Published in final edited form as:

Personal Disord. 2013 April ; 4(2): 152–159. doi:10.1037/a0028709.

Borderline Personality Pathology and Chronic Health Problems in Later Adulthood: The Mediating Role of Obesity

Abigail D. Powers and Thomas F. Oltmanns

Department of Psychology, Washington University in St. Louis

Abstract

Borderline personality disorder (BPD) is associated with many negative physical health outcomes, including increased risk for serious chronic diseases such as diabetes, heart disease, and arthritis. BPD is also linked with obesity, a condition that is strongly related to many of the same physical health problems. Although research has shown that BPD is related to these physical conditions, there is limited evidence of whether body mass mediates the relation between BPD and serious physical health problems. The present study examined the associations among BPD features, body mass index (BMI), and six major physical health problems in an epidemiologically-based sample (N=1051) of Saint Louis residents, ages 55–64. Using interviewer-, self-, and informant-report of personality pathology, we found that BPD features were significantly related to reported presence of heart disease, arthritis, and obesity. BMI was also significantly related to heart disease and arthritis. Sobel mediation models showed that BMI fully mediated the relation between BPD features and arthritis. These results suggest that borderline pathology is an important risk factor for serious health problems in later adulthood. Obesity appears to be one pathway that leads to more health problems among individuals with BPD symptoms and may be a useful starting point when thinking about future intervention strategies.

Keywords

Borderline personality disorder; personality pathology; physical health; obesity; body mass index

Borderline PD (BPD), characterized by pervasive instability in emotion regulation, interpersonal relationships, impulse control, and self-image (APA, 2000), has consistently emerged as an important predictor of major health problems beyond the more general health risk associated with personality pathology (Bender et al., 2001). Among community-dwelling adults, BPD is associated with a greater likelihood of having serious medical conditions including cardiovascular disease, stroke, hypertension, and arthritis, even when controlling for important psychopathology and sociodemographic variables relevant to physical health (El-Gabalawy, Katz, & Sareen, 2010; Lee et al., 2011; Moran et al., 2007). Other longitudinal research on psychiatric patients with BPD has shown that over the course of 6 years, non-remitted BPD patients were significantly more likely to suffer from diabetes, hypertension, back pain, and osteoarthritis than remitted BPD patients (Zanarini, Frankenburg, Hennen, & Silk, 2003).

BPD is also related to increased risk of obesity, a condition linked with many of the serious medical conditions discussed above, such as diabetes and cardiovascular disease (Flegal, Carroll, Ogden, & Curtin, 2010; Frankenburg & Zanarini, 2006). As part of the McLean Study of Adult Development (MSAD), a longitudinal study of adult patients with BPD, Frankenburg and Zanarini (2011) found that increase in body mass index (BMI) over the

course of ten years was predictive of significantly more medical problems and worse overall health (Frankenburg & Zanarini, 2011). BMI, a measure of body mass that accounts for height, is the most widely used anthropometric measurement of obesity. This research suggests that the link between BPD and obesity may be a key factor in understanding the broader relationship between BPD and chronic medical conditions.

Measurement Considerations with Personality Pathology

Growing evidence supports the use of multiple sources in the assessment of psychopathology and personality (Achenbach, Krukowski, Dumenci, & Ivanova, 2005; Connelly & Ones, 2010). The self and others have different strengths in describing personality; the self has privileged access to internal thoughts and feelings, while others may be more accurate in describing personality characteristics related to external (or observable) patterns of behavior (Vazire, 2010). With regard to personality pathology, self-report data seem to be particularly valuable in the assessment of internalizing PDs, and informant reports are most useful with regard to externalizing PDs (Carlson, Vazire, & Oltmanns, in press). Because BPD represents a blend of both internalizing and externalizing features, it follows that both self and informant reports seem to be particularly valuable in the assessment of this complex disorder.

When informants have been used in studies of personality and health, they have provided an important perspective. For example, Smith et al. (2008) found a significant relationship between higher negative affectivity and increased coronary artery calcification when personality traits were rated by spouses; this link was not evident when self-report was used to measure negative affectivity. Other studies also support the need for multiple sources, showing that informant reports predict various kinds of social and occupational impairment, above and beyond self-report (Miller, Pilkonis, & Clifton, 2005; Oltmanns & Turkheimer, 2009). All of this evidence recommends the use of multiple sources in the exploration of links between personality pathology and physical health problems.

The Present Study

Although there is growing evidence that BPD is linked with obesity and obesity-related diseases in clinical samples, no prior studies have examined whether body mass mediates the relationship between BPD and other serious chronic health problems among community-dwelling adults. Furthermore, much of the research on BPD up to now has focused on younger adults and there is a lack of research on this topic in later middle-age, which is a particularly important life stage for this type of investigation due to the increased frequency of chronic health conditions (Oltmanns & Balsis, 2011).

The goal of this paper was to examine associations between BPD features and chronic physical health conditions in a community sample of older adults. More specifically, we were interested in examining whether BPD features were related to increased risk for heart disease, diabetes, stroke, and arthritis. We were also interested in whether BPD features were associated with risk for obesity ($BMI \geq 30$) and if BMI mediated the relationship between BPD features and chronic medical conditions. BPD features were measured using three sources – interviewer-, self-, and informant-report – because we wanted to provide the strongest possible coverage of that construct.

Method

Design Overview

A representative, community-based sample of adults aged 55–64 was recruited to participate in an on-going longitudinal study of personality, health, and transitions in later life: The St. Louis Personality and Aging Network (SPAN; see Oltmanns & Gleason, 2011 for a detailed description of recruitment and other procedures).

Participants

Participants eligible for the current analyses had completed the baseline portion of the SPAN Study ($N = 1,630$) and did not skip any of the measures included in our analyses, resulting in a sample of 1,051¹. The average age of participants at baseline was 59.4 ($SD = 2.7$). Sixty-four percent of participants were Caucasian ($n = 673$) and 53% were female ($n = 552$). Roughly half of participants were currently married (48%, $n = 500$). Fifty-four percent ($n = 508$) of participants had a bachelor degree or higher, and median household income was between \$60,000 and \$79,000.

Informant data were collected for 89% ($n=940$) of the present sample. The mean age of the informants was 54 years ($SD = 11$ years) and 62% were female. Approximately 51% of the informants were spouses or romantic partners of the participants and the rest were other family members, friends, neighbors, or co-workers. The numbers of years the participants had known their informants ranged from 1 to 64 years, with a mean of 32 years ($SD = 15$ years).

Measures

PD features were assessed from three sources: a trained interviewer, the participant themselves, and an informant selected by the participant. Trained interviewers administered the *Structured Interview for DSM-IV Personality* (SIDP-IV; Pfohl, Blum, & Zimmerman, 1997), a semi-structured diagnostic interview that consists of 101 questions corresponding to the criteria for the ten DSM-IV-TR PDs (APA, 2000). Each criterion is rated using a scale from 0 (*not present*) to 3 (*strongly present*). Each participant's scaled score for each PD was calculated by adding together the ratings for the relevant criteria and computing the average². The possible range for scaled scores was 0 – 3.

Participants and informants completed the *Multisource Assessment of Personality Pathology* (MAPP; Oltmanns & Turkheimer, 2009). Each statement in this questionnaire relates to one criterion on the SIDP, but is worded more colloquially. For instance, the borderline criterion “Chronic feelings of emptiness” appears on the MAPP as “I feel emotionally unfulfilled or that life is meaningless.” Participants indicated to what extent each statement applies to them, on a 5-point scale from 0 = *I am never like this* to 4 = *I am always like this*. Informants filled out this same questionnaire with the participant's personality in mind. Scaled scores for each PD were calculated as described above for the SIDP and the possible range was 0 – 4.

The range of SIDP scaled scores for BPD was 0–1.78 ($M=0.13$, $SD = 0.21$). Using self MAPP (S-MAPP) and informant MAPP (I-MAPP), the range of scaled scores was 0–3.22 ($M=0.43$, $SD = 0.40$) and 0–3.11 ($M=0.56$, $SD = 0.54$), respectively. Bivariate correlations

¹The first 552 participants (34%) were excluded from present analyses because we did not obtain height/weight information until January 2009. Additionally, fourteen individuals (<1%) declined to provide BMI data and 20 individuals (1%) did not complete the MAPP measure.

²Scaling was performed for each PD because different PDs have different numbers of symptoms. Using a “total score” would make comparisons between PDs problematic (e.g., BPD has 9 symptoms while histrionic PD has 8).

among the three measures of BPD were as follows: For SIDP and S-MAPP, $r = 0.43$, $p < .01$; for SIDP and I-MAPP, $r = 0.34$, $p < .01$; for S-MAPP and I-MAPP, $r = 0.26$, $p < .01$. Note that the correlations among these three sources of personality information were only moderate. Therefore, each instrument reflects a somewhat different perspective on the relation between borderline pathology and health conditions.

Chronic physical health conditions were assessed using the computerized screening version of the *Diagnostic Interview Schedule* (C-DIS; Robins & Helzer, 1994). The health and mood disorder sections of the interview were used for this study. Health problems were assessed through participants' report (*yes or no*) of being under a doctor's care for a range of physical health problems. The present analyses focused on the presence of the following major health problems at the time of the baseline assessment: Diabetes, heart disease, stroke, arthritis, and obesity (BMI ≥ 30).³ See Table 1 for prevalence rates of all five health conditions in this sample.

Covariates—Sex, age, race, education, marital status, lifetime MDD, drug dependence, alcohol dependence, and other PDs were used as covariates in regression models. These variables were chosen based on previous literature relating them to health problems and BPD (Lenzenweger, Lane, Loranger, & Kessler, 2007; Trull, Jahng, Tomko, Wood, & Sher, 2010). Due to small samples in several categories, race of participants was recoded into Caucasian and Black/African/Other for analyses. Marital status was coded into married and not married (including single, divorced, widowed, and separated individuals). For education, participants were asked their highest education degree; the 9 categorical response options were then transformed to a continuous variable with a possible range of 6.5–20 years of education completed. Lifetime occurrence of MDD was based on DSM-IV criteria using the C-DIS (coded as *present* or *absent* in subsequent analyses). At least one episode of major depression had been experienced by 26% of participants ($n=272$). Lifetime drug and alcohol dependence were assessed using the *Mini-International Neuropsychiatric Interview* (Sheehan et al., 1998). A score of 3 or more “yes” responses to the 7 criteria indicates dependence (coded as *present* or *absent*). Rates of lifetime alcohol and drug dependence in this sample were 17% ($n=180$) and 11% ($n=112$), respectively. Scaled SIDP PD scores (excluding BPD) ranged from 0–2.43, with a range of 0–3.86 for S-MAPP and 0–3.50 for I-MAPP.

Statistical Analyses

We performed separate logistic regressions to examine the association between BPD features and the five physical health conditions. Although borderline pathology is highly skewed, it is appropriate to have a skewed predictor in a regression model provided the range is adequate. There is no normality assumption with respect to the predictors. Each regression was run with three models: 1) adjusting for sex, age, race, marital status, and education; 2) adjusting for sociodemographic variables and any lifetime MDD, alcohol dependence, or drug dependence; and 3) adjusting for sociodemographic variables, Axis I disorders, and any PD except borderline. Models also differed by the source of personality assessment (SIDP, S-MAPP, and I-MAPP). We also ran three linear regression models to test the specific association between the three measures of BPD features and BMI. Then, we performed logistic regressions to examine the association between BMI and the two significant health conditions (excluding obesity), adjusting for sociodemographic variables. Finally, with significant associations, a Sobel test was run to assess formally whether mediation effects of BMI were present.

³BMI was computed for each participant using self-reported height and weight at the baseline assessment ($BMI = (\text{Weight in Pounds} / (\text{Height in inches} \times \text{Height in inches})) \times 703$).

Results

Logistic Regression Analyses

Logistic regressions using interviewer ratings demonstrated that BPD features were significantly associated with arthritis and obesity across all three models (see Table 2). Even using the most stringent criteria to control for sociodemographic variables, MDD, substance use disorders, and the other nine PDs in model 3, the relationship between BPD features and these physical conditions remained significant (arthritis, OR = 2.64; obesity, OR = 2.92).

As shown in Table 3, similar results emerged when using self-report of BPD features in model 1. BPD features were significantly associated with arthritis and obesity when controlling for sociodemographic variables (OR = 1.54 and OR = 1.48, respectively). Obesity was also significantly related to BPD features when Axis I disorders were included in model 2 (OR = 1.48). These relations did not remain significant when other PDs were entered into model 3. Interestingly, when using self-report, BPD features were also significantly related to heart disease across all three models (OR = 2.22, OR = 2.07, and OR = 4.02, respectively).

When using informant-report of BPD features (see Table 4), we also found that BPD features were significantly associated with heart disease (OR = 1.99), arthritis (OR = 1.35), and obesity (OR = 1.40) when controlling for sociodemographic variables in model 1. Only heart disease (OR = 1.82) and obesity (OR = 1.40) remained significant when MDD and substance use disorders were included in model 2. Similar to what was found using interviewer ratings, BPD features were significantly associated with arthritis (OR = 1.76) and obesity (OR = 1.79) even when using the strictest criteria in model 3.

Some of the covariates we included in the models also showed a significant association with chronic health problems. Among the sociodemographic variables in model 1, lower education level was significantly associated with diabetes, arthritis, and obesity ($\beta = -0.12$, OR = 0.88, $p < .001$; $\beta = -0.07$, OR = 0.93, $p < .05$; $\beta = -0.09$, OR = 0.87, $p < .001$, respectively). Race was related to diabetes, heart disease, stroke, and obesity ($\beta = -0.88$, OR = 0.41, $p < .001$; $\beta = -0.76$, OR = 0.47, $p < .01$; $\beta = -1.23$, OR = 0.29, $p < .05$; $\beta = -0.60$, OR = 0.55, $p < .001$, respectively). Older age was also significantly related to heart disease ($\beta = 0.10$, OR = 1.10, $p < .05$), while female gender was related to obesity ($\beta = 0.20$, OR = 1.22, $p < .05$). In model 2, MDD was significantly associated with diabetes ($\beta = 0.55$, OR = 1.74, $p < .05$) and heart disease ($\beta = 0.66$, OR = 1.93, $p < .05$). Drug and alcohol dependence were not predictive of any of the physical health problems.⁴ In model 3, antisocial PD was positively associated of diabetes (SIDP: $\beta = 1.85$, OR = 1.49, $p < .001$; I-MAPP: $\beta = 0.81$, OR = 2.25, $p < .01$), dependent PD with stroke (I-MAPP: $\beta = 1.61$, OR = 5.01, $p < .05$), and obsessive-compulsive PD with obesity (SIDP: $\beta = 0.50$, OR = 1.66, $p < .05$). Alternatively, histrionic PD was negatively associated with arthritis (SIDP: $\beta = -1.28$, OR = 0.28, $p < .05$), diabetes (I-MAPP: $\beta = -0.70$, OR = 0.51, $p < .05$), and obesity (I-MAPP: $\beta = -0.47$, OR = 0.62, $p < .05$).

Mediation Analyses

Because of the strong link between BPD features and obesity, we formally tested whether the association between BPD features and other physical health conditions could be accounted for by mediation through BMI. Following recommended guidelines (Baron & Kenny, 1986), we first verified that there was a significant relation between BPD features

⁴Significant covariates in models 1 and 2 were similar regardless of personality pathology included. Numbers presented reflect models run with SIDP ratings.

and BMI across the three personality measures. Using linear regression, we confirmed that BPD features significantly predicted BMI across interviewer-, self-, and informant-report of BPD features ($\beta = 4.45, p < .001$; $\beta = 1.37, p < .001$; and $\beta = 0.93, p < .001$, respectively). We then tested the association between BMI and the two health conditions that were associated with BPD features in our previous logistic regression models: heart disease and arthritis. As shown in Table 5, BMI was significantly related to both health conditions, controlling for BPD features ($\beta = 0.08, p < .001$; $\beta = 0.06, p < .001$, respectively).

We next specified logistic regression models to determine whether the significant relation between BPD features and these chronic health conditions diminished when BMI was proposed as a mediator. Across all three measures of borderline pathology, we found that the relation between BPD features and arthritis was no longer significant when BMI was included in the model (SIDP: $\beta = .67, p = .07$; S-MAPP: $\beta = .34, p = .08$; I-MAPP: $\beta = .24, p = .09$), suggesting a full mediation. With both self- and informant-report, we found that the relation between BPD features and heart disease also diminished to some extent when BMI was included in the model ($\beta = 0.66, p < .05$ and $\beta = 0.57, p < .01$, respectively), suggesting a partial mediation.

Finally, to formally determine whether this mediation effect was significant, we conducted a Sobel test (Sobel, 1982). Because our outcome variables are dichotomous, we followed the guidelines outlined by MacKinnen and Dwyer (1993) to ensure that the differences between the predictor and outcome variables were handled appropriately. We made the coefficients comparable across all equations and then used the comparable coefficients⁵ on the subsequent Sobel tests. Results indicated that the mediation effect of BMI was significant for arthritis (SIDP: $z = 3.58, p < .01$; S-MAPP: $z = 2.37, p < .05$; I-MAPP: $z = 2.13, p < .05$). The Sobel test did not show a significant mediation effect of BMI for heart disease (S-MAPP: $z = 1.92, p = .06$; I-MAPP: $z = 1.78, p = .07$), although this is a very conservative test of mediation and the p-values were close to significance. Since the mediation effects with arthritis were consistent across all three measures of borderline pathology, we have provided a visual depiction of the results using interviewer-report in Figure 1.⁶

Discussion

This is the first study to examine the mediating effects of BMI on the relationship between BPD features and reported chronic physical health problems in a large, community-based sample of older adults. Consistent with prior research, we found that individuals with higher levels of borderline features were significantly more likely to report being treated by a physician for heart disease and arthritis, as well as meet criteria for obesity. Broadly speaking, arthritis was significantly associated with higher BPD features across all three measures of personality pathology, suggesting that this relationship is particularly salient within our later middle-aged sample. This relationship remained significant above and beyond the effects of important sociodemographic variables, such as education level and marital status, as well as lifetime occurrence of major depression, substance use disorders, and the presence of other personality pathology when using interviewer and informant scores of BPD features. Additionally, across both self- and informant-report, the relation between BPD features and reported heart disease was significant beyond the effects of sociodemographic variables and other mental disorders. This relationship also remained significant when accounting for the effects of other PDs using self-reported BPD features. Again across all three measures of personality pathology, higher levels of BPD features

⁵Equations used: $\text{comp } a = a * \text{SD}(X)/\text{SD}(M')$; $\text{comp } b = b * \text{SD}(M)/\text{SD}(Y'')$; $\text{comp } c = c * \text{SD}(X)/\text{SD}(Y')$; $\text{comp } c' = c' * \text{SD}(X)/\text{SD}(Y'')$. See MacKinnen and Dwyer (1993) for a full explanation of the reasoning for this approach.

⁶Similar mediation numbers were obtained for self- and informant-report.

predicted increased body mass and increased presence of obesity (BMI ≥ 30). Using interviewer scores, this relation was significant even when relevant sociodemographic variables and other mood disorders, alcohol dependence, and personality disorders were controlled. Clearly there is something uniquely important about borderline pathology in relation to these physical conditions over and above any potential co-occurring pathology among the various PDs.

We found a full mediating effect of BMI on the relation between BPD features and arthritis using all three sources of personality information. Although obesity was clearly related to heart disease in our sample, we did not find a significant mediating effect, suggesting that there are a number of other factors linking BPD features and heart disease among these adults. One possibility is that this association may reflect the well-known link between angry-hostility and heart disease (Smith, Glazer, Ruiz, & Gallo, 2004) since individuals with borderline pathology often experience intense, uncontrollable anger. Alternatively, difficulty with emotion regulation and impulsivity may play a stronger role in the development of obesity and thus contribute to conditions like arthritis. This hypothesis is supported by previous reports indicating that emotion dysregulation and disordered eating patterns are connected in patients with BPD (Selby, Ward & Joiner, 2010). Affective instability is also considered one of the most stable characteristics of BPD over time (Zanarini et al., 2003) and can lead to impulsive behavior.

We examined the relation between BPD features and physical health conditions in later adulthood using three sources of information regarding personality pathology. We found similar associations of BPD symptoms with both obesity and arthritis across all three measures, although the strength of these associations was greater in interviewer and informant report of personality pathology. The link with heart disease was not significant using interviewer report and would have been missed if we had employed only this standard assessment device. There is no clear answer for why heart disease was related to BPD features when using self and informant MAPP, while arthritis was most strongly related to BPD features when using interview SIDP score. The wording of items in specific measures (SIDP versus MAPP) may be responsible for these differences. We suspect, however, that the differences are due to the fact that interviewers, informants, and the self have access to different information. That is why multiple sources should be employed in order to provide a more comprehensive picture of both internal and external aspects of personality pathology (Carlson, Vazire, & Oltmanns, in press).

Our findings regarding BPD features and health outcomes in an older adult sample are particularly important in light of current uncertainty among researchers about what happens to borderline symptoms over the lifespan. Recent evidence on the stability of BPD in younger, clinical samples suggests that many symptoms remit over time, but the long-term negative consequences of the disorder remain largely intact (Gunderson et al., 2011; Zanarini et al., 2010). Our results support this assertion in an older community sample, demonstrating that even sub-threshold symptoms of BPD are predictive of serious health risks. These health risks are found above and beyond the risk accounted for by important sociodemographic variables and Axis I disorders that are associated with physical health problems, including MDD, lifetime alcohol dependence, and lifetime drug dependence, suggesting that borderline pathology is uniquely important in understanding health risk as individuals age.

It is important to note that our findings regarding the connections between sociodemographic variables and other mental disorders are consistent with previously reported evidence from other studies. More specifically, minority race was significantly associated with heart disease, stroke, and obesity, while lower education level was

associated with diabetes, arthritis, and obesity. Previous studies have found that minorities, (especially blacks; Shai et al., 2006), individuals with lower education levels (Ross & Wu, 1995), and individuals with lower socio-economic status (Gallo & Matthews, 2003) are more likely to experience chronic physical health conditions, such as obesity and diabetes. We also found that lifetime experience of MDD was related to diabetes and heart disease, another relationship supported by extensive research (Katon & Ciechanowski, 2002).

Limitations

Some limitations should be kept in mind when interpreting the results of these analyses. The first is the cross-sectional nature of our findings. Directionality and third variables are important considerations. To account for the possibility of third variables, we attempted to control for several well-known psychosocial factors that are related to health problems, but the potential for other third variable effects remains. Furthermore, the direction of the relation between borderline pathology and health problems remains open to question. Participants who exhibited features of BPD may have developed these problems after the onset of their other medical problems. However, previous longitudinal research showing that borderline pathology predicts later health problems (Zanarini et al., 2003) leads us to suspect that this is more likely the direction. We are currently collecting longitudinal data on health and personality pathology with our participants and will eventually be able to examine these issues from a longitudinal perspective.

The second limitation is the use of self-report to measure chronic physical health conditions and BMI. Some researchers have explored the relationship between personality and health with objective measures (e.g., the use of multidetector scanners to measure coronary artery calcification; Smith et al., 2008), enabling them to show a clear correlation between personality factors and physical changes in participants' bodies. The scope of the present study did not allow for such thorough medical testing or the cooperation of participants' medical doctors to provide corroboration. Although it would have been ideal to have had access to medical records to check participants' reports of physical illnesses, researchers have found little discrepancy between self-reports of physical illnesses and documented medical histories (Goodwin & Engstrom, 2002). Furthermore, self-reported BMI has been shown to have sufficient validity when compared with objective (laboratory) measures of height and weight (McAdams, Van Dam, & Hu, 2007). Within the present study, we used the phrase "Have you ever been diagnosed by a doctor as having..." when asking about each physical health problem in an effort to reduce participants' self-reported ailments and get them to think about whether they actually went to a doctor to receive treatment for a given condition. This is not a perfect measure of chronic physical health problems, but the use of self-report allowed us to ask important questions about health within the larger SPAN project.

We did not collect detailed information about any of the physical conditions. Therefore, more specific questions about different types of arthritis, diabetes, or heart disease cannot be answered with our present data. This limitation is important because obesity may play a different role in various forms of arthritis (e.g., osteoarthritis versus rheumatoid arthritis). In the future, we look forward to extending our measurement of physical conditions and increasing our understanding of these relationships.

Because we studied adults living in the community rather than focusing exclusively on clinical patients, our sample does not include a large number of individuals with severe levels of personality pathology. However, roughly 10% of our sample met DSM-IV criteria for at least one PD (using the SIDP), as expected based on previous epidemiological studies (9.1%) (Lenzenweger et al., 2007). Also, we focused on variability in borderline pathology using scaled scores, as opposed to the DSM-IV-TR categorical model. Many measurement

problems are associated with the current categorical model, including the use of arbitrary cutoff points. The structure of PD diagnosis in DSM-5 is likely to include a dimensional, trait-based model of pathological personality (Skodol et al., 2011). Although the range of borderline symptoms is relatively low, we still found a significant relationship between borderline pathology and health problems in this older adult sample. This is consistent with research showing the long-term negative consequences of borderline PD after symptoms have remitted.

Finally, this research was conducted with individuals in a relatively narrow age range (ages 55–64), and the generalizability of these findings to other age groups should be considered carefully. The focus of this study, however, was on how BPD features relate to the presence of chronic physical health conditions. The range of health status in our sample allowed for greater variability than would be found in younger participants. For example, previous findings on BPD and physical health from the MSAD (see Zanarini et al., 2003, 2010) focuses on a clinical sample of adults with an average age around 35. Older adults may represent a population in which the impact of personality pathology on physical health is stronger than might be found with younger participants, and therefore this may be an even more important population in which to study such associations (Oltmanns & Balsis, 2011).

Conclusion and Clinical Implications

BPD features are associated with many aspects of physical health, from perceptions of health and illness to physical functioning and costly overuse of medical resources (Bender et al., 2001; Frankenburg & Zanarini, 2006; Powers & Oltmanns, in press). The results of the present study further support this growing evidence to show that borderline pathology relates to a number of chronic physical health problems, including heart disease, arthritis, and obesity, and that obesity may be one factor that connects BPD and risk for medical conditions among older adults.

With mounting evidence of the healthcare burden and costs associated with BPD and other forms of personality pathology, continued effort to identify and treat PDs should be at the forefront of mental health research and treatment. In the restructuring of our healthcare system, many call for a focus on preventative medicine and patient-centered care. Part of that plan for prevention and early intervention should focus on treating psychopathology that interferes with medical adherence and healthy behaviors because evidence shows that when PDs are treated, there are significant reductions in healthcare utilization for up to three years following completion of treatment (Davies & Campling, 2003). In light of the relation between BPD features and obesity, healthcare providers should pay particular attention to possible borderline pathology in the clinical management of obesity and obesity-related conditions. While mood is often considered in chronic disease management, more general self-regulation issues may also need to become a serious focus, as emotion regulation and stress management are important in being able to maintain healthcare recommendations related to healthy living. It is impossible to consider mental and physical health separately, and we must begin to think about ways to treat both together in an effort to promote better general health.

References

- Achenback T, Krukowski R, Dumenci L, Ivanova M. Assessment of adult psychopathology: Meta-analyses and implications of cross-informant correlations. *Psychological Bulletin*. 2005; 131:361–382. [PubMed: 15869333]
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4. Washington, DC: Author; 2000. txt rev

- Baron R, Kenny D. The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*. 1986; 51:1173–1182. [PubMed: 3806354]
- Bender D, Dolan R, Skodol A, Sanislow C, Dyck I, Gunderson J. Treatment utilization by patients with personality disorders. *American Journal of Psychiatry*. 2001; 158:295–302. [PubMed: 11156814]
- Connelly B, Ones D. An other perspective on personality: Meta-analytic integration of observers' accuracy and predictive validity. *Psychological Bulletin*. 2010; 136:109–122.
- Davies S, Campling P. Therapeutic community treatment of personality disorder: Service use and mortality over 3 years' follow-up. *British Journal of Psychiatry*. 2003; 182:s24–s27.
- El-Gabalawy R, Katz L, Sareen J. Comorbidity and associated severity of borderline personality disorder and physical health conditions in a nationally representative sample. *Psychosomatic Medicine*. 2010; 72:641–647. [PubMed: 20508177]
- Flegal K, Carrol M, Ogden C, Curtin L. Prevalence and trends in obesity among US Adults, 1999–2008. *JAMA*. 2010; 503:255–262.
- Frankenburg F, Zanarini M. Obesity and obesity-related illnesses in borderline patients. *Journal of Personality Disorders*. 2006; 20:71–80. [PubMed: 16563080]
- Frankenburg F, Zanarini M. Relationship between cumulative BMI and symptomatic, psychosocial, and medical outcomes in patients with borderline personality disorder. *Journal of Personality Disorders*. 2011; 25(4):421–431. [PubMed: 21838559]
- Gallo L, Matthews K. Understanding the association between socioeconomic status and physical health: Do negative emotions play a role? *Psychological Bulletin*. 2003:129.
- Goodwin R, Engstrom G. Personality and the perception of health in the general population. *Psychological Medicine*. 2002; 32:325–332. [PubMed: 11866326]
- Gunderson J, Stout R, McGlashan T, Shea M, Morey L, Skodol A. Ten-year course of borderline personality disorder: Psychopathology and function from the Collaborative Longitudinal Personality Disorders Study. *Archives of General Psychiatry*. 2011
- Katon W, Ciechanowski P. Impact of major depression on chronic medical illness. *Journal of Psychosomatic Research*. 2002; 53:859–863. [PubMed: 12377294]
- Lee H, Bienvenu J, Cho S, Ramsey C, Bandeen-Roche K, Nestadt G. Personality disorders and traits as predictors of incident cardiovascular disease: Findings from the 23-year follow-up of the Baltimore ECA Study. *Psychosomatics*. 2010; 51:289–296. [PubMed: 20587756]
- Lenzenweger M, Lane M, Loranger A, Kessler R. DSM-IV personality disorders in the National Comorbidity Survey Replication. *Biological Psychiatry*. 2007; 62:553–564.
- MacKinnen D, Dwyer J. Estimating mediation effects in prevention studies. *Evaluation Review*. 1993; 17:144–158.
- McAdams M, Van Dam R, Hu F. Comparisons of self-reported and measured BMI as correlates of disease markers in US adults. *Obesity*. 2007; 15:188–196. [PubMed: 17228047]
- Miller J, Pilkonis P, Clifton A. Self- and other-reports of traits from the five-factor model: Relations to personality disorder. *Journal of Personality Disorders*. 2005; 19:400–419. [PubMed: 16178682]
- Moran P, Stewart R, Brugha T, Bebbington P, Bhugra D, Coid J. Personality disorder and cardiovascular disease: Results from a national household survey. *Journal of Clinical Psychiatry*. 2007; 68:69–74. [PubMed: 17284132]
- Oltmanns T, Balsis S. Personality pathology in later life: Questions about the measurement, course, and impact of disorders. *Annual Review of Clinical Psychology*. 2011
- Oltmanns, T.; Gleason, M. Personality, health, and social adjustment in later life. In: Cottler, L., editor. *Mental health in public health: The next 100 years*. New York: Oxford University Press; 2011. p. 151–179.
- Oltmanns T, Turkheimer E. Person perception and personality pathology. *Current Directions in Psychological Science*. 2009; 18:32–36. [PubMed: 20539833]
- Pfohl, B.; Blum, N.; Zimmerman, M. *Structured Interview for DSM-IV Personality*. Washington, DC: American Psychiatric Association; 1997.

- Powers A, Oltmann T. Personality disorders and physical health: A longitudinal examination of physical functioning, healthcare utilization, and health-related behaviors in middle-aged adults. *Journal of Personality Disorders*. (in press).
- Robins L, Helzer J. The half-life of a structured interview: The NIMH Diagnostic Interview Schedule (DIS). *International Journal of Methods in Psychiatric Research*. 1994;4.
- Selby E, Ward A, Joiner T. Dysregulated eating behaviors in borderline personality disorder: Are rejection sensitivity and emotion dysregulation linking mechanisms? *International Journal of Eating Disorder*. 2010; 43:667–670.
- Shai I, Jiang R, Manson J, Stampfer M, Willett W, Stampfer M. Ethnicity, obesity, and risk of type 2 diabetes in women. *Diabetes Care*. 2006; 29:1585–1590. [PubMed: 16801583]
- Sheehan D, Lecrubier Y, Sheehan K, Amorim P, Janavs J, Dunbar G. The Mini-International Neuropsychiatric Interview (MINI): Development and validation of a structured diagnostic psychiatric interview for DSM-IV. *Journal of Clinical Psychiatry*. 1998; 59:22–33. [PubMed: 9881538]
- Smith T, Glazer K, Ruiz J, Gallo L. Hostility, anger, aggressiveness, and coronary heart disease: An interpersonal perspective on personality, emotion, and health. *Journal of Personality*. 2004; 72:1217–1270. [PubMed: 15509282]
- Smith T, Uchino B, Berg C, Florsheim P, Pearce G, Hyo-Chun Y. Associations of self reports versus spouse ratings of negative affectivity, dominance, and affiliation with coronary artery disease: Where should we look and who should we ask when studying personality and health? *Health Psychology*. 2008; 27:676–684. [PubMed: 19025262]
- Sobel, M. Asymptotic confidence intervals for indirect effects in structural equation models, in *Sociological methodology*. In: Leinhardt, S., editor. *Sociological Methodology*. American Sociological Association; Washington, DC: 1982. p. 290-312.
- Trull T, Jahng S, Tomko R, Wood P, Sher K. Revised NESARC personality disorder diagnoses: Gender, prevalence, and comorbidity with substance dependence disorders. *Journal of Personality Disorders*. 2010; 24:412–426. [PubMed: 20695803]
- Vazire S. Who knows what about a person? The self-other knowledge asymmetry (SOKA) model. *Journal of Personality and Social Psychology*. 2010; 98:281–300. [PubMed: 20085401]
- Zanarini MC, Frankenburg FR, Hennen J, Silk K. The longitudinal course of borderline psychopathology: 6-year prospective follow-up of the phenomenology of borderline personality disorder. *American Journal of Psychiatry*. 2003; 160:274–283. [PubMed: 12562573]
- Zanarini MC, Frankenburg FR, Reich DB, Fitzmaurice G. Time to attainment of recovery from borderline personality disorder and stability of recovery: A 10-year prospective follow-up study. *American Journal of Psychiatry*. 2010; 167:663–667. [PubMed: 20395399]

Figure 1. Sobel mediation model demonstrating the full mediation effect of BMI on the relation between SIDP BPD features and arthritis.

Table 1

Prevalence rates of chronic physical health conditions in the present sample.

Physical Conditions:	Women		Men		Total
	White N (%)	Minority N (%)	White N (%)	Minority N (%)	
Diabetes	36 (9.8)	36 (19.5)	19 (6.2)	40 (20.7)	131 (12.5)
Heart Disease	14 (3.8)	18 (9.7)	15 (4.9)	19 (9.8)	66 (6.3)
Stroke	2 (0.5)	6 (3.2)	4 (1.3)	8 (4.1)	20 (1.9)
Arthritis	91 (24.8)	68 (36.8)	46 (15.0)	32 (16.6)	237 (22.5)
Obesity	125 (34.1)	110 (59.5)	101 (33.0)	84 (43.5)	420 (40.0)

N=1051

* Obesity calculated with BMI 30. BMI range was 11–60, mean = 29.72 (*SD* = 7.13).

Note: Participant rates of obesity are comparable to census estimates for 2008 (34% for St. Louis city).

Table 2

The associations between interviewer-report of BPD features and physical health conditions using logistic regression models.

SIDP - BPD	Model 1		Model 2		Model 3	
	B	OR (95% CI)	B	OR (95% CI)	B	OR (95% CI)
Diabetes	0.82	2.27 (0.98–5.27)	0.69	2.00 (0.81–4.95)	0.31	1.37 (0.46–4.04)
Heart Disease	0.97	2.64 (0.96–7.28)	0.73	2.09 (0.70–6.21)	1.32	3.72 (0.96–14.44)
Stroke	0.13	1.14 (0.12–10.81)	–0.43	0.65 (0.06–7.54)	–0.82	0.44 (0.03–6.92)
Arthritis	0.99**	2.67 (1.34–5.34)**	0.80*	2.23 (1.07–4.67)*	0.97*	2.64 (1.06–6.57)*
Obesity	0.96**	2.61 (1.33–5.11)**	1.04**	2.83 (1.38–5.81)**	1.07**	2.92 (1.25–6.80)**

N=1051;

* p<.05

** p<.01

Model 1) adjusting for sex, age, race, marital status, and education

Model 2) adjusting for sociodemographic variables and any lifetime MDD, alcohol dependence, or drug dependence

Model 3) adjusting for sociodemographic variables, Axis I disorders, and any PD except borderline

Table 3

The associations between self-report of BPD features and physical health conditions using logistic regression models.

S-MAPP - BPD	Model 1		Model 2		Model 3	
	B	OR (95% CI)	B	OR (95% CI)	B	OR (95% CI)
Diabetes	0.35	1.42 (0.92–2.19)	0.29	1.34 (0.85–2.11)	0.08	1.07 (0.49–2.34)
Heart Disease	0.80**	2.22 (1.29–3.81)**	0.73**	2.07 (1.19–3.60)**	1.39**	4.02 (1.46–11.06)**
Stroke	-.01	0.99 (0.34–2.91)	–0.13	0.88 (0.30–2.67)	–0.20	0.82 (0.13–5.24)
Arthritis	0.43*	1.54 (1.07–2.22)*	0.35	1.42 (0.97–2.08)	0.34	1.41 (0.74–2.68)
Obesity	0.38*	1.48 (1.06–2.03)*	0.39*	1.48 (1.06–2.07)*	0.25	1.28 (0.74–2.21)

N=1051;

*

p<.05

**

p<.01

Model 1) adjusting for sex, age, race, marital status, and education

Model 2) adjusting for sociodemographic variables and any lifetime MDD, alcohol dependence, or drug dependence

Model 3) adjusting for sociodemographic variables, Axis I disorders, and any PD except borderline

Table 4

The associations between informant-report of BPD features and physical health conditions using logistic regression models.

LMAPP - BPD	Model 1		Model 2		Model 3	
	B	OR (95% CI)	B	OR (95% CI)	B	OR (95% CI)
Diabetes	0.27	1.32 (0.94–1.83)	0.24	1.26 (0.90–1.78)	0.08	1.08 (0.58–2.02)
Heart Disease	0.69**	1.99 (1.33–2.98)**	0.60**	1.82 (1.20–2.76)**	0.35	1.40 (0.63–3.17)
Stroke	0.12	1.15 (0.49–2.69)	−0.03	0.95 (0.41–2.27)	0.54	1.72 (0.31–9.51)
Arthritis	0.30*	1.35 (1.02–1.77)*	0.23	1.26 (0.95–1.68)	0.57*	1.76 (1.05–2.95)*
Obesity	0.33**	1.40 (1.09–1.79)**	0.34**	1.40 (1.08–1.80)**	0.57**	1.77 (1.13–2.78)**

N=940;
* p<.05
** p<.01

Model 1) adjusting for sex, age, race, marital status, and education
Model 2) adjusting for sociodemographic variables and any lifetime MDD, alcohol dependence, or drug dependence
Model 3) adjusting for sociodemographic variables, Axis I disorders, and any PD except borderline

Table 5
The associations between BMI and physical health conditions using logistic regression.

BMI		
	B	OR (95% CI)
Heart Disease	0.08**	1.08 (1.06–1.10)*
Arthritis	0.06**	1.06 (1.03–1.09)**

N= 1051;
* p<.05
** p<.01
Model adjusts for sex, age, race, marital status, and education, and BPD symptoms. These values did not change across the three measures of BPD.