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PSYCHOMETRIC PROPERTIES OF THE MSI-BPD-R

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ABSTRACT

Purpose: Borderline personality disorder (BPD) is a debilitating disorder that benefits from screening and accurate diagnosis. The McLean Screening Instrument for BPD (MSI-BPD) is a commonly used and clinically useful 10-item screening measure for BPD. In the current study we evaluated the psychometric properties of a 21-item revised version of the MSI-BPD (the MSI-BPD-R). **Method:** A mixed clinical and non-clinical sample ($N= 217$; 84.80% women, $M_{age}=21.82$, $SD=8.11$) was recruited from a community mental health center or identified from a mass screening of undergraduate students. Participants completed questionnaire batteries across three studies, each of which included the MSI-BPD-R. Test-retest reliability, internal consistency, and factor structure were examined. **Results:** Four underlying factors: Angry Confrontation, Fear of Abandonment, Dysphoric Sense of Self, and Impulsive Appetitive Behavior, captured all 21 items of the MSI-BPD-R. The MSI-BPD-R outperformed the MSI-BPD in terms of internal consistency. **Conclusion:** The MSI-BPD-R has strong psychometric properties and is recommended to be used in community and clinical settings for screening purposes.

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Chapter 1

INTRODUCTION

Borderline personality disorder (BPD) is a prevalent and debilitating disorder that impacts functioning of those affected in numerous ways. According to the DSM-5 (American Psychiatric Association, 2013), BPD is characterized by an unstable sense of self, interpersonal relationships, and mood, as well as affective lability, impulsivity, angry outbursts, and suicidality. BPD is common in epidemiological samples, with a prevalence rate of 1% to 6% (Grant et al., 2008; Lenzenweger, Lane, Loranger, & Kessler, 2007; Samuels et al., 2002; Torgersen, Kringlen, & Cramer, 2001; Trull, Jahng, Tomko, Wood, & Sher, 2010) and occurs in 10-20% of outpatients (Korzekwa et al., 2008). The prevalence of BPD makes it more common than schizophrenia, bipolar disorder, and autism combined (Levy & Johnson, 2016).

The most serious symptom of BPD is suicidality (Black, Blum, Pfohl, & Hale, 2004; McGlashan, 1986; Paris & Zweig-Frank, 2001; Pompili, Girardi, Ruberto, & Tatarelli, 2005). Rates of suicide completion range from 3% to upwards of 10% (Pompili, Girardi, Ruberto, & Tatarelli, 2005), a rate 5-400 times greater than community estimates (McGlashan, 1986; Paris & Zwiieg-Frank, 2001; Stone, 1990) . Additionally, BPD is associated with parasuicidality or non-suicidal self-harm, which occurs in about 69%-75% of patients (Kjellander, Bongard, & King, 1998). While BPD is comorbid with other disorders that are also at risk for suicide, such as major depression, bipolar disorder, schizophrenia, eating disorders, and substance use disorders (Zanarini et al., 1998), the risk of suicide among BPD patients is higher (Kelly, Soloff, Lynch, Haas, & Mann, 2000), in part due to increased rates of accidental suicide in BPD, attributed to impulsivity, a core element of the disorder (Yen et al., 2004).

Accurately diagnosing BPD is essential in order to provide effective treatment (Levy in Magnavita, Levy, Critchfield, & Lebow, 2010). Although there are reports of misdiagnosis of BPD, where those with other disorders mistakenly are given a diagnosis of BPD (Arkowitz & Lilienfeld, 2010), it is much more common that a diagnosis of BPD is missed (Paris, 2004; Ruggero, Zimmerman, Chelminski, & Young, 2010). Missing a diagnosis for BPD prevents tailored and effective treatments from being provided (Johnson, Clouthier, Rosenstein, & Levy, 2018).

Traditional assessment of BPD in mental health settings generally occurs in one of two ways: questionnaires and clinical interviews. For both questionnaires and clinical interviews, individuals detail the psychiatric symptoms they are currently experiencing or have experienced in the past. Currently there are several reliable semi-structured diagnostic interviews for personality disorders, including the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II; First, Gibbon, Spitzer, Williams, & Benjamin, 1996), the International Personality Disorder Examination that assesses for DSM-IV Axis II Pathology (IPDE; Loranger, 1999), the Structured Interview for DSM-IV Personality (SIDP; Pfohl, Blum, & Zimmerman, 1995), the Diagnostic Interview for DSM-IV Personality Disorders (DIPD; Zanarini, Frankenburg, Sickel, & Yong, 1996), and the Revised Diagnostic Interview for Borderlines (DIB-R; Zanarini, Gunderson, Frankenburg, & Chauncy, 1989). However, clinical interviews are costly, time-consuming, and require thoroughly training interviewers. Given the high number of resources clinical interviews require, psychometrically sound screening measures are useful supplementary tools for identifying patients that may require full clinical assessments. Screening measures have the advantage of informing clinicians whether a full structured interview is necessary, which decreases the probability that unnecessary interviews are

conducted and minimizes the cost associated with conducting such interviews. Furthermore, there is evidence that a two-stage screening process, specifically preliminarily screening with a self-report measure, and following up with a semi-structured interview for individuals considered at-risk for a specific disorder, is useful to identify those with a specific disorder, such as BPD (Lenzenweger et al., 1997; Korzekwa et al., 2008).

Various clinician-rated/administered and patient self-report questionnaires have been developed to screen for BPD or assess BPD symptoms outside the context of a structured interview, including the McLean Screening Instrument for BPD (MSI-BPD; Zanarini et al., 2003), Borderline Syndrome Index (BSI; Conte, Plutchik, Karasu, & Jerrett, 1980; Leichsenring, 1999), the Personality Assessment Inventory-Borderline Scale (PAI-BOR; Morey, 2007), the Standardized Assessment of Personality – Abbreviated Scale (SAPAS; Moran et al., 2003), the Iowa Personality Disorder Screen (IPDS; Langbehn et al., 1999), the Inventory of Interpersonal Problems - Personality Disorders - 25 (IIP-PD-25; Pilkonis et al., 1995), the Five Factor Model Rating Form (FFMRF; Mullins-Sweat, Jamerson, Samuel, Olson, & Widiger, 2006), and the Personality Diagnostic Questionnaire (PDQ; Hyler, Skodol, Kellman, Oldham, & Rosnick, 1990). The majority of these measures assess BPD features, but are not specifically linked to the criteria for BPD listed in the Diagnostic and Statistical Manual of Mental Disorders (DSM) (APA; 2013).

In an effort to increase the success rate of BPD identification, Zanarini et al. (2003) developed the McLean Screening Instrument for Borderline Personality Disorder (MSI-BPD). The MSI-BPD is a 10-item true-false questionnaire used to assess the nine DSM-5 BPD criteria (Zanarini et al., 2003). The measure corresponds to the borderline criteria according to the Diagnostic Interview for the DSM-IV (DIPD-IV; Zanarini, Frankenburg, Sickel, & Yong, 1996)

personality disorder module. In a sample of 200 women ($N = 139$ with BPD, 69.5%), the MSI-BPD demonstrated high sensitivity (0.81) and specificity (0.85) rates at an optimal cutoff score of seven on the screener (Zanarini et al., 2003). More simply phrased, the MSI-BPD was able to correctly identify individuals who met diagnostic criteria for BPD, as well as screen out those who did not meet BPD criteria. Based on these findings, the MSI-BPD is a feasible tool for identifying individuals who should progress onto more thorough evaluations for BPD (Zanarini et al., 2003; Klonsky, & Olino, 2008; Channen et al 2003). However, one study examining BPD in an outpatient headache sample found that the MSI-BPD had a weak capacity for identifying BPD in that sample (Rothrock, Lopez, Zweifel, Andress-Rothrock, Drinkard, & Walters, 2007). In a study from our lab, we found that the MSI-BPD showed excellent sensitivity with cut-off scores of five or six and weaker sensitivity with cut-off scores of seven or eight (McLaughlin, Medved, Scala, & Levy, 2013; Proszynski, 2016). Additionally, the specificity increased as the cut-off increased. However, the negative predictive power was high for all cut-offs. Furthermore, the results in our lab replicate the earlier findings that the MSI-BPD is more effective with younger participants (< 25 years; Zanarini et al., 2003).

Although the MSI-BPD appears to be a useful screening measure, the true-false format has some limitations. Firstly, dimensional assessment would allow researchers to retain clinically relevant information that would have been lost in an all-or-nothing true-false item assessment (Pianowski, Bacciotti, & Reis, 2018; Fowler et al., 2015; Glenn & Klonsky, 2009; Koerting et al., 2016). Additionally, dimensional ratings tend to be superior in terms of measuring predictive and incremental validity associated with personality constructs (Hopwood, Thomas, Markon, Wright, & Krueger, 2012; Morey et al., 2007; Samuel & Widiger, 2006; Skodol et al., 2005;

Spitzer et al., 2008; Widiger & Samuel, 2005). Moreover, dimensional ratings would also allow for a more rigorous exploration of the underlying factor structure of the measure.

Although there are advantages to both dimensional and criterion-based BPD questionnaires, there are no BPD screening measures that combine both of these properties. It would be useful to have a revised version of the McLean Screening Instrument for BPD that is directly linked to the nine criteria in the DSM for BPD, like the MSI-BPD, and shares the properties of other BPD screening measures that assess each DSM criteria dimensionally, such as having several items per criterion and having a Likert-type scale for each item.

Adapting the MSI-BPD to incorporate dimensional assessment of BPD also allows detailed examination of the latent BPD construct itself. Researchers have utilized exploratory and confirmatory factor analysis of BPD assessment tools to ascertain the underlying factor structure of the disorder. Studies have suggested a multidimensional construct for BPD, consisting of an interpersonal and identity factor, and a dysregulation of behavior and affect factor (Rosenberger & Miller, 1989). Two similar factors were found when examining ICD-10 emotionally unstable personality disorder, akin to DSM BPD (Whewell, Ryman, Bonanno, & Heather, 2000).

When examining the DSM-III BPD criteria, exploratory factor analysis found three factors: disturbed identity and interpersonal relationships, affective dysregulation (including suicidality), and impulsivity (Clarkin, Hull, & Hurt, 1993). However, three studies in adult populations used confirmatory factor analysis to study DSM-IV criteria for BPD supported a unidimensional construct of BPD (Fossati et al., 1999; Johansen et al., 2004; Clifton & Pilkonis, 2007). Expanding the MSI-BPD would contribute to this literature by providing more nuance at the level of the indicators, which may increase confidence in a unidimensional versus

multidimensional solution. However, the majority of the literature has employed the nine DSM criteria for BPD as indicators in their analyses. It is unclear if further delineation of each of these criteria would change the underlying factor structure of the BPD construct. Adapting the MSI-BPD to be a criterion-linked dimensional assessment tool would allow for a more nuanced examination of BPD dimensions and extend upon previous studies.

The purpose of the current study is to examine the psychometric properties of a dimensional version of the McLean Screening Instrument for Borderline Personality Disorder, called the MSI-BPD-Revised (MSI-BPD-R). This was done in a number of ways. First, the reliability of the MSI-BPD-R in terms of internal consistency and test-retest reliability was examined. Second, using Pearson r correlations, we examined the association of the MSI-BPD-R with the original MSI-BPD. Third, we also examined the factor structure of the MSI-BPD-R using exploratory factor analysis. Lastly, taking advantage of the dimensional nature of the MSI-BPD-R, we examined the factor structure of the MSI-BPD-R using confirmatory factor analysis to compare the MSI-BPD-R to three models: a single factor model where all 21 items of the MSI-BPD-R loaded onto a single factor, a nine-factor model where all 21 items were loaded onto the nine criteria for BPD as listed in the DSM-5, and a second-order factor model where each of the nine factors loaded on a higher order factor (BPD).

Chapter 2

METHOD

Participants

Participants ($N = 217$; 84.80% women, $M_{age}=21.81$, $SD=8.11$) were recruited via various studies conducted in our lab. To ensure variability of BPD symptoms in our studies, we recruited participants who exhibited low and high BPD features. Participants were recruited in three main ways. Clinical participants ($n = 54$) were recruited from the Pennsylvania State University Psychological Clinic, a large community mental health center that serves central Pennsylvania. Additionally, students voluntarily completed the MSI-BPD-R as part of a mass screening of individuals participating for credit toward a research experience option in their introductory psychology courses. Students who scored at least two standard deviations above the mean on responses to the MSI-BPD-R ($n = 125$) were selected and administered the MSI-BPD over the phone. These participants were considered “analog” participants (i.e., “at risk” for having a BPD diagnosis). Lastly, undergraduates who scored at least one standard deviation below the mean on the MSI-BPD-R were administered the MSI-BPD over the phone and recruited as healthy controls ($n = 38$). All studies had the same exclusion criteria: Individuals under the age of 18, non-English speaking subjects, and cognitively impaired adults could not participate.

Measures

The McLean Screening Instrument for BPD (MSI-BPD; Zanarini et al., 2003) is a 10-item true-false clinician administered or self-report measure assessing BPD. In the original validation of the MSI-BPD, a cutoff of seven items endorsed was deemed acceptable because it yielded good sensitivity (.81) and specificity (.85) for diagnosing DSM-IV BPD (Zanarini et al.,

2003). The MSI-BPD has shown good internal consistency ($\alpha = .74$) (Zanarini et al., 2003) supported by our own data ($\alpha = .81$).

The McLean Screening Instrument for BPD-Revised (MSI-BPD-R, Levy, unpublished) is a 21-item measure that was created by adapting the MSI-BPD in two ways. First, the response format was converted from a true false format to a Likert-type scale with 4 options (0 = “False, not at all true”; 3 = “Very true”). Second, several of the original items were broken into a set of related items intended to assess particular symptom domains more precisely. For instance, the original item on the MSI-BPD that assessed fear of abandonment was split into six items in the MSI-BPD-R (e.g. “I have made desperate efforts to avoid feeling abandoned or being abandoned by repeatedly calling someone to reassure myself that he or she still cared” and “I have made desperate efforts to avoid feeling abandoned or being abandoned by begging someone not to leave me”). Like the original MSI-BPD, the revised version can be administered by clinicians or self-administered.

Data Analysis Plan

Participants were administered the MSI-BPD-R at two timepoints, once during the mass screening battery online, and once again when participants came in to the lab to complete the studies. Test-retest reliability of the MSI-BPD-R total score was conducted using Pearson correlation. Internal consistency of the MSI-BPD-R was evaluated by Cronbach’s (1951) alpha coefficient. Pearson product-moment correlational analyses were used to examine the association between the MSI-BPD and the MSI-BPD-R.

All analyses cross-sectional using the assessment timepoint with most complete data ($N = 217$). To explore the factor structure of the MSI-BPD-R, we subjected the MSI-BPD-R to

exploratory factor analysis with Oblimin rotation. Factor loadings for the items were considered notable if they loaded .30 or greater on the extracted factors.

Additionally, three models were tested using confirmatory factor analysis: a single-factor model that captured all 21 items, a nine-factor model with the nine criteria for BPD (abandonment, relationship, identity, impulsivity, self-harm, affect, emptiness, anger, and dissociation), and a second-order factor model where BPD served as second-order factor for the nine aforementioned criteria.

Chapter 3

RESULTS

Demographics

Table 1 shows the demographic characteristics of the sample. As can be seen in the table, the majority of participants were women, Caucasian, and heterosexual. Age ranged between 18 and 62 ($M = 21.82$, $SD = 8.11$). Seventy-one percent of the participants identified as White, 10% as Asian/Pacific Islander, 6% as Hispanic/Latino, and 4% as African or African American. The three groups (clinical, analog and healthy controls) did not significantly differ in terms of gender, race/ethnicity, or relationship status. However, the clinical group ($M = 30.13$, $SD = 11.58$) was significantly older than the analog group ($M = 18.82$, $SD = 1.54$) and healthy control group ($M = 19.68$, $SD = 6.75$), $F(2, 209) = 57.71$, $p < .05$. The analog and healthy control group had significantly more students than the clinical group, $\chi^2 = 88.97(2)$, $p < 0.01$, and there were significantly more first year students than second, third, and fourth year students, $\chi^2 = 67.83(6)$, $p < 0.01$.

Data Analyses

Test-retest reliability. Test-retest reliability for the total sum for the MSI-BPD-R was adequate ($n = 142$, $r = 0.72$).

Internal consistency. All items were summed to calculate a continuous scale score. The Cronbach Alpha as a measure of internal consistency for the MSI-BPD-R was excellent ($\alpha = .91$) and higher than that found with the original MSI-BPD ($\alpha = .74$) (Zanarini et al., 2003), and from our own data ($\alpha = .81$).

Convergent validity. The MSI-BPD-R was significantly related to the MSI-BPD ($r=.75$). The MSI-BPD-R and the MSI-BPD were highly correlated, indicating good convergent validity of the MSI-BPD-R.

Factor analyses. Results of the exploratory factor analysis and the respective loadings are depicted in Figure 1. Based on both scree plot evaluation and extraction of factors with eigenvalue > 1 , we extracted four factors that accounted for 53.05% of the covariance among the MSI-BPD-R items.

The first factor, which we called Angry Confrontation, accounted for the largest proportion of the variance (36.59%) with the second factor, called Fear of Abandonment, and third factor, called Dysphoric Sense of Self, accounting for a lesser portion (8.23% and 5.25% respectively). The fourth factor, Impulsive Appetitive Behavior, accounted for the least proportion of the variance (2.99%). The first factor was marked by six items that revolved around acting in an angry manner: “I have often acted in an angry or sarcastic manner”, feeling angry “I have felt very angry a lot of the time”, being distrustful “I have often been distrustful of other people”, feeling extremely moody “I have been extremely moody”, having verbal outbursts “I have engaged in impulsive verbal outbursts”, and experiencing arguments and breakups “Some of my closest relationships have been troubled by a lot of arguments or repeated breakups”. The second factor was marked by seven items that revolved around arguments and breakups: “Some of my closest relationships have been troubled by a lot of arguments or repeated breakups” (which also loaded onto the first factor), threatening to hurt someone/themselves “I have made desperate efforts to avoid feeling abandoned or being abandoned by threatening to hurt someone or myself”, begging “I have made desperate efforts to avoid feeling abandoned or being abandoned by begging someone not to leave me”, clinging “I

have made desperate efforts to avoid feeling abandoned or being abandoned by clinging physically”, blackmailing “I have made desperate efforts to avoid feeling abandoned or being abandoned by blackmailing someone (e.g. threatening to tell parents/significant other about his/her past behavior)”, repeatedly calling “I have made desperate efforts to avoid feeling abandoned or being abandoned by repeatedly calling someone to reassure myself that he or she still cared”, and unwanted behavior “I have made desperate efforts to avoid feeling abandoned or being abandoned by engaging in behavior that I really didn’t want to do (e.g. having sex even though I didn’t feel like it)”. The third factor was marked with six items: having no sense of self “I have often felt that I had no idea who I am”, chronic emptiness “I have chronically felt empty”, no identity “I have often felt that I have no identity”, attempting suicide “I have made a suicide attempt”, engaging in self-harm “I have deliberately hurt myself physically (e.g. punched myself, cut myself, burned myself), and feeling unreal “I have frequently felt unreal or as if things around me were unreal”. The fourth factor, Impulsive Appetitive Behavior, was marked with three items that revolved around impulsive binge-eating “I have engaged in impulsive binge eating”, impulsive spending sprees “I have engaged in impulsive spending sprees”, and excessive drinking “I have engaged in impulsive excessive drinking”. The four factors captured all 21 items of the MSI-BPD-R.

The R package “lavaan” was used to conduct confirmatory factor analyses (Rosseel, 2012). All subjects (i.e., with and without borderline personality disorder) were included in the analyses to maximize item variability. In the single factor model, we allowed all 21 items of the MSI-BPD-R to load onto a single BPD factor. The threshold for evaluating fit for these criteria are non-significant chi-square test statistic ($p > .05$), Comparative Fit Index (CFI) and Tucker-Lewis Index (TLI) > 0.95 , root mean squared error of approximation (RMSEA) < 0.05 , and

standardized root mean squared residual (SRMR) < 0.08 (Hu & Bentler, 1999). Model fit was poor on all criteria, $\chi^2 = 850.17(189)$, $p < .001$, CFI = .64, TLI = .60, RMSEA = .14, SRMR = .10. Next, in the nine-factor model, groups of items were drawn from each DSM BPD criterion to load each on their own factor. This model also did not fit the data well, $\chi^2 = 364.65(156)$, $p < .001$, CFI = .89, TLI = .85, RMSEA = .09, SRMR = .07. There was a significant difference between the two models, such that the nine-factor model provided better fit than the single-factor model but still did not adequately model the data ($\Delta\chi^2 = 485.52$, $p < .001$). Lastly, we tested a second-order factor model in which each of the nine criterion factors loaded on a general BPD factor to test whether or not the addition of a second-order factor would improve fit by accounting for significant residual covariance among individual factors. The second-order factor model remained suboptimal, $\chi^2 = 491.50(184)$, $p < .001$, CFI = .83, TLI = .81, RMSEA = .10, SRMR = .08, although this model significantly improved upon the nine-factor model ($\Delta\chi^2 = 126.85$, $p < .001$).

Chapter 4

DISCUSSION

The purpose of this study was to examine the psychometric properties of a revised version of the MSI-BPD, a commonly used and established screening instrument for BPD. In the current study we examined the reliability of the MSI-BPD-R in terms of internal consistency and test-retest reliability. We then examined the relationship of the MSI-BPD-R as it related to the original MSI-BPD. Taking advantage of the dimensionality of the MSI-BPD-R, we examined the factor structure using EFA and CFA procedures.

Results showed that the MSI-BPD-R provides a reliable assessment of a coherent construct of BPD in a sample with clinical and non-clinical participants. The MSI-BPD-R demonstrated excellent internal consistency ($\alpha = .91$), comparable to the original validation study of the MSI-BPD ($\alpha = .91$). In a study that examined the MSI-BPD in Finnish outpatients, the internal consistency was acceptable ($\alpha = .77$) (Melartin, Häkkinen, Koivisto, Suominen, & Isometsä, 2009). Keng et al. (2018) examined the MSI-BPD in two Singaporean samples: undergraduates and patients. The internal consistency of the MSI-BPD was ($\alpha = .79$) and ($\alpha = .84$) in the student sample and the patient sample, respectively (Keng et al., 2018). Thus, the MSI-BPD-R displayed greater internal consistency than the MSI-BPD administered across a range of samples. Furthermore, the MSI-BPD-R displayed acceptable test-retest reliability ($r = .72$), comparable to that of the MSI-BPD ($r = .72$) (Zanarini et al., 2003), indicating relative consistency in participants' responses over time.

Exploratory factor analysis of the MSI-BPD-R found four factors: Angry Confrontation, Fear of Abandonment, Dysphoric Sense of Self, and Impulsive Appetitive Behavior. Each of these factors were consistent with theoretical formulations of BPD (e.g., Kernberg, 1967) and

suggested that the items comprising the MSI-BPD-R capture the breadth of BPD phenomenology and domains of symptoms and functioning that are affected in this disorder (APA, 2013).

Confirmatory factor analysis allows for theoretically driven testing of possible clusters of symptoms that reflect the presentation of BPD in the current context. The MSI-BPD-R did not fit a unifactorial model, a nine-factor model where items were loaded onto DSM criteria for BPD, or a nine-factor model with a second-order factor of BPD. The nine-factor model fit the data significantly better than the unifactorial model, and the nine-factor model with BPD as a second-order factor was an even better model. Given that all three models were suboptimal, results suggest that the MSI-BPD-R may be better described as assessing a four-dimensional understanding of BPD. Surprisingly, the majority of multidimensional models of BPD have found a three-factor model comprised of affective dysregulation, behavioral dysregulation, and disturbed identity (Andión, Ferrer, & Gancedo, 2011; Blais, Hilsenroth, & Castlebury, 1997; Chmielewski, Bagby, & Quilty, 2011; Clarkin, Hull, & Hurt, 1993; Clifton & Pilkonis, 2007; Johansen, Karterud, & Pedersen, 2004; Sanislow, Grilo, & McGlashan, 2000; Sanislow et al., 2002). Our results suggest that Fear of Abandonment may be a useful dimension directly assessed by items of the MSI-BPD-R, and that different components of behavioral dysregulation (e.g., fights vs substance use) may actually be indicative of separate underlying subcomponents of BPD (i.e., Angry Confrontation and Impulsive Appetitive Behavior factors). Our finding of meaningful relations between anger and interpersonal conflict, for example, is consistent with literature connecting anger to destructive interpersonal relationships, especially for those suffering from BPD (Gunderson et al., 2006; Zanarini, Frankenburg, Hennen, Reich, & Silk, 2005).

Clinical Implications

The value of the MSI-BPD-R lies in it serving as a screener and requires less time and effort than a semi-structured interview. However, a two-stage process, where a self-report measure such as the MSI-BPD-R is utilized, and is followed up with a semi-structured interview, is a recommended standard of practice and worth the small additional cost and time. The MSI-BPD-R should not be the sole diagnostic tool in clinical or research settings. Although screening does not replace the use of semi-structured interviews in clinical practice, the findings of this study support the value of the MSI-BPD-R as an economic, reliable, and valid way to screen for BPD. Similarly, in research settings, a semi-structured diagnostic interview for BPD is still warranted. Furthermore, the MSI-BPD-R serves as an even stronger screener than the MSI-BPD with its ability to assess the dimensional nature of BPD criterion and its expansion of several diagnostic criteria for BPD compared to the MSI-BPD, while retaining (and in some cases improving) good psychometric properties. The MSI-BPD-R offers the opportunity to examine BPD pathology in a dimensional and richer way than the MSI-BPD.

Moreover, the MSI-BPD-R can be disseminated to various levels of society and be used across diverse populations such as clinical populations and undergraduate populations. Additionally, screening for the presence of BPD in mental and medical health care would benefit patients and professionals in terms of treatment referral and optimized care (André, Verschuere, & Lobbestael, 2015; Levy in Magnavita et al., 2010). Individuals deemed at-risk for BPD after being screened by the MSI-BPD-R could receive appropriate treatment faster and consequently reduce global health care costs. Altogether, the results of this study suggest that the MSI-BPD-R may be a useful screening tool for the presence of DSM-5 BPD.

Limitations

One limitation to the study is the small sample size. The small sample size may influence the validity of factor analysis results. However, the current sample size is above the generally recommended 10:1 subject-to-variables ration and minimum sample size of 100 (Velicer & Fava, 1998). Additionally, participants who came in to the lab to complete one study before 2015 were not administered the MSI-BPD, thus, there are 73 participants whose data are missing. Additionally, another limitation of the MSI-BPD-R are that all items that loaded onto the fourth factor only measured one specific form of impulsivity: appetitive impulsivity. Other forms of impulsivity, such as around cognitive inhibition, may be present in BPD, but the MSI-BPD-R is not equipped to assess for them. Also, the sample of participants in the current study included clinical participants, (those who are diagnosed with BPD who were recruited from the clinic), analogs (participants who scored at least two standard deviations above the mean on responses to the MSI-BPD-R), and healthy controls (participants who scored at least one standard deviation below the mean on the MSI-BPD-R). The current sample either exhibited high levels of BPD or low levels of BPD. Thus, it is difficult to know if these results would generalize to a group of people who endorse moderate symptoms of BPD. Notwithstanding the limitations, the current study builds upon existing research and offers a revised screening tool for BPD.

Future Directions

Future studies should aim to replicate the findings with a larger clinical sample as well as a general community sample. Furthermore, future studies in the field should aim to replicate the findings with more diverse ethnic groups. Further studies examining the clinical utility of the MSI-BPD-R in larger community psychiatric and more diverse ethnic samples are warranted. Additionally, it would be important to test the sensitivity and specificity of the MSI-BPD-R in predicting BPD diagnoses.

In conclusion, the current study provides empirical support for the use of the MSI-BPD-R as a tool to screen for potential diagnosis of BPD. Results from factor analyses demonstrate a unique four factor solution comprised of Angry Confrontation, Fear of Abandonment, Dysphoric Sense of Self, and Impulsive Appetitive Behavior. The MSI-BPD-R would be a useful tool that could be disseminated across all levels of society, such as in clinical assessment and undergraduate populations. The MSI-BPD-R could have large clinical implications by providing health benefits to the general public, allocating resources to underserved populations, and refining targets for treatment and referrals.

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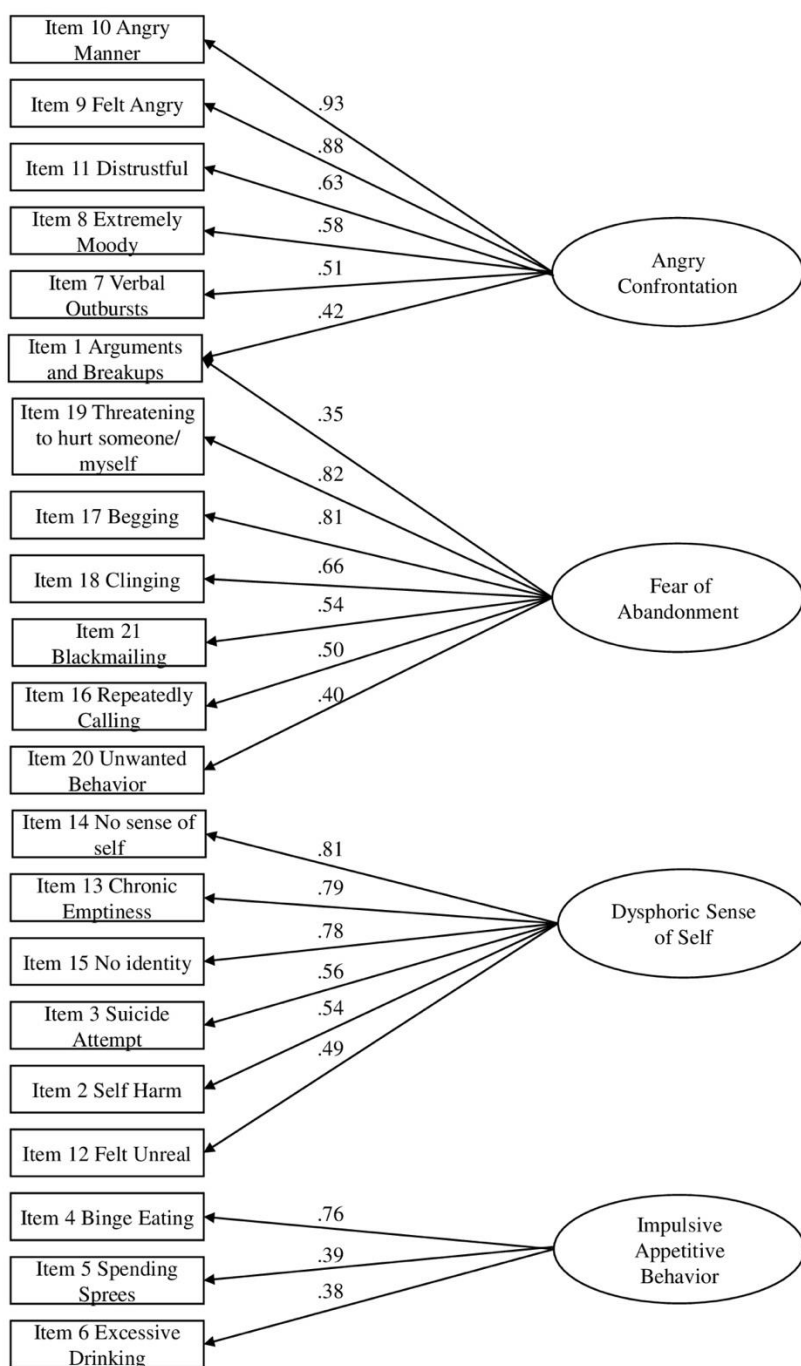
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Appendix A

Figure 1. Factor Loadings of MSI-BPD-R Items



Factor loadings less than 0.3 were not shown in this diagram

Appendix B

Table 1.
Demographic characteristics as a function of recruitment source (N=217)

Age	Clinical (n = 54)		Analog (n = 125)		Healthy Control (n = 38)		F	p
	M	SD	M	SD	M	SD		
	30.13	11.58	18.82	1.54	19.68	6.75	57.71	<.001
	N	%	N	%	N	%	χ^2	p
<i>Sex</i>	52		122		38			
Women	48	88.9	104	83.2	32	84.2	2.40	.66
Men	4	7.4	16	12.8	5	13.2		
Other	0	0	2	1.6	1	2.6		
Unknown	2	3.7	3	2.4	0	0.0		
<i>Sexual Orientation</i>	35		115		34			
Heterosexual	21	38.9	88	70.4	32	84.2	14.53	.07
Homosexual	1	1.9	1	0.8	1	2.6		
Bisexual	10	18.5	18	14.4	1	2.6		
Unsure	1	1.9	5	4.0	0	0.0		
Other	2	3.7	3	2.4	0	0.0		
Unknown	19	35.2	10	8.0	4	10.5		
<i>Ethnicity</i>	52		122		38			
Caucasian	39	72.2	89	71.2	27	71.1	13.52	.20
African American	2	3.7	4	3.2	0	0.0		
Asian	1	1.9	16	12.8	4	10.5		
Latino	3	5.6	7	5.6	3	7.9		
Other	7	13.0	6	4.8	3	7.9		
Unknown	2	3.7	3	2.4	0	0.0		
<i>Relationship Status</i>	45		122		38			
In a Relationship	19	35.2	46	36.8	13	34.2	.58	.75
Not in a relationship	26	48.1	76	60.8	25	65.8		
Unknown	9	16.7	3	2.4	0	0.0		
<i>Student</i>	51		122		38			
Yes	26	48.1	122	97.6	38	100.0	88.97	.00*
No	25	46.3	0	0	0	0.0		
Unknown	3	5.6	3	2.4	0	0.0		
<i>Class Year</i>	26		122		38			
First Year	4	7.4	93	74.4	35	92.1	67.83	.00*
Second Year	6	11.1	20	16.0	2	5.3		

Third Year	8	14.8	5	4.0	1	2.6
Fourth Year	8	14.8	4	3.2	0	0.0
Unknown	28	51.9	3	2.4	0	0.0

Note. This table compares demographic variables between participants recruited from the clinic ($n = 54$), analog ($n = 125$), and healthy controls ($n = 38$).

Appendix C: MSI-BPD-R

1. Some of my closest relationships been troubled by a lot of arguments or repeated breakups.
2. I have deliberately hurt myself physically (e.g., punched myself, cut myself, burned myself).
3. I have made a suicide attempt.
4. I have engaged in impulsive binge eating.
5. I have engaged in impulsive spending sprees.
6. I have engaged in impulsive excessive drinking.
7. I have engaged in impulsive verbal outbursts.
8. I have been extremely moody.
9. I have felt very angry a lot of the time.
10. I have often acted in an angry or sarcastic manner.
11. I have often been distrustful of other people.
12. I have frequently felt unreal or as if things around me were unreal.
13. I have chronically felt empty.
14. I have often felt that I had no idea who I am.
15. I have often felt that I have no identity.
16. I have made desperate efforts to avoid feeling abandoned or being abandoned by repeatedly calling someone to reassure myself that he or she still cared.
17. I have made desperate efforts to avoid feeling abandoned or being abandoned by begging someone not to leave me.
18. I have made desperate efforts to avoid feeling abandoned or being abandoned by clinging to someone physically.

19. I have made desperate efforts to avoid feeling abandoned or being abandoned by threatening to hurt someone or myself.

20. I have made desperate efforts to avoid feeling abandoned or being abandoned by engaging in behavior that I really didn't want to do (e.g., having sex even though I didn't feel like it).

21. I have made desperate efforts to avoid feeling abandoned or being abandoned by blackmailing someone (e.g., threatening to tell parents/significant other about his/her past behavior).

ACADEMIC VITA

EDIE YE

EDUCATION

Bachelor of Science in Psychology, Biological and Evolutionary Sciences Option
Bachelor of Arts in Criminology

The Pennsylvania State University
The Schreyer Honors College
The Paterno Fellowship Program
Exchange Student at Victoria University of Wellington, New Zealand
Fall 2017

HONORS AND AWARDS

Schreyer Travel Grant for NASSPD Conference
Spring 2019

Psi Chi Travel Grant for Eastern Psychological Association Conference
Spring 2019

Phi Kappa Phi Honor Society
Fall 2018-Present

Style Family Fund for Curacao
Fall 2018

Schreyer Ambassador Travel Grant for Curacao
Fall 2018

Radomsky/Ellzey Honors Scholarship
Fall 2018-Present

Phi Beta Kappa Honor Society
2018-Present

McKeon Paterno Undergraduate Fellowship Program
Summer 2018

Susan Welch Dean's Chair Grant
Summer 2018

Hugh & Lynn J Arnelle Scholarship

Fall 2017-Spring 2018

McKeon Paterno LA Undergraduate Fellowship Program
Fall 2017

Schreyer Ambassador Travel Grant for New Zealand
Fall 2017

Psi Chi National Honor Society in Psychology
2016-Present

Dean's List, College of Liberal Arts
Fall 2015-Present

Penn State University Park Provost Fund
Fall 2015-Present

CLINICAL EXPERIENCE

Mental Health Practicum with Children

August 2018-Present

Supervisors: Kelsey Quigley, M.S. and Daryl Cooley, M.S.

Implemented Friendship Group, an evidence-based treatment developed by Dr. Karen Bierman for children with significant peer difficulties with a group of 5 internalizing and externalizing children weekly for two semesters, assisting children with identifying emotions and developing social skills using validation, active observation, reflection, and narration along with behavior management tools

Clinical Interviewer

July 2018-Present

Supervisor: Lia Rosenstein, M.S.

Conducted semi-structured clinical interviews including the Structured Clinical Interview for DSM-IV/5 (SCID-IV/5) and the International Personality Disorder Examination (IPDE) to provide diagnoses in order to determine presence of BPD (and comorbid disorders) for research protocols and the Adult Attachment Interview (AAI) and participating in weekly Longitudinal Expert All Available Data (LEAD) meetings

Crisis Text Line Counselor

July 2018-Present

Various Supervisors: References available upon request

Applied over 30 hours of training focused on good contact techniques, rapport building, validation, active listening and providing local resources for dealing with emotional and behavioral crises, including mental disorders and traumatic experiences, trained for and comfortable supporting suicidal individuals in high-risk scenarios including 2 active rescue cases

Centre Safe Counselor Advocate

June 2018-Present

Supervisor: Meredith Hall, B.S.

Underwent over 100 hours of training to provide crisis counseling for Centre Safe's 24-Hour Crisis Hotline for victims of sexual violence, intimate partner violence, and stalking; supported victims who go to Mount Nittany medical center emergency room for medical and forensic examinations as part of Sexual Assault Response Team (SART) in Centre county

CLINICAL ASSESSMENT TRAINING

Adult Attachment Interview (AAI)

International Personality Disorder Examination (IPDE)

Mini-International Neuropsychiatric Interview (MINI)

Linehan's Suicide Attempt Self-Injury Interview (SASII)

Structured Clinical Interview for DSM IV/V (SCID IV/V)

RESEARCH MANAGEMENT POSITIONS

Relationships and Stress Research Lab

August 2018-Present

Lab Manager

Supervisor: Amy Marshall, Ph.D.

Delegated tasks to research assistants, kept track of hours, led discussions and lab meetings, and coordinated undergraduate study

Laboratory for Personality, Psychopathology and Psychotherapy Research

August 2018-Present

Follow-Up Project Coordinator

Supervisor: Kenneth N. Levy, Ph.D.

Coordinated ongoing study designed to examine the long-term efficacy of several types of treatment in a multi-treatment RCT for BPD

Relationships and Stress Research Lab

January 2018- July 2018

Project Coordinator

Supervisor: Amy Marshall, Ph.D.

Manage participants in an ongoing study examining undergraduate students and trauma

RESEARCH EXPERIENCE

Research Assistant for Dr. Steffany Fredman, Ph.D.

July 2018-Present

Undergraduate Research Assistant

Supervisor: Steffany Fredman, Ph.D.

Segmented audio files using Audacity software for a study examining how couples with PTSD regulate and co-regulate emotional arousal in real time during discussion about their relationship by measuring vocally encoded emotional arousal; conducted literature reviews to assist in conceptualizing an ecological momentary assessment study; assisted in preparing research proposal for an ecological momentary assessment study for presentation to the Institutional Review Board (IRB)

Laboratory for Personality, Psychopathology and Psychotherapy Research

October 2016-Present

Undergraduate Research Assistant

Supervisor: Kenneth N. Levy, Ph.D.

Labeled audio and video files of therapy sessions for therapist and client talking turns using Otranscribe software for a randomized controlled trial looking at the effects of transference focused therapy, dialectical behavioral therapy, and usual treatment for clients with BPD; cleaning and editing the audio files for the therapy sessions using Audacity software; consenting and proctoring participants in a study interested in how well clients with BPD traits can identify facial expressions; transcribing Adult Attachment Interviews; attending weekly lab meetings; working an average of 9 hours a week while maintaining a full time course load

In progress: completing honors thesis, a psychometrics project comparing original 10-item McLean Screening Instrument for BPD (MSI-BPD) to revised 21-item McLean Screening Instrument for BPD (MSI-BPD-R)

Laboratory for Anxiety and Depression Research

January 2017-July 2018

Undergraduate Research Assistant

Supervisors: Michelle Newman, Ph.D., and Nicholas Jacobson, M.S.

Carried out a smartphone research project studying anxiety and depression with the Mood Triggers app in Google play store, recruited and consented participants, completed compliance checks and debriefs; trained in administering the Mini-International Neuropsychiatric Interview (MINI) for a study examining the effects of worrying or relaxing activity prior to thinking about life events, recorded scripts including happy, sad, and neutral, recruited and scheduled participants; assisted with a different alcatel phone study on worry by onboarding participants, completing compliance checks, and debriefing participants; attended weekly lab meetings; worked an average of 9 hours a week while maintaining a full time course load

Relationships and Stress Research Lab

January 2017-Present

Undergraduate Research Assistant

Supervisor: Amy Marshall, Ph.D.

Coded videos of couples with PTSD talking about their strengths and weaknesses for psychological aggression, rejection and abandonment, and social dominance threat to determine if an individual's level of emotion influences their partner due to conflict and intimacy

conversations are considered harmful for clients with PTSD; data entry using SPSS; attended bi-weekly lab meetings; worked an average of 9 hours a week while maintaining a full time course load

In progress: conducting self-initiated independent study on psychopathy in sample of over 400 undergraduate students

PROFESSIONAL AFFILIATIONS

American Psychology-Law Society (Division 41)
2017-Present

Eastern Psychological Association
2018-Present

Society for a Science of Clinical Psychology
2019-Present

Society of Clinical Child and Adolescent Psychology (SCCAP)
2019-Present

LANGUAGES

English: Native Language

Mandarin: Bilingual Proficiency

RELEVANT COURSEWORK PSYCHOLOGY & HDFS

Introductory Psychology	Introduction to Abnormal Psychology
Neurological Bases of Human Behavior with Dr. Rick Gilmore	Introduction to Personality Psychology
Research Methods in Psychology	Forensic Psychology with Dr. Clare-Ann Fortune
Psychology as a Science and Profession	Adolescence Honors
Introduction to Clinical Psychology	Introduction to Developmental Psychology
Mental Health Practicum with Children	Senior Seminar in Psychology with Dr. Amy Marshall

The Helping Relationship Honors with Dr.
Steffany Fredman

Intervention for High Risk Youth and
Adolescents

RELEVANT COURSEWORK STATISTICS & COMPUTER SCIENCE

Regression Methods*

Elementary Statistics

Introduction to R

Applied Regression Analysis

Analysis of Variance

Topics in R Statistical Language

Applied Statistical Inference for the
Behavioral Sciences

Introduction to C++

Introduction to Clinical Trials and Design*

Statistical Applications in Educational
Research*

** Graduate level course*

RELEVANT COURSEWORK CRIMINOLOGY

Introduction to Sociology

Society and Law

Introduction to Criminal Justice

Sociology of Deviance

Criminology

Policing in America

Sexual and Domestic Violence

Race, Crime, and Justice (embedded course
with Dr. Howard Smith)

PROGRAMS

SPSS

R

Express Scribe

Qualtrics

Otranscribe

Microsoft Office

Zotero

Audacity

LEADERSHIP EXPERIENCE

Global Engagement Leadership Experience

February 2018, University Park, US

Attended two-and-a-half day conference with diverse sample of international and domestic students, learned about various aspects of global leadership through conversations, activities, and practical simulations

Victoria International Leadership Program

July-November 2017, Wellington, New Zealand

Completed tailored VILP program for exchange students while studying abroad at Victoria University of Wellington, attended diplomatic dialogues with the ambassadors from Japan and Mexico, attended several other speaker events, and submitted reflections

CONFERENCE PRESENTATIONS

Johnson, B. N., **Ye, E.**, & Levy, K. N. (2019, October). *Development and validation of a revised version of the McLean Screening Instrument for BPD*. In K. Levy (Chair). *Putting the self back in borderline personality disorder*. Symposium submitted to the 17th biennial convention of the International Society for the Study of Personality Disorders, Vancouver, Canada.

Ye, E., Mattern, A.C., & Marshall, A.D. (2019, April). *Gender Differences in Characteristics Associated with Psychopathy Subtypes*. Poster to be presented at the 2019 annual Pennsylvania State University Undergraduate Research Exhibition, University Park, PA.

Ye, E., Johnson, B. N., & Levy, K. N. (2019, April). *Psychometric Properties of the Revised McLean Screening Instrument for Borderline Personality Disorder*. Poster to be presented at the North American Society of Personality Disorders, Pittsburgh, PA.

Ye, E., Johnson, B. N., & Levy, K. N. (2019, February). *Comparing Anxiety and Risk Taking Between Psychopathy Subtypes and Narcissism*. Poster presented at the 90th Eastern Psychological Association, New York City, NY.

Ye, E., Pearson, N. (2018, April). *CBT versus psychodynamic therapy for depression*. Poster presented at the 2018 annual Psi Chi International Honor Society in Psychology Research Conference, University Park, PA.

Ye, E., Pearson, N. (2018, April). *CBT versus psychodynamic therapy for depression*. Poster presented at the 2018 annual Pennsylvania State University Undergraduate Research Exhibition, University Park, PA.

PROFESSIONAL DEVELOPMENT

American Statistical Association DataFest

April 2019, University Park, US

Collaborated with a team in an annual competition to wrangle and analyze data as part of a challenge that spanned an entire weekend, presented results to a panel of judges

PNC Leadership Development Center

February 2019, University Park, US

Attended full day leadership development center that assessed for 8 important leadership skills across all majors and fields, partook in activities involving a realistic business scenario, received feedback report, and attended debrief session that detailed ways to maintain strengths and capitalize on growth opportunities

SERVICE WORK

Penn State Alternative Breaks Volunteer

Spring Break 2017, Baltimore, MD

Volunteered at Pimlico Elementary/Middle School by working with students in different classes, assisted with booths at Science Night, and cleared overgrown garden

THON Rules and Regulation Committee Member

October 2015-March 2016, University Park, PA

Attended various events, trainings, weekly meetings, and fundraisers, learned security protocol for THON weekend and took tests on the material over five months, and volunteered for over 32 hours as security personnel at Penn State's student run IFC Panhellenic Dance Marathon 2016

WORK EXPERIENCE

Student Technology Services Lab Consultant

January 2016 - Present, University Park, PA

Supervisor: Brittany Morton, Ph.D.

Provided technical support in computer labs around PSU campus, assisted users, documented questions, and maintained labs for 8-12 hours a week

Legal Assistant Intern at Jin Rui Law Firm

Summer 2016, Beijing, China

Supervisor: Hui Hong, J.M.

Assisted with researching laws and regulations, translating contracts, and meeting clients for 40 hours a week

REFERENCES

Daryl Cooley, M.S., Clinical Supervisor

Department of Psychology, Pennsylvania State University
366 Bruce V. Moore Building, University Park, PA 16802

Steffany J. Fredman, Ph.D., Assistant Professor

Department of Human Development and Family Studies
205 Health and Human Development Building, University Park, PA 16802

Kenneth N. Levy, Ph.D., Associate Professor

Department of Psychology, Pennsylvania State University
240 Bruce V. Moore Building, University Park, PA 16802

Amy Marshall, Ph.D., Associate Professor
Department of Psychology, Pennsylvania State University
259 Bruce V. Moore Building, University Park, PA 16802

Michelle Newman, Ph.D., Professor
Department of Psychology, Pennsylvania State University
371 Bruce V. Moore Building, University Park, PA 16802

Kelsey Quigley, M.S., Instructor and Clinical Supervisor
Department of Psychology, Pennsylvania State University
219 Bruce V. Moore Building, University Park, PA 16802