alcohol Use Disorders Identification Test (AUDIT). *Alcoholism: Clinical and Experimental Research*. 1997; 21(4):613–619.
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders: DSM-5*. Washington, D.C: American Psychiatric Association; 2013.
- Amlung MT, MacKillop J. Delayed reward discounting and alcohol misuse: The roles of response consistency and reward magnitude. *Journal of Experimental Psychopathology*. 2011; 2(3):418–431. [PubMed: 25191534]
- Bateman A, Fonagy P. Health service utilization costs for borderline personality disorder patients treated with psychoanalytically oriented partial hospitalization versus general psychiatric care. *American Journal of Psychiatry*. 2003; 160(2):169–172. [PubMed: 12505818]
- Baumeister RF, Vohs KD, Tice DM. The strength model of self-control. *Current Directions in Psychological Science*. 2007; 16(6):351–355.
- Beck KH, Arria AM, Caldeira KM, Vincent KB, O'Grady KE, Wish ED. Social context of drinking and alcohol problems among college students. *American Journal of Health Behavior*. 2008; 32(4):420–430. [PubMed: 18092902]
- Bickel WK, Jarmolowicz DP, Mueller ET, Gatchalian KM, McClure SM. Are executive function and impulsivity antipodes? A conceptual reconstruction with special reference to addiction. *Psychopharmacology*. 2012; 221(3):361–387. [PubMed: 22441659]
- Bornoalova MA, Hicks BM, Iacono WG, McGue M. Longitudinal twin study of borderline personality disorder traits and substance use in adolescence: developmental change, reciprocal effects, and genetic and environmental influences. *Personality Disorders: Theory, Research, and Treatment*. 2013; 4(1):23.
- Brodsky BS, Groves Sa, Oquendo Ma, Mann JJ, Stanley B. Interpersonal precipitants and suicide attempts in borderline personality disorder. *Suicide & Life-Threatening Behavior*. 2006; 36(3):313–322. [PubMed: 16805659]
- Congdon E, Mumford J, Cohen J, Galvan A, Canli T, Poldrack RA. Measurement and reliability of response inhibition. *Frontiers in Psychology*. 2012; 3(37):1–10. [PubMed: 22279440]
- Coskunpinar A, Dir AL, Cyders MA. Multidimensionality in impulsivity and alcohol use: A meta-analysis using the UPPS model of impulsivity. *Alcoholism: Clinical and Experimental Research*. 2013; 37(9):1441–1450.
- Costa PT, McCrae RR. Domains and facets: Hierarchical personality assessment using the Revised NEO Personality Inventory. *Journal of Personality Assessment*. 1995; 64(1):21–50. [PubMed: 16367732]
- Crowell SE, Beauchaine TP, Linehan MM. A biosocial developmental model of borderline personality: Elaborating and extending Linehan's theory. *Psychological Bulletin*. 2009; 135(3):495–510. [PubMed: 19379027]

- Cyders MA, Smith GT, Spillane NS, Fischer S, Annus AM, Peterson C. Integration of impulsivity and positive mood to predict risky behavior: development and validation of a measure of positive urgency. *Psychological Assessment*. 2007; 19(1):107–118. [PubMed: 17371126]
- Cyders MA, Coskunpinar A. Measurement of constructs using self-report and behavioral lab tasks: Is there overlap in nomothetic span and construct representation for impulsivity? *Clinical Psychology Review*. 2011; 31(6):965–982. DOI: 10.1016/j.cpr.2011.06.00 [PubMed: 21733491]
- Dick DM, Smith G, Olausson P, Mitchell SH, Leeman RF, O'Malley SS, Sher K. Review: understanding the construct of impulsivity and its relationship to alcohol use disorders. *Addiction Biology*. 2010; 15(2):217–226. [PubMed: 20148781]
- Dvorak RD, Simons JS, Wray TB. Alcohol use and problem severity: associations with dual systems of self-control. *Journal of Studies on Alcohol and Drugs*. 2011; 72(4):678–684. [PubMed: 21683050]
- Friese M, Hofmann W. Control me or I will control you: Impulses, trait self-control, and the guidance of behavior. *Journal of Research in Personality*. 2009; 43(5):795–805.
- Grant BF, Chou SP, Goldstein RB, Huang B, Stinson FS, Saha TD, et al. Ruan WJ. Prevalence, correlates, disability, and comorbidity of DSM-IV borderline personality disorder: Results from the Wave 2 National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry*. 2008; 69(4):533–545. [PubMed: 18426259]
- Hamilton KR, Mitchell MR, Wing VC, Balodis IM, Bickel WK, Fillmore M, et al. Moeller FG. Choice impulsivity: Definitions, measurement issues, and clinical implications. *Personality Disorders: Theory, Research, and Treatment*. 2015; 6(2):182–198.
- Hofmann W, Friese M, Strack F. Impulse and self-control from a dual-systems perspective. *Perspectives on Psychological Science*. 2009; 4(2):162–176. [PubMed: 26158943]
- Kirby KN, Petry NM, Bickel WK. Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. *Journal of Experimental Psychology: General*. 1999; 128(1):78–87. [PubMed: 10100392]
- Krampe H, Wagner T, Stawicki S, Bartels C, Aust C, Kroener-Herwig B, et al. Ehrenreich H. Personality disorder and chronicity of addiction as independent outcome predictors in alcoholism treatment. *Psychiatric Services*. 2006; 57(5):708–712. [PubMed: 16675768]
- Lappin JS, Eriksen CW. Use of a delayed signal to stop a visual reaction-time response. *Journal of Experimental Psychology*. 1966; 72(6):805.
- Lawrence KA, Allen JS, Chanen AM. Impulsivity in borderline personality disorder: reward-based decision-making and its relationship to emotional distress. *Journal of Personality Disorders*. 2010; 24(6):786–799. [PubMed: 21158600]
- Levy KN, Johnson BN, Clouthier TL, Scala JW, Temes CM. An attachment theoretical framework for personality disorders. *Canadian Psychology*. 2015; 56(2):197–207.
- Linehan, MM. Cognitive-behavioral treatment of borderline personality disorder. Guilford Press; New York, NY: 1993.
- Logan GD, Cowan WB. On the ability to inhibit thought and action: A theory of an act of control. *Psychological Review*. 1984; 91(3):295–327.
- Lynam DR, Widiger TA. Using the Five-Factor Model to represent the DSM-IV personality disorders: An expert consensus approach. *Journal of Abnormal Psychology*. 2001; 110:401–12. [PubMed: 11502083]
- MacKillop J, Amlung MT, Few LR, Ray LA, Sweet LH, Munafò MR. Delayed reward discounting and addictive behavior: A meta-analysis. *Psychopharmacology*. 2011; 216(3):305–321. DOI: 10.1007/s00213-011-2229-0 [PubMed: 21373791]
- Merikangas KR, McClair VL. Epidemiology of substance use disorders. *Human Genetics*. 2012; 131(6):779–789. [PubMed: 22543841]
- Miller JD, Bagby RM, Pilkonis PA, Reynolds SK, Lynam DR. A simplified technique for scoring DSM-IV personality disorders with the five-factor model. *Assessment*. 2005; 12(4):404–415. [PubMed: 16244121]
- Morey LC, Gunderson J, Quigley BD, Lyons M. Dimensions and categories: The “big five” factors and the DSM personality disorders. *Assessment*. 2000; 7(3):203–216. [PubMed: 11037388]

- Mullins-Sweatt SN, Jamerson JE, Samuel DB, Olson DR, Widiger TA. Psychometric properties of an abbreviated instrument of the five-factor model. *Assessment*. 2006; 13(2):119–137. [PubMed: 16672728]
- Muraven M, Collins RL, Neinhuis K. Self-control and alcohol restraint: an initial application of the self-control strength model. *Psychology of Addictive Behaviors*. 2002; 16(2):113. [PubMed: 12079249]
- Samuel DB, Widiger TA. A meta-analytic review of the relationships between the five-factor model and DSM-IV-TR personality disorders: A facet-level analysis. *Clinical Psychology Review*. 2008; 28:1326–1342. [PubMed: 18708274]
- Saunders JB, Aasland OG, Babor TF, de la Fuente JR, Grant M. Development of the Alcohol Use Disorders Identification Test (AUDIT): WHO Collaborative Project on Early Detection of Persons with Harmful Alcohol Consumption--II. *Addiction*. 1993; 88(6):791–804. [PubMed: 8329970]
- Tangney JP, Baumeister RF, Boone AL. High self-control predicts good adjustment, less pathology, better grades, and interpersonal success. *Journal of Personality*. 2004; 72(2):271–324. [PubMed: 15016066]
- Thakkar KN, Congdon E, Poldrack Ra, Sabb FW, London ED, Cannon TD, Bilder RM. Women are more sensitive than men to prior trial events on the Stop-signal task. *British Journal of Psychology*. 2014; 105:254–272. [PubMed: 24754812]
- Tomko RL, Trull TJ, Wood PK, Sher KJ. Characteristics of borderline personality disorder in a community sample: Comorbidity, treatment utilization, and general functioning. *Journal of Personality Disorders*. 2014; 28(5):734–750. [PubMed: 25248122]
- Tonidandel S, LeBreton JM. Relative importance analysis: A useful supplement to regression analysis. *Journal of Business and Psychology*. 2011; 26(1):1–9.
- Tragesser SL, Robinson RJ. The role of affective instability and UPPS impulsivity in borderline personality disorder features. *Journal of Personality Disorders*. 2009; 23:370–83. [PubMed: 19663657]
- Trull TJ, Durrett CA. Categorical and dimensional models of personality disorder. *Annual Review of Clinical Psychology*. 2005; 1(1):355–380.
- Trull TJ, Sher KJ, Minks-Brown C, Durbin J, Burr R. Borderline personality disorder and substance use disorders: A review and integration. *Clinical Psychology Review*. 2000; 20(2):235–253. [PubMed: 10721499]
- Tull MT, Gratz KL. The impact of borderline personality disorder on residential substance abuse treatment dropout among men. *Drug and Alcohol Dependence*. 2012; 121:97–2. [PubMed: 21907503]
- van den Bosch LM, Verheul R, Schippers GM, van den Brink W. Dialectical behavior therapy of borderline patients with and without substance use problems: Implementation and long-term effects. *Addictive Behaviors*. 2002; 27(6):911–923. [PubMed: 12369475]
- Verheul R, van den Brink W. Causal pathways between substance use disorders and personality pathology. *Australian Psychologist*. 2005; 40:127–136.
- Whiteside SP, Lynam DR. The five factor model and impulsivity: Using a structural model of personality to understand impulsivity. *Personality and Individual Differences*. 2001; 30(4):669–689.
- Widiger, TA., Trull, TJ., Clarkin, JF., Sanderson, C., Costa, PT, Jr. A description of the DSM-IV personality disorders with the five-factor model of personality. In: Costa, PT., Widiger, TA., editors. *Personality disorders and the five-factor model of personality*. 2nd. Washington, DC: American Psychological Association; 2002. p. 89-99.
- Wilkinson-Ryan T, Westen D. Identity disturbance in borderline personality disorder: An empirical investigation. *American Journal of Psychiatry*. 2014; 157(4):528–541.

Descriptive statistics of and correlations among the AUDIT, SCS, measures of impulsivity, and BPD scales

Table 1

	N	Mean	SD	AUDIT	BPD-Expert	BPD-Empirical	SCS	Negative Urgency	Positive Urgency	Premeditation	Perseverance	Sensation Seeking	MCQ
Alcohol Use													
AUDIT	191	7.10	5.29										
BPD Profiles													
BPD-Expert	192	2.71	.43	.19 [*]									
BPD-Empirical	192	2.74	.44	0.08	.69 ^{***}								
Self-Control													
SCS	192	117.16	18.92	-.42 ^{***}	-.43 ^{***}	-.43 ^{***}							
Self-Reported Impulsivity (UPPS-P)													
Negative Urgency	190	2.34	.46	.33 ^{***}	.38 ^{***}	.34 ^{***}	-.66 ^{***}						
Positive Urgency	190	2.2	.45	.31 ^{***}	.28 ^{***}	.21 ^{**}	-.53 ^{***}	.67 ^{***}					
Premeditation	190	2.06	.42	.21 ^{**}	0.13	.17 [*]	-.33 ^{***}	.14 [*]	.13				
Perseverance	190	1.93	.44	.06	.16 [*]	.39 ^{***}	-.57 ^{***}	.40 ^{***}	.23 ^{**}	.37 ^{***}			
Sensation Seeking	190	2.86	.55	.19 ^{**}	0.13	-0.07	-0.11	.16 [*]	.40 ^{***}	.23 ^{***}	-.23 ^{**}		
Laboratory Measured Impulsivity													
MCQ	192	2.74	.44	-0.01	-0.03	0.05	-0.08	.38 ^{***}	.28 ^{***}	.13	.16 [*]	.13	
SSRT	192	2.55	.42	-0.02	0.01	-0.02	0.01	.34 ^{***}	.21 ^{**}	.17 [*]	.39 ^{***}	-.07	-0.08

Note. Pearson product-moment correlations, two-tailed tests. AUDIT = Alcohol Use Disorders Identification Test; BPD = borderline personality disorder; SCS = Self-Control Scale; MCQ = Monetary Choice Questionnaire; SSRT = Stop-Signal Response Time. BPD-Expert = Lynam & Widiger (2001) profile; BPD-Empirical = Samuel & Widiger (2008) profile.

* Correlation is significant at $p < .05$.

** Correlation is significant at $p < .01$.

*** Correlation is significant at $p < .001$.

Table 2
Stepwise linear regression analyses of UPPS-P and SCS as predictors of AUDIT and BPD scales

Predictor	AUDIT (N = 188)					BPD-Expert (N = 189)					BPD-Empirical (N = 189)							
	F	p	R ²	b	SE	p	F change	p	R ²	b	SE	p	F	p	R ²	b	SE	p
Step 1	9.19	<.001	.17				8.00	<.001	0.15				13.25	<.001	.22			
UPPS-P																		
Urgency			.10	4.82	1.03	<.001			.09	0.37	0.09	<.001			.05	0.27	0.08	<.001
Premeditation			.03	2.49	0.99	.01			.002	0.07	0.08	.43			.001	0.04	0.07	.58
Perseverance			.01	-1.66	1.06	.12			<.001	0.03	0.09	.73			.05	0.27	0.08	<.001
Sensation Seeking			<.001	0.06	0.80	.94			<.001	0.02	0.07	.78			.005	-.07	0.06	.27
Step 2	24.18	<.001	.10				17.66	<.001	.08				10.65	.001	.04			
UPPS-P																		
Urgency			.008	1.68	1.16	.15			.009	0.14	0.10	.14			.006	0.11	0.09	.23
Premeditation			.01	1.73	0.94	.07			<.001	0.01	0.08	.90			<.001	0.002	0.07	.98
Perseverance			.05	-3.63	1.07	<.001			.006	-.11	0.09	.22			.02	0.17	0.08	.045
Sensation Seeking			<.001	0.08	0.75	.92			<.001	0.02	0.06	.76			.005	-.07	0.06	.26
SCS			.10	-0.13	0.03	<.001			.07	-.01	.002	<.001			.04	-0.01	0.002	.001
Overall Model	13.13	<.001	.27				10.50	<.001	.22				13.28	<.001	.25			

Note. BPD = borderline personality disorder; AUDIT = Alcohol Use Disorders Identification Test. SCS = Self-Control Scale. BPD-Empirical = Lynam & Widiger (2001) profile; BPD-Expert = Samuel & Widiger (2008) profile.

Table 3
Relative importance of UPPS-P and SCS in predicting AUDIT and BPD scales

Predictor	AUDIT (N = 188)		BPD-Expert (N = 189)		BPD-Empirical (N = 189)	
	RW (raw)	RW (scaled)	RW (raw)	RW (scaled)	RW (raw)	RW (scaled)
UPPS-P						
Urgency	.07 ^b	.25	.07 ^{b,a}	.31	.06 ^{b,a}	.21
Premeditation	.03 ^b	.10	.01 ^b	.03	.01 ^{b,c}	.04
Perseverance	.02 ^b	.09	.01 ^b	.06	.08 ^b	.29
Sensation Seeking	.01 ^b	.05	.01 ^b	.04	.01 ^{b,c}	.04
SCS	.14 ^a	.52	.13 ^a	.57	.11 ^{a,b}	.43

Note. Analyses computed via 10,000 bootstrapped samples. All confidence intervals describe the 95% lower and upper bounds of the raw relative weights of the predictors. Raw relative weights indicate the proportion of variance in the dependent variable that is explained by each individual predictor. Scaled relative weights indicate the proportion of variance explained by all measures in the total model that is explained by each individual predictor. RW = relative weight; CI = confidence interval; BPD = borderline personality disorder; AUDIT = Alcohol Use Disorders Identification Test; SCS = Self-Control Scale. BPD-Expert = Lynam & Widiger (2001) profile; BPD-Empirical = Samuel & Widiger (2008) profile. Superscripts in the RW (raw) columns indicate the significance of comparisons between RWs. Weights with the same superscript (e.g., *a*) do not differ significantly from one other, while weights with different superscripts (e.g., *a* and *b*) are significantly different from one another at $p < 0.05$.

Table 4
Logistic regression analyses of UPPS-P and SCS as predictors of “comorbid” group

AUDIT & BPD-Expert (N = 189)									AUDIT & BPD-Empirical (N = 189)							
Predictor	χ^2	<i>p</i>	<i>R</i> ²	<i>b</i>	<i>SE</i>	<i>Wald</i>	<i>p</i>	<i>OR</i>	χ^2	<i>p</i>	<i>R</i> ²	<i>b</i>	<i>SE</i>	<i>Wald</i>	<i>p</i>	<i>OR</i>
<i>Block 1</i>	21.89	<.001	.19						9.33	.053	.08					
UPPS-P																
Urgency				2.01	0.67	8.99	.003	7.45				0.51	0.52	0.99	.32	1.67
Premeditation				1.01	0.59	2.89	.09	2.74				0.03	0.49	.003	.95	1.03
Perseverance				-0.26	0.63	0.18	.67	0.77				-0.15	0.57	4.10	.04	0.32
Sensation Seeking				0.47	0.54	0.74	.39	1.60				0.39	0.42	0.87	.35	0.48
<i>Block 2</i>	6.48	.01	.06						1.46	.23	.01					
UPPS-P																
Urgency				0.96	0.79	1.49	.22	2.61				0.09	0.63	0.02	.89	1.09
Premeditation				0.75	0.60	1.57	.21	2.12				-0.08	0.50	0.03	.87	0.92
Perseverance				-0.92	0.70	1.77	.18	0.40				-1.42	0.61	5.37	.02	0.24
Sensation Seeking				0.42	0.53	0.62	.43	1.52				0.39	0.42	0.88	.35	1.48
SCS				-0.05	0.02	5.86	.02	0.96				-0.02	0.02	1.44	.23	0.98
<i>Overall Model</i>	28.37	<.001	.25						10.78	.06	.09					

Note. Reported R^2 is the Nagelkerke R^2 statistic. SE = standard error; OR = odds ratio; BPD = borderline personality disorder; AUDIT = Alcohol Use Disorders Identification Test; SCS = Self-Control Scale. BPD-Empirical = Lynam & Widiger (2001) profile; BPD-Expert = Samuel & Widiger (2008) profile.