Personality Disorders: Theory, Research, and Treatment

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Persistent loneliness is often reported by patients with borderline personality disorder (BPD). However, empirical studies investigating this aspect of BPD psychopathology are sparse. Studies from social psychology revealed that social isolation and low social functioning contribute to loneliness, that is, the subjective feeling of being alone. The aim of the present study was to contribute to the understanding of loneliness in BPD by investigating its relation to social isolation and functioning in different domains of life. Subjective experience of loneliness was measured in 80 women (40 BPD patients, 40 healthy controls) with the UCLA Loneliness Scale. Social isolation and social functioning were assessed with the Social Network Inventory and the Social Functioning Scale. In addition, we assessed global functioning with the Global Assessment of Functioning. BPD patients reported stronger feelings of loneliness compared to healthy participants. In general, the level of loneliness was linked to network size, social engagement, and prosocial behavior. Diversity of social networks and functioning in the domain of interpersonal communication were associated with the level of loneliness only in BPD. A reduced variety of roles in social life together with impairments in interpersonal communication were particularly relevant for the experience of loneliness in BPD, suggesting an indirect path to target this psychopathological feature in therapeutic interventions. However, both social isolation and social functioning were not sufficient to explain the severely increased loneliness experienced by these patients, stressing the need for further investigation of determinants of loneliness in this clinical population.

Keywords: borderline personality disorder, loneliness, aloneness, social networks, social functioning

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Loneliness, that is, the feeling of being alone, is severely distressing (Russell, Peplau, & Ferguson, 1978), negatively affects health and well-being (Pinquart & Sörensen, 2003; Queen, Stawski, Ryan, & Smith, 2014), and even increases morbidity and mortality (Cacioppo et al., 2000; Cacioppo & Hawkley, 2009). Persistent loneliness is one of the key experiences reported by individuals with borderline personality disorder (BPD). On the home page of the Brain and Behavior Research Foundation a patient describes BPD as "pretty much the most painful and lonely existence imaginable" (retrieved from http://bbrfoundation.org/bpd).

As early as 1979, Adler and Buie identified the experience of intensely painful aloneness as a core disturbance and central aspect of BPD individuals (Adler & Buie, 1979; Buie & Adler, 1982). Gunderson (1996) emphasized that the inability to cope with aloneness distinguishes BPD from other disorders, such as posttraumatic stress disorder or depressive disorder. He suggests that it may develop as a consequence of abusive primary caretakers. The intolerance of aloneness is so characteristic for BPD patients that it was even one of the diagnostic criteria for BPD when it first came up as independent diagnosis in the *Diagnostic and Statistical*

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Manual of Mental Disorders III (*DSM–III*) in 1980 (see Gunderson, 1996). Although the concept of aloneness is close to loneliness, it has primarily been linked to the experience of emptiness, which is one of the diagnostic criteria for BPD in the *DSM* (see Klonsky, 2008). Psychoanalytic theories distinguish aloneness from loneliness by the inability to maintain an internal representation of a soothing other, resulting in a longing for someone to fill the emptiness, but also the assumption that this will never be possible (Bender & Skodol, 2007; for further discussion on the differentiation of these concepts see Richman & Sokolove, 1992). As such, aloneness has been proposed to be a relevant concept in BPD pathology. Beyond this characterization of aloneness and of BPD patients in psychoanalytic theories, chronic feelings of loneliness have been described as part of the dysphoric affects characterizing BPD patients (Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004). Moreover, loneliness was implemented as a separate subscale in the Borderline Symptom List, which is a well-established instrument for the quantification of BPD symptom severity (Bohus et al., 2007). Empirical studies focusing on loneliness in BPD, rather than investigating it as one aspect of symptom severity, are largely missing. Findings from a study on the effects of psychotherapeutic interventions suggest that therapeutic approaches may benefit from a deeper understanding of loneliness in BPD: Loneliness and hostility were the only symptom domains that did not respond to successful dialectical behavior therapy residential treatment (Bohus et al., 2007).

Findings from social psychology suggest that social isolation and low social functioning contribute to the development of loneliness. In the present study we investigated whether the intense feelings of loneliness in BPD are linked to stronger social isolation and impaired social functioning in these patients.

Loneliness and Features of Social Networks

Loneliness is different from being alone. *Being alone* refers to the objective state of social isolation, that is, when people have no or only a limited number of contacts with others. In contrast, *loneliness* is defined as "perceived social isolation" emphasizing its subjectivity (Weiss, 1973). It resembles the subjective experience of a "shortfall in one's social resources" (Cornwell & Waite, 2009). Being alone is a state that can, but does not necessarily, lead to loneliness (Russell, Cutrona, McRae, & Gomez, 2012). On the contrary, people can feel lonely even when they are not socially isolated but are around others (Cacioppo et al., 2000; van Baarsen, Snijders, Smit, & Van Dujin, 2001). Peplau and Perlman (1982) emphasized that feelings of loneliness arise when participants perceive a discrepancy between desired and actual social relationships. Nevertheless, loneliness has been linked to being alone (Witvliet, Brendgen, van Lier, Koot, & Vitaro, 2010). Studies using social network parameters to quantify social isolation have linked loneliness to smaller (Dykstra & van Tilburg, 2005; Pinquart & Sörensen, 2003) and less dense (Stokes, 1985) social networks as well as to the loss of important members of a social network (Dykstra & van Tilburg, 2005; Hawkley & Cacioppo, 2007; Mullins & Mushel, 1992; Victor, Scambler, Bowling, & Bond, 2005).

To date, knowledge about social networks in BPD is limited. Stepp, Pilkonis, Yaggi, Morse, and Feske (2009) reported that the frequency of social interactions of BPD patients equals that of healthy participants. However, these involved a lower number of interaction partners, suggesting that the patients' networks were smaller than those of the healthy participants. In addition, the networks of BPD patients were characterized by a larger number of former romantic partners and a frequent loss of network members, that is, break-ups with around a third of their relationships within the past year (Clifton, Pilkonis, & McCarty, 2007). These findings suggest that features of the social network may contribute to the feeling of loneliness in BPD.

Loneliness and Social Functioning

Social functioning was defined as "the level at which an individual functions in his or her social context, such function ranging between self-preservation and basic living skills to the relationship with others in society" (p. 8, Tyrer & Casey, 1993). Several studies have linked social skills to loneliness. Cacioppo et al. (2006) showed that loneliness is negatively correlated with social skills such as maintaining conversations or expressing feelings. Reduced social skills, for example, in terms of emotional expressivity and social control, have also been linked to higher perceived levels of loneliness (DiTommaso, Brannen-McNulty, Ross, & Burgess, 2003). Moreover, experimental induction of loneliness via hypnosis decreased social skills (Cacioppo et al., 2006). Impairments in social skills might promote feelings of loneliness, because adequate social functioning is required to maintain close contacts to other people, which is the best strategy for meeting the need to belong and prevent feelings of loneliness (Baumeister & Leary, 1995).

Several studies observed reduced social functioning in BPD compared to healthy participants and clinical control groups, even after successful psychotherapeutic treatments of BPD symptoms (Gunderson et al., 2011; Hill et al., 2008; Stepp, Hallquist, Morse, & Pilkonis, 2011; Zanarini, Frankenburg, Hennen, Reich, & Silk, 2005; see also Lis & Bohus, 2013). So far, no studies have addressed whether impaired social skills contribute to elevated feelings of loneliness in BPD. Social functioning has mostly been assessed as part of global functioning by the Global Assessment of Functioning (GAF; American Psychiatric Association, 2013). The GAF is an observer-based one-dimensional rating of general functioning that collapses patients' reports across multiple social domains. Although a reliable, valid, and well-established instrument that is sensitive to change over time, the GAF has been criticized due to its intermingling of symptom severity and psychological, social, and occupational functioning (Gold, 2014). The investigation of functioning in BPD, particularly in regard to its relevance for the experience of loneliness, requires a finer-grained assessment that focuses on social aspects of functioning and takes the heterogeneity of social skills into account. Aspects of social functioning that tap social skills and behaviors in regard to social engagement or withdrawal, interpersonal communication, prosocial behavior, or recreational activities may have a stronger association to loneliness compared to more basic domains of social functioning, such as skills required for independent living (Birchwood, Smith, Cochrane, Wetton, & Copestake, 1990).

To summarize, loneliness constitutes a prominent feature in self-descriptions of BPD psychopathology. From social psychology, it is known that loneliness, that is, perceived social isolation, is linked to actually being alone and poor social functioning. The aim of the present study was to investigate the relevance of social isolation and social functioning for the experience of loneliness in BPD. We hypothesized that BPD patients would report higher

levels of perceived loneliness, and smaller and less diverse social networks, and lower social functioning across different domains of social skills and behaviors. We expected that high loneliness is linked to actual social isolation and to reduced social functioning in BPD. Finally, we were interested in whether increased loneliness reflects a unique feature in these patients, which is separable from pure alterations in social isolation and social functioning; or whether differences in the level of loneliness between BPD und HC groups vanish when taking participants' social isolation and social functioning into account.

Methods

Sample

A total of 80 women participated in this study. Forty BPD patients and 40 healthy controls (HCs) were matched for age (HCs: 27.0 ± 6.4, BPD: 27.1 ± 5.6, $t = 0.9$, $p = .927$) and education (HCs: 12.2 ± 1.4, BPD: 11.7 ± 1.5, $t = 1.4$, $p = .176$). There were no differences between groups in IQ (Raven Progressive Matrices; Raven, 1976; HCs: 54.8 ± 3.8, BPD: 53.3 ± 4.7, $t = 1.6$, $p = .104$).

Recruitment was done by the central project of the KFO 256, a Clinical Research Unit funded by the German Research Foundation dedicated to investigating mechanisms of disturbed emotion processing in BPD (Schmahl et al., 2014). The data presented in this article were collected within a larger individual project of the KFO. The study followed the Declaration of Helsinki and was approved by the Research Ethics Board of the University of Heidelberg. Participants provided written informed consent prior to study participation.

General exclusion criteria included a lifetime history of psychotic or bipolar I disorder, current substance abuse, current pregnancy, history of organic brain disease, skull or brain damage, or severe neurological illness. Additional exclusion criteria for the HCs were any lifetime psychiatric diagnoses.

The diagnosis of BPD according to *DSM–IV* was assessed by experienced clinical psychologists or psychiatrists who were trained in conducting interviews using the International Personality Disorder Examination (IPDE; Loranger, 1999). Patients met at least five of the nine *DSM–IV* criteria for BPD. Comorbid Axis I disorders were assessed using the German version of the Structured Interview for *DSM–IV* (First, Spitzer, Gibbon, Williams, & Benjamin, 1997). Twenty percent of the patients met criteria for a current comorbid major depressive episode, 22.5% for an eating disorder, 26.3% for an anxiety disorder, and 27.5% for posttraumatic stress disorder. None of the patients had been on psychotropic medication for at least 4 weeks before the time of testing.

BPD symptom severity was measured by the short version of the Borderline Symptom List (BSL-23; Bohus et al., 2009) and the Zanarini Rating Scale for borderline personality disorder (ZAN-BPD; Zanarini et al., 2003). The BSL-23 is a self-report measure that assesses symptom severity of borderline-specific symptomatology during the last week and contains 23 items rated on a 5-point Likert scale. The ZAN-BPD is a clinician-based diagnostic interview that assesses the severity of BPD symptoms in nine items during the last week. Its total score ranges from 0 (*no BPD symptoms*) to 36 (*severe symptoms*). Internal consistency was comparably high for both assessments (BSL-23: Cronbach's alpha = .98; ZAN-BPD: Cronbach's alpha = .91). Both methods confirmed higher BPD symptom severity in BPD patients compared to HCs (BSL-23: HCs: 0.11 ± 0.15, BPD: 2.16 ± 0.66, $t = 18.2$, $p < .001$; ZAN-BPD: HCs: 0.4 ± 1.4, BPD: 11.9 ± 5.1, $t = 13.7$, $p < .001$).

Analyses of three diagnostic interviews taped on video indicated high interrater reliability with respect to both the number of BPD criteria (IPDE) and the dimensional score (ZAN-BPD) for *DSM–IV* borderline psychopathology, with intraclass coefficients of 0.99 and 0.91, respectively.

Measurements

Loneliness. Loneliness was assessed using a German version of the UCLA Loneliness Scale (Russell et al., 1978). The UCLA Loneliness Scale has become the most frequently and widely used instrument for the assessment of loneliness (Vassar & Crosby, 2008). It consists of 20 items (e.g., "How often do you feel part of a group of friends?") examining the frequency and intensity of loneliness-related experiences. For the construction of the original version of the UCLA Loneliness Scale, lonely individuals' statements that described their feelings of loneliness were used (Russell et al., 1978). The terms *lonely* or *loneliness* were eliminated from all of the items to avoid response bias. Participants evaluate their personal agreement on how well the 20 statements apply to themselves using a 5-point Likert scale ranging from 1 (*not at all*) to 5 (*totally*). Hence, the total score ranges from 20 to 100 with higher scores representing more intense feelings of loneliness. In the present study internal consistency for the UCLA Loneliness Scale was high (BPD: Cronbach's alpha = .95; HCs: Cronbach's alpha = .90).

Social network features. Social network features were assessed using a German version of the Social Network Index (SNI; Cohen, Doyle, Skoner, Rabin, & Gwaltney, 1997). The SNI consists of 12 items assessing 12 different types of social relationships: spouse, parents, parents-in-law, children, other close family members, close neighbors, friends, workmates, schoolmates, fellow volunteers, and members of groups with and without religious affiliations. For each type of relationship, the participant is asked how many people she knows and talks to at least once every two weeks. These questions can be answered with a number between 0 to 6 or '7 or more,' except for parents and parents-in-law, who are naturally restricted to 2, and for the items on romantic partnership, where only a yes or no answer is permitted.

As social network characteristics, the SNI quantifies the size (SNI-size) and the diversity (SNI-diversity) of social networks as well as the number of embedded subnetworks (SNI-EN) within three subscales. The size of the social network is defined as the total number of people with whom the respondent speaks at least once every two weeks and serves as a measure of social isolation/being alone. Social network diversity quantifies the number of social roles. It is calculated as the number of domains of social relationships in which the respondent has regular contact with at least one person. The number of embedded networks is a measurement reflecting the number of different network domains in which the participant is active. Activity in the different domains is defined by having at least four high-contact people within each domain. High scores indicate large size, diversity, or high number of embedded networks.

Social functioning. Social functioning was assessed using the Social Functioning Scale (SFS; Birchwood et al., 1990; German version Iffland et al., 2015). The SFS is a self-report questionnaire that allows for a fine-grained assessment of social functioning. Based on 79 items, it measures the frequency of key social skills and behaviors in seven different domains of social functioning, that is, in regard to social engagement (time spent alone, initiation of conversations, social avoidance), interpersonal communication (number of friends, quality of communication), prosocial behavior (engagement in a range of common social activities, e.g., sports), recreational activities (engagement in a range of common hobbies, interests, pastimes, etc.), independence (measured separately by both the ability to perform skills necessary for independent living and the actual performance of skills necessary for independent living), and occupation (engagement in productive employment or structured program of daily activity). Different response formats are used for the different items. Therefore, comparisons between different subscales and calculation of a total score of the SFS as a mean of the seven subscales require standardization of the distinct scores. Following the suggestion of Birchwood et al. (1990) all scores were transformed to a mean of 100 and a standard deviation of 15 before calculating the mean as a total score. Higher scores on each subscale, as well as on the total score, indicate higher levels of functioning in the specific domain. The SFS has been shown to be a reliable and valid measure of psychosocial functioning (Birchwood et al., 1990; see also for the German version Iffland et al., 2015).

Global functioning. Global functioning was assessed using the GAF (American Psychiatric Association, 2013). The GAF is a well-established and widely used instrument for the assessment of global functioning. It is a clinician-administered measure that requires the assessment of the level of social functioning together with symptom severity as well as psychological and occupational functioning on a 1-item scale. The GAF score ranges from 0 to 100, with a higher score indicating higher levels of functioning.

Statistical Analysis

All analyses were performed using SPSS. The level of significance was set to $\alpha = 5\%$. Differences in loneliness scores, social network features, and social functioning scores between BPD patients and HCs were analyzed using two-sided independent *t* tests. Effect sizes were computed using Cohen's *d* and used to calculate the overlap between the distributions of loneliness scores between groups (Bortz & Döring, 2006).

To analyze the hypothesized covariations between loneliness, social network features, and social functioning, Pearson's correlation coefficients were computed. To assess whether higher loneliness in the BPD group can be solely explained by differences in social network features and social functioning, we compared loneliness scores between groups by using features of social networks and social functioning as covariates in a one-factorial analysis of variance (ANOVA).

Results

Loneliness

BPD patients reported higher levels of loneliness than HCs; see Table 1 and online Supplemental Material Figure S1a. Effect size indicated an overlap of loneliness score distributions of 0.6% for HCs and BPD patients (see Online Supplemental Material Figure S1b; Cohen's $d = 2.728$).

Table 1
Means and Standard Deviations Together With the Results of the Independent t-Tests for BPD Patients and HCs in UCLA Loneliness Scale, SNI, GAF, and SFS

Measure	HC AM *SD*	BPD AM *SD*	*t*	*p*	*d*
UCLA-Loneliness	28.6 ± 7.6	62.9 ± 15.6	−12.5	<.001	2.728
SNI-Size	16.2 ± 9.8	8.3 ± 6.5	4.2	<.001	.939
SNI-Diversity	5.1 ± 2.0	3.8 ± 1.9	3.0	.002	.671
SNI-Embeddedness	1.8 ± 1.5	2.1 ± 3.9	−.4	.706	.085
GAF	89.4 ± 6.2	53.3 ± 9.0	20.9	<.001	4.673
SFS-total	108.7 ± 3.8	91.3 ± 9.1	11.2	<.001	2.504
SFS-*SE*	111.3 ± 6.8	88.7 ± 12.2	10.2	<.001	2.281
SFS-IC	109.0 ± 6.7	91.0 ± 15.6	6.7	<.001	1.498
SFS-IN-P	108.4 ± 5.4	91.6 ± 16.8	6.0	<.001	1.342
SFS-IN-C	108.6 ± 1.6	91.4 ± 17.4	6.2	<.001	1.386
SFS-PRO	110.1 ± 12.1	89.9 ± 10.1	8.1	<.001	1.811
SFS-REC	108.2 ± 11.0	91.8 ± 14.0	5.8	<.001	1.297
SFS-OCC	105.5 ± 8.1	94.5 ± 18.1	3.5	.001	.783

Note. HC = healthy controls; BPD = borderline personality disorder patients; SNI = Social Network Index; GAF = Global Assessment of Functioning; SFS = Social Functioning Scale; SE = social engagement; IC = interpersonal communication; IN-P = independence performance; IN-C = independence competence; PRO = prosocial; REC = recreation, OCC = occupation. All group differences are also significant after correction for multiple testing, Bonferroni correction (i.e., $p < .003$).

Social Network Features

Size and diversity of social networks were reduced in BPD. There was no difference between groups in the number of embedded networks (see Table 1). The percentage of participants living alone was higher in BPD patients than in the HC group (BPD: 35%, HCs: 15%, $\chi^2 = 4.267$, $p = .039$).

Social and Global Functioning

The level of functioning was reduced in the BPD group compared to HCs for both the GAF and the SFS. Reduced social functioning was seen across all subscales of the SFS (see Table 1). Information retrieved from the SFS revealed that 35% of the BPD patients were unemployed, compared to only 5% of the HCs ($\chi^2 = 11.25$, $p = .001$).

Covariation of Loneliness With Social Network Features and Social Functioning

Social networks. Loneliness correlated with social network size in both the BPD and the HC group: The fewer people there were in participants' social networks, the higher their loneliness (BPD: $r = -.29$, $p = .037$, HCs: $r = -.31$, $p = .026$). In the BPD group, loneliness additionally correlated inversely with social network diversity: The lower the number of high-contact roles within the network, the higher the loneliness (BPD: $r = -.38$, $p = .009$, HCs: $r = -.07$, $p > .10$; $z = 1.42$, $p = .078$). The number of embedded networks was not linked to loneliness (both $p > .10$). In

neither of the two groups was living alone correlated with loneliness (both $p > .10$).

Social and global functioning. There was no significant correlation between loneliness and global functioning as assessed with the GAF (BPD: $r = .07$, $p > .10$, HCs: $r = .11$, $p > .10$). In contrast, loneliness was negatively correlated with social functioning as assessed with the SFS (SFS total: BPD: $r = -.38$, $p = .007$, HCs: $r = -.31$, $p = .025$). A more detailed analysis of subdomains of social functioning in the SFS revealed that higher loneliness was linked to lower social functioning in the domain of 'interpersonal communication' in BPD patients ($r = -.42$, $p < .001$; see Online Supplemental Figure S2), but not in HCs ($r = .18$, $p = .274$; $z = -3.38$, $p < .001$). Irrespective of group, loneliness was higher with lower social functioning in the domains of "social engagement" (BPD: $r = -.32$, $p = .044$; HCs: $r = -.49$, $p = .001$) and "pro-social behavior" (BPD: $r = -.45$, $p = .003$; HCs: $r = -.31$, $p = .048$). Loneliness was not related to social functioning scores in the domains of "independence performance," "independence competence," "recreation," and "occupation" in either the BPD or the HC groups (all $p > .10$). In neither of the two groups was employment status correlated with loneliness (both $p > .134$). An overview of all correlations can be found in the Online Supplemental Tables S1 and S2.

Contribution of Social Network Features and Social Functioning to Group Differences in Loneliness

To test whether group differences in loneliness are still present after controlling for social network features and social functioning, those social network features and social functioning domains that were linked to loneliness, that is, social network size and diversity as well as social engagement, interpersonal communication, and pro-social behavior, were added to the ANOVA as covariates. Differences between groups in loneliness still remained significant, $F(1, 73) = 20.1$, $p < .001$, $d = 1.015$, explaining 22% of the variance in loneliness compared to a 67% explanation of variance without controlling for social network features and social functioning. Interpersonal communication was a significant covariate, $F(1, 73) = 9.5$, $p = .003$, $d = 0.698$, and explained 12% of the variance in loneliness scores. As a trend, prosocial behavior was also relevant, $F(1, 73) = 3.0$, $p = .089$, $d = 0.392$, explaining 4% of the variance in loneliness. The other covariates did not significantly contribute to the group effect of loneliness (all $p > .121$).

Discussion

The feeling of loneliness is often reported as a symptom in BPD and is well known to every clinician. The present study investigated loneliness in BPD and the relevance of social functioning and social isolation measured by features of social networks. Our findings confirmed that BPD patients report higher levels of loneliness. We found an overlap of only 0.6% in the distribution of loneliness between HCs and BPD patients, which is remarkably small. BPD patients reported smaller and less diverse social networks compared to HCs as well as lower social functioning across all domains of social skills and behaviors. Small network size and low functioning in the domains of social engagement and prosocial behavior were linked to increased loneliness in both healthy participants and BPD patients. The diversity of social networks and reduced interpersonal communication contributed to increased feelings of loneliness, particularly in BPD. However, after controlling for effects of social network features and social functioning, we still found increased loneliness scores in the BPD group, suggesting that further factors contribute to the painful experience in this clinical sample.

Loneliness and Being Alone

Loneliness describes perceived social isolation and is different from objective social isolation, that is, a lack of interpersonal relations. Our findings revealed that BPD patients not only subjectively feel socially isolated, as their heightened levels of loneliness show, but are indeed more isolated as revealed by social network features. BPD patients report smaller networks, that is, a smaller number of people with whom they have regular contact. This confirms past findings that suggest that the social contacts of BPD are restricted to a smaller number of different people compared to healthy participants and patients without personality disorders (Stepp et al., 2011). Beyond network size, network diversity is reduced in BPD: The social roles of BPD patients within their networks are less diverse, that is, BPD patients have regular contact with at least one person in a more restricted range of social domains.

Both network features that distinguish BPD patients from HCs are linked to loneliness. However, although smaller network size in general promotes stronger feelings of loneliness in both groups, a lower diversity of social roles within the network contributes to loneliness particularly in BPD. What comes to mind immediately when thinking about reduced network diversity is the influence of living alone or being unemployed, since both result in the complete loss of a single social domain. Routasalo, Savikko, Tilvis, Strandberg, and Pitkälä (2006) found that higher levels of loneliness are associated with living alone. However, although in the present study BPD patients both lived alone and were unemployed more often than HCs, neither living alone nor employment status was related to loneliness, suggesting that these aspects are of minor relevance in healthy participants as well as in BPD patients. This agrees with our finding that the number of embedded networks has no effect on the level of loneliness. In regard to loneliness and social functioning it seems to be irrelevant whether someone has more or fewer embedded networks within the social network as a whole. Instead it is relevant to have regular contact with a high number of people and take different social roles in the social network, regardless of whether it can be subdivided into many smaller networks.

A recent study linked social network diversity to neuronal activation during the processing of nonverbal social signals. Dziura and Thompson (2014) asked participants to identify repeated presentations of human body movements depicted as point-light arrays. When contrasted with a control condition consisting of presentations of scrambled versions of the same movie clips, biological motions elicited activity in the right posterior superior temporal sulcus which was linked particularly with the participants' network diversity. Both the findings of Dziura and Thompson (2014) and our study underline the special relevance of diversity which is distinct from other network features such as network size. The relationship of network diversity with both brain activation and loneliness remained significant after controlling for effects of social network size (loneliness with diversity controlled for network size: $r = -.24$, $p = .037$). Although empirical

data on the factors ensuring a network of high diversity are still sparse, the accurate perception and interpretation of social signals seems to contribute to a person's ability to take different social roles. Together with various findings on altered processing of social signals in BPD (see Lazarus, Cheavens, Festa, & Rosenthal, 2014; Mitchell, Dickens, & Picchioni, 2014), these results suggest that an attenuation of strong feelings of loneliness may be achieved by increasing network diversity via improving perception and interpretation of social signals.

Loneliness and Social Functioning

Confirming previous studies, our data revealed lower functioning in the BPD group. This held true both for the observer-based assessment with the GAF as well as for the self-report-based SFS. An analysis of different domains of social functioning suggests that social skills and behaviors are generally reduced in BPD.

Regarding the link between loneliness and functioning, our study showed inconsistent findings. The GAF measure of global functioning was not correlated with loneliness, whereas the SFS total score measure of solely social functioning was. A finer-grained analysis of different aspects of functioning revealed social engagement and prosocial activities as particularly important for the feeling of loneliness in all participants. Beyond these aspects, the level of interpersonal communication was linked to loneliness only in BPD. Interpersonal communication comprises the actual number of friends, having a romantic partner, how often one participates in a sensible or rational conversation, and how difficult one finds it to talk to people.

Impairments in social functioning likely lead to less frequent interactions with others, which in turn promotes smaller networks, being alone, and finally feelings of loneliness (Dykstra & van Tilburg, 2005; Pinquart & Sörensen, 2003). Thus, interpersonal communication may be linked to the number of interpersonal contacts, that is, the size of the social network. However, additional analyses revealed no correlation between these factors in BPD patients ($p = .150$). Because larger network size and better social functioning in general (measured by the SFS total score) were positively correlated, this argues for the distinctness of interpersonal communication as a discrete aspect of social functioning. Having more people in the network as potential communication partners does not necessarily mean that an individual is able to carry out a sensible or rational conversation and finds it easy to talk to other people. The missing link suggests that deficits in interpersonal communication result from impaired communication skills rather than from a lack of potential conversational partners. This argues for the relevance of improving interpersonal communication skills in psychotherapy as an indirect path to improving feelings of loneliness in BPD.

We performed a post hoc analysis to explore causes underlying the divergent findings for the relationship between loneliness and functioning measured with the GAF and SFS. In BPD, the GAF score correlated at trend-level with the SFS total score, $r = .27$, $p = .089$. An analysis of covariance between the different domains of social functioning on the SFS revealed that the GAF mainly indicates occupation-related social functioning, as the only significant correlation was between the GAF and the subscale of the SFS that indicates employment, $r = .33$, $p = .040$. Besides a marginally significant correlation between the GAF score and the competence for living independently, $r = .27$, $p = .099$, all other areas of social functioning were not linked to the GAF score (all $p > .207$). Moreover, the GAF score was not linked to features of social networks. The GAF is a well-established measure of general functioning and is therefore often used as an outcome measure in psychotherapy studies (Jørgensen et al., 2013; Piersma & Boes, 1997; Salvi, Leese, & Slade, 2005). Our findings suggest that—in contrast to a measure which combines symptom severity with psychological, social, and occupational functioning, as the GAF does—a finer-grained assessment of social functioning in psychotherapy research may allow the beneficial effects of interventions in certain domains of functioning to be distinguished from insufficient effects in other domains. For example, shortcomings in regard to improving interpersonal communication may explain a failure of therapeutic approaches to beneficially affect loneliness in BPD (Bohus et al., 2007).

Limitations

Finally, some limitations of the present study have to be addressed. The main limitation is its merely correlational approach. Nonetheless, we found relevant links between the investigated concepts, which is a first step to the understanding of loneliness in BPD. Further studies should investigate causal relationships between specific impairments using longitudinal designs and experimental manipulations. Beyond that, our data rely on self-reports of both network features and social functioning. Because our data point to the relevance of impairments in social–cognitive functions regarding the perception and interpretation of complex social signals for increased feelings of loneliness, experimental tasks may help to identify these impairments and their relevance for loneliness. Thome et al. (2016) identified a lower self-confidence during the assessment of low intensity positive facial expressions as being linked to increased feelings of loneliness in BPD patients. This supports the relevance of alterations in social cognition for this psychopathological feature.

Because we did not include a clinical control group in the present study, the specificity of the observed alterations has to be investigated in future studies. Closely related is the question of whether different comorbidities contributed to our findings, because BPD patients may display differential patterns of impairment across distinct areas of social functioning and network features depending on the occurrence of specific patterns of concurrent disorders. The generalization of our findings to male BPD patients has to be investigated since we only included female participants.

Because the results of the present study show that social network features and social functioning contribute to severely increased feelings of loneliness in BPD, yet do not explain group differences completely, future research is necessary that investigates further potentially contributing factors, such as rejection sensitivity or rumination.

Moreover, loneliness has been shown to be predicted by neuroticism in healthy individuals (Flett, Goldstein, Pechenkov, Nepon, & Wekerle, 2016; Mund & Neyer, 2015; Stokes, 1985). BPD patients have been consistently described not only by high levels of neuroticism (according to the five-factor model; Trull & Brown, 2013) but also by extreme expressions of negative affectivity (according to the temperament model of BPD; Widiger, 2005). Because negative emotionality directly impacts social functioning and development of social skills (Widiger, 2005), future research on loneliness in BPD may

profit from taking contributions of personality traits such as neuroticism and negative affectivity into account.

Summary and Conclusions

Loneliness, that is, the feeling of being alone, is markedly increased in BPD. Network features as well as skills and behaviors in specific domains of social functioning contribute to increased feelings of loneliness (see the summary in Online Supplemental Figure S2). In addition to factors that contribute to increased loneliness in general, we identified aspects with particular relevance for the emergence of loneliness in BPD. These seem to be related to deficits in social–cognitive functioning. However, the present study is only a first step to understanding loneliness in BPD, because social isolation and deficits in social functioning were not sufficient to explain the whole extent of the severe feelings of loneliness experienced by these patients. Nevertheless, our findings suggest starting points to determine an approach that may improve the persistent feelings of loneliness in this clinical sample.

References

Adler, G., & Buie, D. H., Jr. (1979). Aloneness and borderline psychopathology: The possible relevance of child development issues. *The International Journal of Psychoanalysis, 60,* 83–96.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Press.

Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin, 117,* 497–529. http://dx.doi.org/10.1037/0033-2909.117.3.497

Bender, D. S., & Skodol, A. E. (2007). Borderline personality as a self-other representational disturbance. *Journal of Personality Disorders, 21,* 500–517. http://dx.doi.org/10.1521/pedi.2007.21.5.500

Birchwood, M., Smith, J., Cochrane, R., Wetton, S., & Copestake, S. (1990). The Social Functioning Scale. The development and validation of a new scale of social adjustment for use in family intervention programmes with schizophrenic patients. *The British Journal of Psychiatry, 157,* 853–859. http://dx.doi.org/10.1192/bjp.157.6.853

Bohus, M., Kleindienst, N., Limberger, M. F., Stieglitz, R. D., Domsalla, M., Chapman, A. L., . . . Wolf, M. (2009). The short version of the Borderline Symptom List (BSL-23): Development and initial data on psychometric properties. *Psychopathology, 42,* 32–39. http://dx.doi.org/10.1159/000173701

Bohus, M., Limberger, M. F., Frank, U., Chapman, A. L., Kühler, T., & Stieglitz, R. D. (2007). Psychometric properties of the Borderline Symptom List (BSL). *Psychopathology, 40,* 126–132. http://dx.doi.org/10.1159/000098493

Bortz, J., & Döring, N. (2006). *Forschungsmethoden und Evaluation für Human- und Sozialwissenschaftler* [Research methods and evaluation for human and social scientists] (4, überarb. Aufl. ed.). Heidelberg, Germany: Springer Medizin Verlag.

Buie, D., & Adler, G. (1982). Definitve treatment of the borderline personality. *International Journal of Psychoanalytic Psychotherapy, 10,* 40–79.

Cacioppo, J. T., Ernst, J. M., Burleson, M. H., McClintock, M. K., Malarkey, W. B., Hawkley, L. C., . . . Berntson, G. G. (2000). Lonely traits and concomitant physiological processes: The MacArthur social neuroscience studies. *International Journal of Psychophysiology, 35,* 143–154. http://dx.doi.org/10.1016/S0167-8760(99)00049-5

Cacioppo, J. T., & Hawkley, L. C. (2009). Perceived social isolation and cognition. *Trends in Cognitive Sciences, 13,* 447–454. http://dx.doi.org/10.1016/j.tics.2009.06.005

Cacioppo, J. T., Hawkley, L. C., Ernst, J. M., Burleson, M. H., Berntson, G. G., Nouriani, B., & Spiegel, D. (2006). Loneliness within a nomological net: An evolutionary perspective. *Journal of Research in Personality, 40,* 1054–1085. http://dx.doi.org/10.1016/j.jrp.2005.11.007

Clifton, A., Pilkonis, P. A., & McCarty, C. (2007). Social networks in borderline personality disorder. *Journal of Personality Disorders, 21,* 434–441. http://dx.doi.org/10.1521/pedi.2007.21.4.434

Cohen, S., Doyle, W. J., Skoner, D. P., Rabin, B. S., & Gwaltney, J. M., Jr. (1997). Social ties and susceptibility to the common cold. *Journal of the American Medical Association, 277,* 1940–1944. http://dx.doi.org/10.1001/jama.1997.03540480040036

Cornwell, E. Y., & Waite, L. J. (2009). Measuring social isolation among older adulty using multiple indicators from the NSHAP study. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences, 64B*(Suppl. 1), 38–46. http://dx.doi.org/10.1093/geronb/gbp037

DiTommaso, E., Brannen-McNulty, C., Ross, L., & Burgess, M. (2003). Attachment styles, social skills and loneliness in young adults. *Personality and Individual Differences, 35,* 303–312. http://dx.doi.org/10.1016/S0191-8869(02)00190-3

Dykstra, P. A., & van Tilburg, T. D. J. G. (2005). Changes in older adult loneliness: Results from a seven-year longitudinal study. *Research on Aging, 27,* 725–747. http://dx.doi.org/10.1177/0164027505279712

Dziura, S. L., & Thompson, J. C. (2014). Social-network complexity in humans is associated with the neural response to social information. *Psychological Science, 25,* 2095–2101. http://dx.doi.org/10.1177/0956797614549209

First, M. B., Spitzer, R. L., Gibbon, M., Williams, J. B. W., & Benjamin, L. S. (1997). *User's guide for the structured clinical interview for DSM–IV Axis I disorders (SCID-I)—clinical version*. Washington, DC: American Psychiatric Press.

Flett, G. L., Goldstein, A. L., Pechenkov, I. G., Nepon, T., & Wekerle, C. (2016). Antecedents, correlates, and consequences of feeling like you don't matter: Associations with maltreatment, loneliness, social anxiety, and the five-factor model. *Personality and Individual Differences, 92,* 52–56. http://dx.doi.org/10.1016/j.paid.2015.12.014

Gold, L. H. (2014). DSM–5 and the assessment of functioning: The World Health Organization Disability Assessment Schedule 2. 0 (WHODAS 2.0). *Journal of the American Academy of Psychiatry and the Law, 42,* 173–181.

Gunderson, J. G. (1996). The borderline patient's intolerance of aloneness: Insecure attachments and therapist availability. *The American Journal of Psychiatry, 153,* 752–758. http://dx.doi.org/10.1176/ajp.153.6.752

Gunderson, J. G., Stout, R. L., McGlashan, T. H., Shea, M. T., Morey, L. C., Grilo, C. M., . . . Skodol, A. E. (2011). Ten-year course of borderline personality disorder: Psychopathology and function from the Collaborative Longitudinal Personality Disorders study. *Archives of General Psychiatry, 68,* 827–837. http://dx.doi.org/10.1001/archgenpsychiatry.2011.37

Hawkley, L. C., & Cacioppo, J. T. (2007). Aging and loneliness: Downhill quickly? *Current Directions in Psychological Science, 16,* 187–191. http://dx.doi.org/10.1111/j.1467-8721.2007.00501.x

Hill, J., Pilkonis, P., Morse, J., Feske, U., Reynolds, S., Hope, H., . . . Broyden, N. (2008). Social domain dysfunction and disorganization in borderline personality disorder. *Psychological Medicine, 38,* 135–146. http://dx.doi.org/10.1017/S0033291707001626

Iffland, J. R., Lockhofen, D., Gruppe, H., Gallhofer, B., Sammer, G., & Hanewald, B. (2015). Validation of the German Version of the Social Functioning Scale (SFS) for schizophrenia. *PLoS ONE, 10,* e0121807. http://dx.doi.org/10.1371/journal.pone.0121807

Jørgensen, C. R., Freund, C., Bøye, R., Jordet, H., Andersen, D., & Kjølbye, M. (2013). Outcome of mentalization-based and supportive psychotherapy in patients with borderline personality disorder: A randomized trial. *Acta Psychiatrica Scandinavica, 127,* 305–317. http://dx.doi.org/10.1111/j.1600-0447.2012.01923.x

Klonsky, E. D. (2008). What is emptiness? Clarifying the 7th criterion for borderline personality disorder. *Journal of Personality Disorders, 22,* 418–426. http://dx.doi.org/10.1521/pedi.2008.22.4.418

Lazarus, S. A., Cheavens, J. S., Festa, F., & Rosenthal, Z. M. (2014). Interpersonal functioning in borderline personality disorder: A systematic review of behavioral and laboratory-based assessments. *Clinical Psychology Review, 34,* 193–205. http://dx.doi.org/10.1016/j.cpr.2014.01.007

Lieb, K., Zanarini, M. C., Schmahl, C., Linehan, M. M., & Bohus, M. (2004). Borderline personality disorder. *The Lancet, 364,* 453–461. http://dx.doi.org/10.1016/S0140-6736(04)16770-6

Lis, S., & Bohus, M. (2013). Social interaction in borderline personality disorder. *Current Psychiatry Reports, 15,* 338–344. http://dx.doi.org/10.1007/s11920-012-0338-z

Loranger, A. W. (1999). *International Personality Disorder Examination (IPDE): DSM–IV and ICD-10 modules*. Odessa, FL: Psychological Assessment Resources.

Mitchell, A. E., Dickens, G. L., & Picchioni, M. M. (2014). Facial emotion processing in borderline personality disorder: A systematic review and meta-analysis. *Neuropsychology Review, 24,* 166–184. http://dx.doi.org/10.1007/s11065-014-9254-9

Mullins, L. C., & Mushel, M. (1992). The existence and emotional closeness of relationships with children, friends, and spouses: The effect on loneliness among older persons. *Research on Aging, 14,* 448–470. http://dx.doi.org/10.1177/0164027592144002

Mund, M., & Neyer, F. J. (2015). The Winding Paths of the Lonesome Cowboy: Evidence for Mutual Influences Between Personality, Subjective Health, and Loneliness. *Journal of Personality*. Advance online publication. http://dx.doi.org/10.1111/jopy.12188

Peplau, L. A., & Perlman, D. (1982). *Loneliness: A sourcebook of current theory, research, and therapy*. New York, NY: Whiley.

Piersma, H. L., & Boes, J. L. (1997). The GAF and psychiatric outcome: A descriptive report. *Community Mental Health Journal, 33,* 35–41. http://dx.doi.org/10.1023/A:1022413110345

Pinquart, M., & Sörensen, S. (2003). Risk factor for loneliness in adulthood and old age - a meta-analysis. In S. P. Shohov (Ed.), *Advances in psychology research* (vol. *19,* pp. 111–143). Hauppauge, NY: Nova Science Publishers.

Queen, T. L., Stawski, R. S., Ryan, L. H., & Smith, J. (2014). Loneliness in a day: Activity engagement, time alone, and experienced emotions. *Psychology and Aging, 29,* 297–305. http://dx.doi.org/10.1037/a0036889

Raven, J. C. (1976). *Standard progresssive matrices*. Oxford, UK: Oxford Psychologists Press.

Richman, N. E., & Sokolove, R. L. (1992). The experience of aloneness, object representation, and evocative memory in borderline and neurotic aptients. *Psychoanalytic Psychology, 9,* 77–91. http://dx.doi.org/10.1037/h0079323

Routasalo, P. E., Savikko, N., Tilvis, R. S., Strandberg, T. E., & Pitkälä, K. H. (2006). Social contacts and their relationship to loneliness among aged people - a population-based study. *Gerontology, 52,* 181–187. http://dx.doi.org/10.1159/000091828

Russell, D. W., Cutrona, C. E., McRae, C., & Gomez, M. (2012). Is loneliness the same as being alone? *The Journal of Psychology: Interdisciplinary and Applied, 146,* 7–22. http://dx.doi.org/10.1080/00223980.2011.589414

Russell, D., Peplau, L. A., & Ferguson, M. L. (1978). Developing a measure of loneliness. *Journal of Personality Assessment, 42,* 290–294. http://dx.doi.org/10.1207/s15327752jpa4203_11

Salvi, G., Leese, M., & Slade, M. (2005). Routine use of mental health outcome assessments: Choosing the measure. *The British Journal of Psychiatry, 186,* 146–152. http://dx.doi.org/10.1192/bjp.186.2.146

Schmahl, C., Herpertz, S. C., Bertsch, K., Ende, G., Flor, H., Kirsch, P., . . . Bohus, M. (2014). Mechanisms of disturbed emotion processing and social interaction in borderline personality disorder: State of knowledge and research agenda of the German Clinical Research Unit. *Borderline Personality Disorder and Emotion Dysregulation, 1,* 3–17. http://dx.doi.org/10.1186/2051-6673-1-12

Stepp, S. D., Hallquist, M. N., Morse, J. Q., & Pilkonis, P. A. (2011). Multimethod investigation of interpersonal functioning in borderline personality disorder. *Personality Disorders: Theory, Research, and Treatment, 2,* 175–192. http://dx.doi.org/10.1037/a0020572

Stepp, S. D., Pilkonis, P. A., Yaggi, K. E., Morse, J. Q., & Feske, U. (2009). Interpersonal and emotional experiences of social interactions in borderline personality disorder. *Journal of Nervous and Mental Disease, 197,* 484–491. http://dx.doi.org/10.1097/NMD.0b013e3181aad2e7

Stokes, J. P. (1985). The relation of social network and individual difference variables to loneliness. *Journal of Personality and Social Psychology, 48,* 981–990. http://dx.doi.org/10.1037/0022-3514.48.4.981

Thome, J., Liebke, L., Bungert, M., Schmahl, C., Domes, G., Bohus, M., & Lis, S. (2016). Confidence in facial emotion recognition in borderline personality disorder. *Personality Disorders: Theory, Research, and Treatment, 7,* 159–168. http://dx.doi.org/10.1037/per0000142

Trull, T. J., & Brown, W. C. (2013). Borderline personality disorder: A five-factor model perspective. In T. A. Widiger & P. T. Costa (Eds.), *Personality disorders and the five-factor model* (pp. 119–132). Washington, DC: American Psychological Association. http://dx.doi.org/10.1037/13939-008

Tyrer, P. J., & Casey, P. R. (1993). *Social function in psychiatry: The hidden axis of classification exposed*. Petersfield, UK: Wrightson Biomedical Publishing LTD.

van Baarsen, B., Snijders, T. A. B., Smit, J. H., & Van Dujin, M. A. J. (2001). Lonely but not alone: Emotional isolation and social isolation as two distinct dimensions of loneliness in older people. *Educational and Psychological Measurement, 61,* 119–135. http://dx.doi.org/10.1177/00131640121971103

Vassar, M., & Crosby, J. W. (2008). A reliability generalization study of coefficient alpha for the UCLA loneliness scale. *Journal of Personality Assessment, 90,* 601–607. http://dx.doi.org/10.1080/00223890802388624

Victor, C. R., Scambler, S. J., Bowling, A. N. N., & Bond, J. (2005). The prevalence of, and risk factors for, loneliness in later life: A survey of older people in Great Britain. *Ageing and Society, 25,* 357–375. http://dx.doi.org/10.1017/S0144686X04003332

Weiss, R. S. (1973). *Loneliness: The experience of emotional and social isolation*. Cambridge, MA: MIT Press.

Widiger, T. A. (2005). A temperament model of borderline personality disorder. In M. Zanarini (Ed.), *Borderline personality disorder* (pp. 63–81). Boca Raton, FL: Taylor & Francis.

Witvliet, M., Brendgen, M., van Lier, P. A., Koot, H. M., & Vitaro, F. (2010). Early adolescent depressive symptoms: Prediction from clique isolation, loneliness, and perceived social acceptance. *Journal of Abnormal Child Psychology, 38,* 1045–1056. http://dx.doi.org/10.1007/s10802-010-9426-x

Zanarini, M. C., Frankenburg, F. R., Hennen, J., Reich, D. B., & Silk, K. R. (2005). Psychosocial functioning of borderline patients and axis II comparison subjects followed prospectively for six years. *Journal of Personality Disorders, 19,* 19–29. http://dx.doi.org/10.1521/pedi.19.1.19.62178

Zanarini, M. C., Vujanovic, A. A., Parachini, E. A., Boulanger, J. L., Frankenburg, F. R., & Hennen, J. (2003). Zanarini Rating Scale for Borderline Personality Disorder (ZAN-BPD): A continuous measure of *DSM–IV* borderline psychopathology. *Journal of Personality Disorders, 17,* 233–242. http://dx.doi.org/10.1521/pedi.17.3.233.22147