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# THE FACTOR STRUCTURE OF THE PERSONALITY ASSESSMENT INVENTORY-BORDERLINE FEATURES (PAI-BOR) SCALE IN A NONCLINICAL SAMPLE

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We evaluated the fit of Morey's (1991) proposed 4-factor structure on *Personality Assessment Inventory-Borderline Features Scale* (PAI-BOR; Morey, 1991) items in a sample of approximately 5,000 nonclinical participants. The proposed model did not fit the data well. Results from a series of exploratory and confirmatory factor analyses suggested that a 6-factor model provided the best fit to the PAI-BOR item covariances.

A number of self-report and structured interview assessment instruments target borderline personality disorder (BPD). A relatively recent self-report measure of BPD features is the *Personality Assessment Inventory-Borderline Features* (PAI-BOR) Scale (Morey, 1991). PAI-BOR items tap features of severe personality pathology that are commonly associated with BPD. Based on a review of the historical conceptualizations of BPD, as well as on empirical studies of borderline patients, potential PAI-BOR items were generated to reflect core "factors" of the construct (Morey, 1991). These factors are affective instability, identity problems, negative relationships, and self-harm (Morey, 1991). Final item selection was guided by both the conceptual nature of the items as well as the items' psychometric properties. The final version of the PAI-BOR consists of 24 items that are rated on a 4-point scale (0 to 3; false, slightly true, mainly true, very true).

Preliminary studies have supported the reliability and validity of total PAI-BOR scores in indexing the degree to which borderline personality features are present (Morey, 1991; Trull, 1995, 2001). To date, however, only Morey (1991) has provided data addressing the factor structure of PAI-BOR items. Morey (1991) tested the proposed 4-factor structure of the PAI-BOR by performing a confirmatory factor analysis on PAI-BOR item data from a clinical sample ($n$ = 1,246) that was predominantly male and between the ages of 30 and 49. Morey (1991) reported that the proposed 4-factor structure (6 PAI-BOR items per factor) provided an excellent fit to the data

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(Bentler-Bonett Normed Fit Index = .98; Comparative Fit Index = .98). Morey (1991) also presented some preliminary data supporting the validity of the four PAI-BOR subscales, and he has advocated using elevations on all four of these subscales (i.e., ≥ 70T score on each) as a psychometric marker for a diagnosis of BPD.

The purpose of our study was to attempt to replicate Morey's (1991) confirmatory factor-analysis findings and proposed PAI-BOR factor structure in a large, nonclinical sample. Such a replication would be important because factor invariance across groups (e.g., clinical vs. nonclinical) cannot be assumed, and findings suggesting lack of invariance will have implications for the use of subscales as measures of the "core" features of borderline personality.

## METHOD

Approximately 5,000 18-year-old freshmen at the University of Missouri participated in a screening assessment for a prospective study on the development of borderline personality disorder features in young adults during the academic years 1997-1998 and 1998-1999 (Trull, 2001). Participants in the screening phase of the study were contacted through mailings, classes, telephone calls, and electronic messages (e-mails), and were scheduled to complete the screening battery during supervised sessions held in dormitories, fraternities and sororities, and classrooms. Potential participants were scheduled up to ten times to complete the assessment or until they indicated their desire to not participate. All those who completed the screening received five dollars or research credit if enrolled in Introduction to Psychology.

The screening battery included items from the *PAI-BOR scale* (Morey, 1991) as well as validity items from the *Personality Diagnostic Questionnaire-Revised* (PDQ-R; Hyler & Rieder, 1987) aimed at identifying individuals who tended to present themselves in an overly favorable light (Too Good subscale), to respond in a random or haphazard way (Suspect Questionnaire subscale), or to respond in a way that suggested deceitfulness (Lie subscale). Finally, items that assessed demographic information were also included.

## RESULTS

The factor analytic results reported here are based on the 4,682 participants with complete PAI-BOR data who were not excluded based on their responses to the validity items. This sample was predominantly female (63%), most participants were white (82%), and most were from middle-class families (64%; family income between $25,000-$100,000). The average total PAI-BOR score in this sample was 24.71 (*SD* = 10.56), and the mean total scores for men and women, respectively, did not differ significantly. Table 1 shows means and standard deviations for the 24 PAI-BOR scale items for the full sample (and the calibration and validation sample, respectively; see below).

**TABLE 1. Item Content, and Means (and Standard Deviations) for the 24 PAI-BOR Items, for the Full Sample, for the Calibration Sample, and for the Validation Sample**

| Scl | Item | Full sample ($n$ = 4682) | Calibration sample ($n$ = 2341) | Validation sample ($n$ = 2341) |
|---|---|---|---|---|
| AI | 1. Mood shifts | 1.35 (0.87) | 1.33 (0.86) | 1.37 (0.88) |
| ID | 2. Attitude about self changes | 1.07 (0.87) | 1.07 (0.86) | 1.06 (0.87) |
| NR | 3. Relationships stormy | 0.72 (0.84) | 0.72 (0.84) | 0.72 (0.83) |
| AI | 4. Moods intense | 1.19 (0.96) | 1.18 (0.95) | 1.21 (0.96) |
| ID | 5. Feel empty | 1.01 (0.98) | 1.00 (0.97) | 1.02 (0.99) |
| NR | 6. Let people know they've hurt me | 1.16 (1.02) | 1.17 (1.02) | 1.15 (1.02) |
| AI | 7. Mood steady* | 1.51 (0.92) | 1.50 (0.92) | 1.51 (0.92) |
| ID | 8. Worry about people leaving | 0.86 (0.94) | 0.86 (0.94) | 0.86 (0.95) |
| NR | 9. People let me down | 1.31 (1.05) | 1.32 (1.05) | 1.29 (1.05) |
| AI | 10. Little control over anger | 0.46 (0.71) | 0.46 (0.71) | 0.46 (0.71) |
| ID | 11. Wonder about life | 1.49 (1.07) | 1.50 (1.07) | 1.48 (1.07) |
| NR | 12. Rarely lonely* | 1.39 (0.97) | 1.40 (0.97) | 1.38 (0.97) |
| SH | 13. Do things impulsively | 0.78 (0.90) | 0.78 (0.90) | 0.78 (0.90) |
| AI | 14. Happy person* | 0.92 (0.86) | 0.92 (0.86) | 0.92 (0.86) |
| ID | 15. Can't handle separation | 1.23 (0.95) | 1.23 (0.95) | 1.23 (0.96) |
| NR | 16. Mistakes in picking friends | 0.59 (0.87) | 0.61 (0.89) | 0.57 (0.85) |
| SH | 17. When upset, hurt self | 0.19 (0.52) | 0.18 (0.51) | 0.20 (0.54) |
| AI | 18. Can't express all of anger | 0.95 (1.04) | 0.94 (1.03) | 0.95 (1.05) |
| ID | 19. Don't get bored* | 1.68 (0.95) | 1.70 (0.95) | 1.66 (0.94) |
| NR | 20. Stay friends with people* | 1.06 (0.74) | 1.05 (0.73) | 1.07 (0.76) |
| SH | 21. Too impulsive | 0.54 (0.76) | 0.54 (0.76) | 0.54 (0.76) |
| SH | 22. Spend money easily | 1.41 (1.06) | 1.41 (1.06) | 1.42 (1.05) |
| SH | 23. Reckless person | 0.38 (0.65) | 0.38 (0.65) | 0.38 (0.65) |
| SH | 24. Careful about money* | 1.47 (0.97) | 1.45 (0.97) | 1.48 (0.97) |

*Note.* Scl = Morey (1991) subscale to which the item was originally assigned. AI = Affective Instability; ID = Identity Problems; NR = Negative Relationships; SH = Self-Harm. *Indicates this item is reverse-scored. These are brief descriptions of items, not actual PAI-BOR items.

## CONFIRMATORY FACTOR ANALYSES

The major goal of this study was to attempt to replicate Morey's (1991) proposed factor structure of PAI-BOR items. Toward this goal, we conducted a confirmatory factor analysis (CFA) using data from the full sample ($n$ = 4,682). For this analysis, we used a maximum likelihood estimation procedure included in the statistical package MPlus (Muthen & Muthen, 1999). The fit of Morey's proposed 4-factor model (affective instability, identity disturbance, negative relationships, self-harm) was poor, $\chi^2(246, N = 4{,}682) = 8{,}279.50$; RMSEA = .08; Comparative Fit Index (CFI) = 0.74; Tucker-Lewis Index (TLI) = .70. Figure 1 provides standardized factor loadings for PAI-BOR items and correlations between factors for this 4-factor model.[1] Although the chi-square was approximately twice the degrees of freedom, the relatively low fit indices, particularly the CFI and the TLI, warranted

1. Following Morey (1991), the model allowed estimates of covariances between the four latent factors but did not estimate any item error covariances.

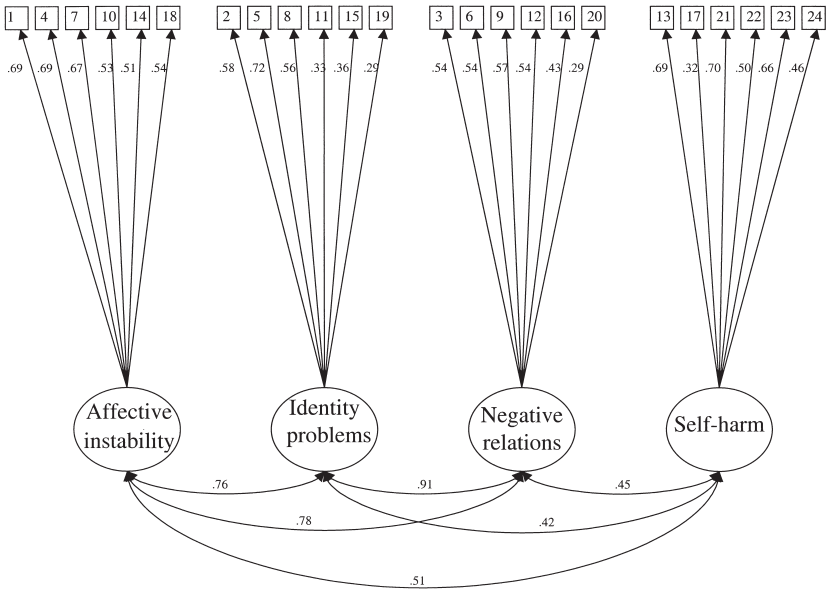


FIGURE 1. Standardized factor loadings for a confirmatory factor analysis of Morey's 4-factor PAI-BOR model.

concern. In addition, the correlation between identity disturbance and negative relationships factors was $r = .91$, which was much higher than desired, and a number of factor loadings were low (i.e., ≤ .40).

Given these problems with model fit, we examined modification indices to determine whether the addition or removal of parameters would result in an improved model fit. Modification indices suggested a significant improvement in model fit with the addition of parameters (i.e., paths) from item 17 to each of the other factors (i.e., negative affectivity, identity disturbance, and negative relationships). The wording of item 17 suggests that it may tap both negative affect and self-harm. As such, we concluded that item 17 was factorially complex, and we dropped it from the model. In addition, we noted that allowing the error terms for items 22 and 24 to covary would increase model fit dramatically. However, given the content overlap between items 22 and 24 (both refer to spending money recklessly), and their high intercorrelation ($r = .74$), we decided to drop item 24 in the revised model. A CFA on this revised model (i.e., with items 17 and 24 removed) was conducted. Although model fit improved, $\chi^2(203, N = 4{,}682) = 4454.49$; RMSEA = .07; CFI = 0.83; TLI = .81, fit indices remained below the desired value (at or below .06 for RMSEA, and at or above .95 for CFI and TLI; Hu & Bentler, 1999). Further, the factors of identity disturbance and negative relationships remained highly correlated ($r = .91$).

Next, we hypothesized that, given their high intercorrelation ($r = .91$), identity disturbance and negative relationships might be better modeled as a single factor. We combined these two subfactors into a single factor, and reestimated the model using all 24 items. Model fit was not improved,

$\chi^2(249, N = 4{,}682) = 8{,}350.18$; RMSEA = .08; CFI = 0.73; TLI = .71. Finally, we noted that some of the individual items were skewed (e.g., for item 17, skew = 3.19; kurtosis = 10.92). As such, we computed polychoric correlations between items and reestimated the initial model proposed by Morey (1991) using the Calis procedure in SAS (SAS Institute, 1999). Model parameters were quite similar to those of the maximum likelihood model shown in Figure 1, and model fit was not improved.

Given the relatively poor fit of Morey's model using our nonclinical sample data, and the failure to improve upon the model with removal of items, the combination of factors, or estimation using polychoric correlations, we decided to empirically test the nature of the factor structure using exploratory factor analysis.

## EXPLORATORY FACTOR ANALYSES

We divided our sample into halves, a calibration subsample ($N = 2{,}341$) and a validation subsample ($N = 2{,}341$), according to observation (i.e., participant) number (odd observation numbers were assigned to the calibration sample, even numbers were assigned to the validation sample). The number of males and females was roughly equal in each subsample (36.9% male in the calibration sample, 37.2% male in the validation sample). Table 1 shows means and standard deviations for the 24 PAI-BOR scale items for the calibration sample (middle column) and validation sample (right column). Using the calibration sample, we performed an exploratory factor analysis; with the validation sample, we replicated the derived empirical model using confirmatory factor analysis.

*Calibration Sample.* We conducted a principal components analysis (communality estimates set equal to one) with promax rotation. To determine the best model (i.e., the number of factors to extract), we used two criteria: (1) the number of factors with an eigenvalue above 1.0, and (2) the scree plot, which is a visual representation of each factor solution. Six factors had eigenvalues greater than one.[2] Although there were two "elbows" in the scree plot, one suggesting a 4-factor solution and one suggesting 6 factors, our criteria suggested that a 6-factor solution might be most appropriate.[3] The 6-factor solution included the following factors: lack of control/impulsive behavior (items 13, 17, 18, 21, and 23), mood instability (items 1, 4, 7, and 10), chronic emptiness/loneliness/boredom (items 2, 5, 11, 12, 14, and 19), separation and abandonment concerns (items 6, 8, and 15), negative relationships (items 3, 9, 16, and 20), and reckless spending (items 22 and 24). Standardized regression coefficients from the rotated

2. Eigenvalues for the first eight factors were 5.95, 2.14, 1.48, 1.32, 1.22, 1.07, 0.93, and 0.91, respectively.

3. Examination of the item factor loadings generated by the 4-factor solution revealed many item cross-loadings, making interpretation of the factors difficult. Therefore, our choice of a 6-factor solution also resulted in a much more interpretable factor solution.

**TABLE 2. Standardized Regression Coefficients from the Six-Factor Rotated Pattern Matrix**

| | Factor | | | | | |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| Item | Lack of control/ impulsive behavior | Mood instability | Chronic emptiness/ loneliness/ boredom | Separation and abandonment concerns | Negative relationships | Reckless spending |
| 1 | 0.03 | 0.85* | 0.02 | 0.02 | -0.10 | 0.01 |
| 2 | -0.003 | 0.33 | 0.38* | 0.27 | -0.17 | 0.04 |
| 3 | 0.18 | 0.16 | -0.01 | 0.12 | 0.41* | 0.01 |
| 4 | 0.17 | 0.70* | -0.03 | 0.06 | -0.001 | -0.10 |
| 5 | 0.07 | 0.10 | 0.54* | 0.32 | 0.03 | -0.08 |
| 6 | -0.05 | 0.17 | -0.09 | 0.50* | 0.32 | 0.00 |
| 7 | -0.14 | 0.74* | 0.21 | -0.05 | 0.04 | 0.09 |
| 8 | -0.05 | -0.11 | 0.18 | 0.70* | 0.16 | 0.05 |
| 9 | -0.02 | -0.05 | -0.006 | 0.42 | 0.58* | -0.01 |
| 10 | 0.37 | 0.42* | -0.03 | -0.04 | 0.07 | -0.06 |
| 11 | 0.38 | -0.19 | 0.50* | 0.14 | -0.24 | -0.01 |
| 12 | -0.10 | 0.05 | 0.70* | 0.13 | 0.03 | 0.03 |
| 13 | 0.75* | 0.04 | -0.13 | -0.03 | 0.04 | 0.09 |
| 14 | 0.03 | 0.16 | 0.59* | -0.20 | 0.26 | -0.06 |
| 15 | -0.07 | 0.06 | -0.03 | 0.73* | -0.12 | 0.10 |
| 16 | 0.08 | -0.08 | -0.07 | 0.16 | 0.71* | 0.03 |
| 17 | 0.49* | -0.12 | 0.28 | 0.02 | 0.11 | -0.22 |
| 18 | 0.43* | 0.21 | 0.04 | 0.10 | 0.14 | -0.15 |
| 19 | -0.11 | 0.04 | 0.55* | -0.09 | 0.06 | 0.24 |
| 20 | -0.02 | -0.04 | 0.20 | -0.31 | 0.67* | 0.07 |
| 21 | 0.67* | 0.10 | -0.14 | -0.02 | 0.04 | 0.19 |
| 22 | 0.12 | -0.003 | -0.00 | 0.15 | 0.01 | 0.85* |
| 23 | 0.76* | 0.00 | 0.08 | -0.18 | -0.04 | 0.17 |
| 24 | 0.06 | -0.03 | 0.11 | 0.02 | 0.05 | 0.88* |

*Note.* Calibration Sample, $N = 2341$. Coefficients marked with an asterisk (*) represent the factor to which an item was assigned in the 6-factor solution.

pattern matrix are presented in Table 2. As can be seen, only one item (item 9) loaded greater than .40 on more than one factor.

*Validation Sample.* Using confirmatory factor analysis, we tested the fit of this 6-factor model in the other half of the sample. Model fit was fair [$\chi^2(237, N = 2{,}341) = 2{,}432.67$; RMSEA = .06; CFI = 0.86; TLI = .83; see Figure 2 for standardized parameter estimates].

In order to determine whether our fair (but not exceptional) model fit in the validation sample was due primarily to model fit overall or to only a fair replication of the model, we also conducted a 6-factor CFA on the calibration sample. Model fit for the calibration sample was nearly identical to that of the validation sample, $\chi^2(237, N = 2{,}341) = 2{,}429.12$; RMSEA = .06; CFI = 0.86; TLI = .83, suggesting excellent replication of a fair (but not exceptionally well fitting) model.

*Two-Factor Model.* Finally, given the fit of the 6-factor model, we estimated a 2-factor model on the calibration sample because the eigenvalues associated with the first two factors were much larger than those of the re-

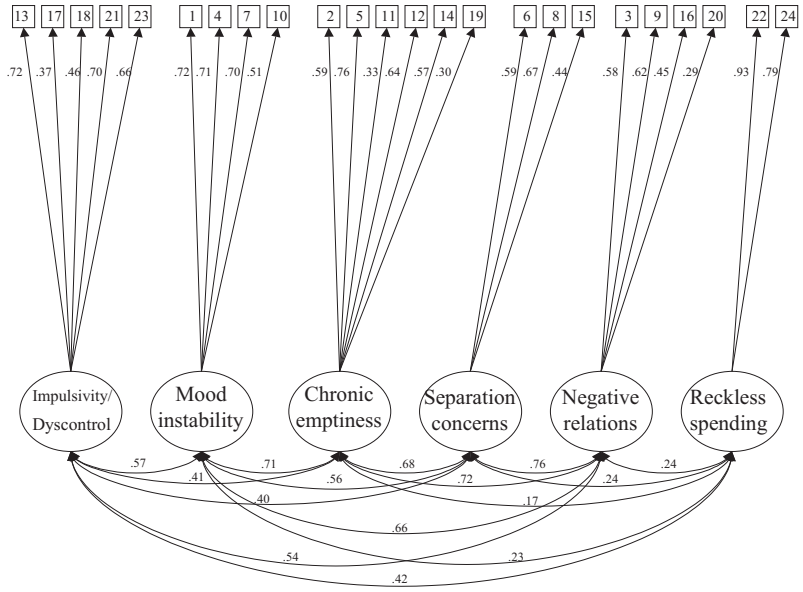


FIGURE 2. Standardized factor loadings for a confirmatory factor analysis on the validation sample to replicate the 6-factor PAI-BOR model.

maining factors. According to a 2-factor EFA, the first factor, which represented a smaller impulsivity/disinhibition factor, contained items 13, 21, 22, 23, and 24. The second factor represented a large negative emotionality factor and contained all remaining items. We attempted to replicate this 2-factor solution on the validation sample using CFA; however, model fit was poor, $\chi^2(251, N = 2{,}341) = 4{,}525.42$; RMSEA = .08; CFI = 0.72; TLI = .69.

## DISCUSSION

This study attempted to replicate the factor structure of PAI-BOR items proposed by Morey (1991) in a nonclinical sample. Results suggested that Morey's (1991) 4-factor model did not provide an adequate fit to the data. Instead, of the models we tested, a 6-factor model appeared to account best for the covariances between PAI-BOR items. Several of these six factors resembled those proposed by Morey (1991).

According to Morey (1991), PAI-BOR items tap four major features or traits of borderline personality disorder that are embedded in the DSM-IV [American Psychiatric Association (APA), 1994] criteria set for BPD and that are included in historical accounts of this personality disorder. Items tapping affective instability seem well represented in the PAI-BOR. In both clinical (Morey, 1991) and nonclinical samples (present study), factor analyses of PAI-BOR items revealed a factor reflecting mood shifts, intense mood states, and anger dyscontrol. Our mood instability factor included four of Morey's six affective instability items. However, Morey's (1991) two remaining affective instability items seem to reflect a lack of happiness and anger

expression, and these items loaded on our chronic emptiness and our dyscontrol factors, respectively.

The present study found evidence for an impulsivity/dyscontrol factor, a major feature of BPD (APA, 1994). Morey's (1991) self-harm factor reflects "a tendency to engage in impulsive self-destructive behaviors" (p. 72), and four of his six self-harm factor items loaded on our impulsivity factor. Interestingly, the PAI-BOR does not include any items that *directly* assess suicidal behavior, often considered a hallmark feature of BPD. The endorsement of one PAI-BOR item (item 17) may reflect suicidal behavior or it may reflect self-harm/self-mutilation without the intent to kill oneself. Therefore, one potential limitation of the PAI-BOR is that this feature of BPD (i.e., suicidal behavior) is underrepresented. Morey's (1991) PAI does include a Suicidal Ideation scale, but these items do not directly assess suicidal behavior (i.e., gestures, attempts).

Morey's (1991) identity problems and negative relationships factors also have historical precedents and appear as features listed in the DSM-IV BPD criteria set. In general, these factors emerged from our analyses (although we gave the factors different labels). Our chronic emptiness/loneliness/boredom factor included four of the six identity problem items whereas the remaining two loaded on our separation and abandonment concerns factor. Although one could certainly make a case for separation and abandonment concerns reflecting identity problems, our analyses supported a separate factor. It is also noteworthy that Morey's identity problems factor seemed the least coherent in our sample (see Figure 1). Three of the six items were only modestly related to this latent variable (standardized factor loadings $\leq .40$). Concerning Morey's (1991) negative relationships factor, four of the six items loaded on a negative relationships factor in our sample as well. The remaining two items (along with item 15) loaded on a separation and abandonment concerns factor in our sample.

Along with our separation and abandonment concerns factor, another somewhat unique factor emerged from our data. Specifically, a sixth factor, reckless spending, was comprised of two items. Although reckless spending may be seen as an indicator of impulsivity, these items did not load highly on this factor in our sample. Although these two items did seem to define an interpretable factor in our nonclinical sample, the similarities in the wording of these two items may call into question the inclusion of both in the PAI-BOR. Future research might focus on the necessity of two similarly worded items.

It is also instructive to compare our results to those from several recent studies that examined the latent structure of DSM BPD symptoms (e.g., Clarkin, Hull, & Hurt, 1993; Fossati, Maffei, Bagnato, Donati, Caterina, & Novella, 1999; Sanislow, Grilo, & McGlashan, 2000). Although these studies found evidence for fewer latent factors or latent classes underlying BPD criteria (because of the smaller number of variables considered), several of their findings were consistent with the results from our study. Similar to our study, previous investigators found evidence for an impulsivity/behavioral dysregulation factor. Our factor is most similar to that extracted by Sanislow et al. (2000) in that it includes items related to self-harm. Previous studies, and our own study, also found evidence for a mood instability fac-

tor. However, in some studies, this factor was defined more by anger dyscontrol than other types of affective instability (e.g., Sanislow et al., 2000). Finally, several studies (Clarkin et al., 1993; Sanislow et al., 2000) reported a latent factor involving interpersonal/relationship disturbance. However, our negative relations factor was narrower and did not include features related to identity disturbance, feelings of emptiness, and abandonment concerns.

It is important to highlight several points and acknowledge the limitations of the present study. First, these results do *not* challenge the reliability, validity, or use of the total PAI-BOR score as an indicator of degree of borderline pathology or features. Our results only suggest that researchers or clinicians should be cautious in their interpretation of scores on Morey's (1991) PAI-BOR subscales as markers for the presence of the "core" features of BPD-affective instability, identity problems, negative relations, and self-harm-in nonclinical samples. Our results suggest a different factor structure; our six factors are similar to but not identical to several of Morey's (1991) four factors. Second, in addition to its nonclinical nature, the present sample differed from Morey's in several important ways. For example, all participants in the present study were 18 years of age and most were female, whereas, most clinical participants in Morey's (1991) validation sample were between 30 and 49 years of age, most were male, and most received affective disorder or substance use disorder diagnoses. Further, as would be expected, Morey's (1991) clinical sample produced higher mean scores of the PAI-BOR scale and its four subscales than we observed in our nonclinical sample. Differences in the endorsement or "difficulty levels" of items between samples can also influence the degree to which their item covariance structures are similar. Finally, two of the six factors identified by the present study included a relatively small number of items (i.e., separation/abandonment concerns and reckless spending). These factors emerged because their respective items did not covary significantly and in a systematic fashion with items defining the other four factors. However, the utility of subscales with so few items is limited. Therefore, the present results are best seen as a more detailed examination of the structure of the PAI-BOR items in a nonclinical sample rather than as evidence advocating the establishment of new PAI-BOR subscales. It will be important for future research to attempt to test Morey's (1991) 4-factor model of PAI-BOR items in additional nonclinical and clinical samples.

In summary, the major implication of this research is that the factor structure of PAI-BOR reported for clinical samples (Morey, 1991) does not appear to account adequately for the item covariance structure in a large nonclinical sample of young adults. Thus, investigators should be cautious in calculating and interpreting PAI-BOR subscale scores in similar samples. The present results suggest that at least some of Morey's four subscales may be multidimensional, and alternative interpretations of scores on these subscales may be warranted.

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