Are There Subtypes of Panic Disorder? An Interpersonal Perspective

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Objective: Panic disorder (PD) is associated with significant personal, social, and economic costs. However, little is known about specific interpersonal dysfunctions that characterize the PD population. The current study systematically examined these interpersonal dysfunctions. *Method:* The present analyses included 194 patients with PD out of a sample of 201 who were randomized to cognitive–behavioral therapy, panic-focused psychodynamic psychotherapy, or applied relaxation training. Interpersonal dysfunction was measured with the Inventory of Interpersonal Problems–Circumplex (Horowitz, Alden, Wiggins, & Pincus, 2000). *Results:* Individuals with PD reported greater levels of interpersonal distress than that of a normative cohort (especially when PD was accompanied by agoraphobia), but lower than that of a cohort of patients with major depression. There was no single interpersonal profile that characterized PD patients. Symptom-based clusters (with vs. without agoraphobia) could not be discriminated on core or central interpersonal problems. Rather, as revealed by cluster analysis based on the pathoplasticity framework, there were 2 empirically derived interpersonal clusters among PD patients that were not accounted for by symptom severity and were opposite in nature: domineering–intrusive and nonassertive. The empirically derived interpersonal clusters appear to be of clinical utility in predicting alliance development throughout treatment: Although the domineering–intrusive cluster did not show any changes in the alliance throughout treatment, the nonassertive cluster showed a process of significant strengthening of the alliance. *Conclusions:* Empirically derived interpersonal clusters in PD provide clinically useful and nonredundant information about individuals with PD.

What is the public health significance of this article?
The current study demonstrated the importance of taking into account interpersonal dysfunction when treating individuals with panic disorder. Specifically, 2 distinct interpersonal profiles in panic disorder patients were identified, nonassertive and domineering–intrusive. Classifying panic disorder patients according to these interpersonal profiles contributes unique information about these individuals and has implications for treatment.

Keywords: panic disorder, interpersonal problems, interpersonal profile, psychopathology, alliance

Panic disorder (PD) is defined by recurrent, unexpected panic attacks (abrupt surges of intense fear or discomfort that peak within minutes) coupled with persistent concerns about additional attacks or their consequences (e.g., losing control or having a heart attack; American Psychiatric Association, 2013). PD has a high lifetime prevalence (4.8% in the general population), and is associated with substantial suffering and dysfunction (Kessler et al., 2006). PD patients have a higher suicide risk than the general population (Khan, Leventhal, Khan, & Brown, 2002), and reduced quality of life (Mendlowicz & Stein, 2000). Patients show considerable variability in the level of dysfunction. Evaluating heterogeneity in PD, researchers have focused primarily on symptom-based clusters, including the presence of agoraphobia (Sánchez-Meca, Rosa-Alcázar, Marín-Martínez, & Gómez-Conesa, 2010), which commonly co-occurs with PD (APA, 2013).

There is substantial documentation that PD arises during times of elevated interpersonal life stress (Nay, Brown, & Roberson-Nay, 2013; Scocco, Barbieri, & Frank, 2007), including interpersonal loss (Milrod, Leon, & Shear, 2004), severe and prolonged interpersonal conflict, and social isolation (Goldstein & Chambless, 1978; Kleiner & Marshall, 1985). Therefore, interpersonal life stress may be related to the pathology of PD, but no specific interpersonal dysfunctions that may characterize individuals with PD have been adequately characterized. As Carter and colleagues (1994) noted two decades ago: "it is surprising that none of the studies to date clearly explicated a specific dysfunctional interpersonal pattern" (pp. 31–32). The present study aims to fill this gap by systematically evaluating the interpersonal dysfunctions that characterize a cohort of PD patients.

Although interpersonal dysfunctions have not been well studied in PD, many studies have evaluated them in other disorders, including depression (Cain et al., 2012), social phobia (Cain, Pincus, & Grosse Holtforth, 2010), and generalized anxiety disorder (GAD; Przeworski et al., 2011; Salzer et al., 2008). These studies have utilized the pathoplasticity paradigm for understanding psychopathologies in the context of individuals' interpersonal functioning. Pathoplasticity assumes that psychopathology and personality affect one another but one does not exclusively cause the other (Pincus & Wright, 2011; Widiger & Smith, 2008). Therefore, the psychopathology of PD for any individual cannot be understood by focusing only on heterogeneity at the symptom level (PD with vs. without agoraphobia), but necessitates consideration of the individuals' personality and of their tendencies for perceiving and reacting to the world (Widiger & Smith, 2008).

In the present study, we use the pathoplasticity framework to explore interpersonal dysfunction among a PD cohort. This framework has not been previously used to explore interpersonal dysfunction in this population. We chose the interpersonal circumplex (IPC) model (Leary, 1957; Wiggins, 1996) because it is one of the most common and productive ways of conceptualizing interpersonal dysfunction in studies using the pathoplasticity framework. IPC describes individuals' interpersonal styles according to two orthogonal dimensions: dominance and affiliation. Dominance reflects a tendency toward interpersonal assertion (as opposed to passivity); affiliation reflects a tendency toward friendly interaction with others (as opposed to interpersonal distance). Descriptions of individuals and groups are based on their location in this two-dimensional space. Studies using the IPC suggest that at least some disorders have a kaleidoscopic relationship with interpersonal dysfunctions, with personality and psychopathology intertwining to produce phenotypic variability in the expression of a disorder. Specifically, IPC has been used to identify distinct interpersonal clusters among individuals with bulimia nervosa (Ambwani & Hopwood, 2009; Hopwood, Clarke, & Perez, 2007), depression (Cain et al., 2012), social phobia (Kachin, Newman, & Pincus, 2001; Cain et al., 2010), GAD (Przeworski et al., 2011; Salzer et al., 2008), borderline personality disorder (Wright et al., 2013), and fear of failure (Wright, Pincus, Conroy, & Elliot, 2009).

The above-mentioned studies demonstrated heterogeneity in interpersonal dysfunction within specific disorders and found different numbers of interpersonal clusters within a disorder, most commonly two or four clusters. For example, in individuals with social phobia, Cain et al. (2010) identified two profiles: cold-submissive and friendly-submissive. Similarly, in individuals with pathological perfectionism, Slaney, Pincus, Uliaszek, and Wang (2006) identified two profiles, one characterized by hostile, and the other by friendly submissive behaviors. Studies focusing on post-traumatic stress disorder (PTSD; Thomas et al., 2014) and GAD (Przeworski et al., 2011) identified four empirically derived interpersonal clusters arrayed around the quadrants of the circumplex (warm-dominant, warm-submissive, cold-submissive, and cold-dominant). Studies focusing on depression identified six (Cain et al., 2012) and eight (Grosse Holtforth et al., 2014) clusters. Despite differences between the two or more interpersonal clusters solutions, the overall message is that interpersonal heterogeneity appears to exist within specific disorders. Thus, we expected to find interpersonal heterogeneity within PD.

Although PD with agoraphobia may be associated with higher interpersonal distress than PD without agoraphobia (Chambless, 2010), according to the pathoplasticity model we did not expect the prevalent symptom-based clustering for evaluating heterogeneity in PD on the basis of the presence of agoraphobia symptoms to suffice for evaluating distinct interpersonal clusters in PD. Specifically, symptom-based clustering is not predicted to yield sufficient information for discriminating heterogeneity in interpersonal dysfunctions in patients with PD because previous studies have shown that clusters of interpersonal dysfunctions were generally unrelated to psychopathology and functional severity (Cain at el., 2010; Przeworski et al., 2011). This hypothesis is also based on the suggestion that empirically derived interpersonal clusters may have unique contributions over other clustering-based typologies (Thomas et al., 2014). Specifically, interpersonal clusters in PTSD were found to yield an alternative perspective on personality heterogeneity to another clustering typology on the basis of temperament traits.

The current study tested the severity of interpersonal problems in PD and examined whether PD can be characterized by distinct interpersonal dysfunction clusters. Data were collected from a cohort of patients with PD. A four-step framework was employed: In the first step, to learn about the severity of interpersonal problems in PD, we explored the interpersonal dysfunctions of the cohort as a whole, comparing its general level of distress with a representative normative U.S. sample and with a cohort of patients with major depressive disorder (MDD). We also examined whether one distinct, homogenous interpersonal profile accurately described individuals with PD.

We determined a priori that if this first step did not reveal a single distinct interpersonal profile, the second step would explore the ability of symptom-based clustering to obtain distinct interpersonal subtypes in PD. We focused on whether agoraphobia, which commonly co-occurs with PD, would be a useful marker for delineating clusters. We determined that if the second step did not reveal distinct interpersonal clusters of PD based on the presence of symptoms (agoraphobia), the third step would attempt to identify distinct clusters with characteristic interpersonal dysfunctions based on the pathoplasticity model (Cain et al., 2010; Wright et al., 2009). Finally, we determined that if we found distinct interpersonal clusters in the third step, the fourth step would investigate the utility of such clusters, by examining their ability to predict the development of the therapist-patient alliance throughout treatment.

Method

Participants

Two hundred and one patients with primary *DSM–IV* (American Psychiatric Association., 2000) PD participated in a two-site (University of Pennsylvania and Weill-Cornell Medical College) randomized controlled trial (RCT) of panic-focused psychodynamic psychotherapy ($n = 81$), cognitive–behavioral therapy ($n = 81$), and applied relaxation training ($n = 39$). Inclusion criteria were patients ages 18 to 70 with primary *DSM–IV* PD with or without agoraphobia, as diagnosed by the Anxiety Disorders Interview Schedule (ADIS-IV). Exclusion criteria were current substance dependence, acute suicidality, a lifetime history of any psychotic or bipolar disorder, and organic mental disorders. Patients were recruited through advertisements and via referrals from physicians, emergency rooms, and outpatient clinics. Only participants who completed the Inventory of Interpersonal Problems–Circumplex (IIP-C) at intake ($n = 194$) were included in the current article. In this subsample of 194 participants the mean age was 38.90 ($SD = 13.31$), 132 participants (68%) were female, 142 were White (73%), 40 were African American (20%), 9 (0.4%) were Asian, 28 were Latino/a (14.4%), and the remainder identified as "other" ($n = 3$).

Most of the PD patients in this subsample had an Axis I comorbidity (92.3%). The majority of patients receiving an Axis I comorbid diagnosis were diagnosed with agoraphobia (78.9%), GAD (47.9%), social phobia (25.3%), or MDD (19.6%). Of the patients, 51% received a diagnosis of at least one comorbid personality disorder. The most prevalent diagnoses included obsessive–compulsive (26.4%), depressive[1] (21.2%), and avoidant (16.1%) personality disorders. Although the prevalence of personality disorders seems somewhat higher relative to some previous reports (Hoffart, 1997), it is difficult to clearly determine how representative this sample is compared to other samples of patients of PD with or without personality disorders due to the small number of previous studies reporting the percentages of comorbidity with specific personality disorders. The study was approved by Institutional Review Boards at Weill-Cornell Medical College and the University of Pennsylvania.

Measures

Anxiety Disorders Interview Schedule for Diagnostic and Statistical Manual-IV (ADIS-IV). The ADIS-IV (Brown, DiNardo, & Barlow, 1994) is a semistructured clinical diagnostic interview for *DSM–IV* Axis I disorders. Primary PD diagnosis was required for study inclusion. Kappas ranged for Axis I disorders was $.64 \leq K \leq .79$.

Structured Clinical Interview for *DSM–IV* Personality Disorders (SCID-II). The SCID-II (First, Gibbon, Spitzer, Williams, & Benjamin, 1997) is a 113-item structured clinical interview designed to diagnose Axis II personality disorders. In the current study, interrater reliability for the number of traits as assessed by intraclass correlations (ICC [2, 1]; Shrout & Fleiss, 1979) ranged from fair to excellent ($.58 \leq \rho_I \leq 1$). The kappa range for diagnoses was $.67 \leq K \leq .1$ (kappa could not be calculated in instances in which very few of the patients received certain diagnoses).

Panic Disorder Severity Scale (PDSS). The PDSS is a seven-item, diagnostician-rated measure of panic severity (Shear et al.,

1997). In the current study, interrater reliability was excellent ($\rho_I = .95$).

Hamilton Rating Scale for Anxiety (HRSA). The HRSA (Hamilton, 1959) is a 14-item measure of nonpanic related anxiety that assesses psychiatric and somatic symptoms. In the current study, interrater reliability for the total scale score was excellent ($\rho_I = .96$).

Hamilton Rating Scale for Depression (HRSD). The HRSD (Hamilton, 1960; Williams, 1988) is a 27-item measure of depression severity that assesses a variety of depressive symptoms. For the purposes of this study, the severity of depression was computed from the first 17 items, which is a strategy employed in many randomized clinical trials. In the current study, interrater reliability was excellent ($\rho_I = .80$).

Sheehan Disability Scale (SDS). The SDS (Sheehan, 1983) is a three–item self-report measure of social, family, and vocational impairment, chosen for its simplicity and accuracy in PD populations (Leon et al., 1993).

Inventory of Interpersonal Problems–Circumplex (IIP-C). The IIP-C (Alden, Wiggins, & Pincus, 1990; Horowitz, Rosenberg, Baer, Ureño, & Villaseñor, 1988) is a 64-item self-report questionnaire assessing interpersonal difficulties and distress. Patients rate two types of items: interpersonal behaviors that are "hard for you to do" (e.g., "it is hard for me to let other people know when I am angry") and interpersonal behaviors that "you do too much" (e.g., "I am too afraid of other people"). Ratings of the degree to which each problem is distressing are made on a 5-point scale, ranging from 0 (*not at all*) to 4 (*extremely*).

Working Alliance Inventory (WAI). The WAI-P (Tracey & Kokotovic, 1989) is a 12-item patient's self-report questionnaire assessing the quality of the therapeutic alliance. Items were rated on a 7-point Likert scale, ranging from 1 (*never*) to 7 (*always*). In the current study the internal reliability range for the three time points was .91 to .94.

Procedure

Individuals screened on the telephone for eligibility were scheduled for a diagnostic evaluation if they were identified as likely to meet *DSM–IV* criteria for PD. Prior to evaluation, written informed consent was obtained. All evaluations were conducted at intake by 13 specifically trained, independent diagnosticians (MS- or PhD-level psychologists), who each received at least 30 hr of supervised training before administering the measures for the study. The above reported interrater reliabilities were established by having judges rate videotapes from 28 patients. An ICC (2, 1) was calculated for the reproducibility of a single judge's ratings on each diagnosis using a variance decomposition strategy (Shrout & Fleiss, 1979). Alliance was assessed at three scheduled time points: Week 1, 3, and 5 of treatment.

Data Analytic Strategy

The current analysis employed the two most comprehensive methods of analyzing IIP-C data: circular statistics and the struc-

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[1] Although depressive personality disorder was removed from the DSM main section, it remained in the appendix for conditions warranting further study and is included in the SCID-II for a diagnostic category.

tural summary method (Wright et al., 2009). The first analytic strategy, the circular statistics method, is conceptualized along two fundamental dimensions underlying individual differences in interpersonal behavior: dominance (dominance vs. submissiveness) and affiliation (affiliation vs. coldness/distance). Different combinations of these dimensions yield eight octants of interpersonal problems (Gurtman & Pincus, 2003; Guttman, 1954). As recommended by Gurtman (1994), in the current study IIP-C octant scores were obtained from standardized z-score transformations relative to a normative cohort (i.e., gender norms provided by Horowitz et al., 2000). Circular statistics preserve the conceptual similarities between the locations on the circle while allowing for the calculation of mean (i.e., the average of the angular displacements for each individual within the group), circular variance (i.e., the dispersion of the angular displacements of individuals within a given group around the circular mean), and 95% confidence intervals (CIs), which are important for testing differences between groups (Wright et al., 2009).

The second analytic strategy, the structural summary method for modeling interpersonal profiles (Gurtman, 1994; Gurtman & Balakrishnan, 1998; Gurtman & Pincus, 2003), plots interpersonal data on a sinusoidal curve that can be summarized with the following set of structural parameters: (a) angular displacement, or the angular shift from 0° for the peak of the curve, which is an index of the predominant interpersonal problem; (b) elevation, or the mean level of the profile, which is an index of global levels of interpersonal distress across all types of interpersonal problems; and (c) amplitude, or the difference between the group's mean (i.e., their average level of distress) and peak values (i.e., their most predominant type of interpersonal problem), which is an index of group profile differentiation. Specifically, higher amplitudes indicate that a distinct set of interpersonal problems is more troubling to the group than other types of interpersonal problems (as delineated by a profile with a clear interpersonal peak and trough). An amplitude value of 0 indicates a flat (i.e., undifferentiated) profile with no identifiable peak in the group (Gurtman & Balakrishnan, 1998). Goodness of fit (R^2) indicates profile prototypicality, meaning how well the entire group's data (elevation, amplitude, and displacement) conforms to circumplex expectations, such that adjacent scales are rated more similarly than opposing scales. An $R^2 < .70$ reflects a complex profile in which the information cannot be represented accurately by the profile's elevation, amplitude, and displacement (Wright, Pincus, Conroy, & Hilsenroth, 2009). High R^2 scores ($R^2 > .80$) indicate a pattern that is prototypical. It has been suggested that when considered together, as opposed to separately, the circular statistics method and the structural summary method provide more detailed and clinically useful information regarding the assessment of a group's interpersonal profile and homogeneity, as well as statistical tests of differences between subtypes. (See Wright et al., 2009 for detailed descriptions.) Therefore, in the current study both methods were used complementarily.

In preliminary analyses, we examined whether demographics were consistently related to scores on the eight octants of interpersonal problems and the general level of interpersonal distress in patients with PD. Then, we followed the four-step framework described earlier. In the first step, we compared the general level of interpersonal distress in PD to both a normative cohort and to an MDD cohort based on both the level of elevation (i.e., the mean

height of the profile) and the mean interpersonal distress in each of the eight IIP-C subscales, where larger values indicate higher levels of distress or maladjustment (Tracey, Rounds, & Gurtman, 1996). The normative comparison group comprised 800 adults representative of the U.S. population (Horowitz et al., 2000). The MDD comparison group comprised 151 adults enrolled in a recent RCT (Barber, Barrett, Gallop, Rynn, & Rickels, 2012). The mean age of the MDD cohort was 37.8 ($SD = 12.1$) and 92 participants (60.9%) were female. A fuller description of the MDD RCT and the IIP-C data collected in that study appears elsewhere (Barber et al., 2012; Barrett & Barber, 2007).

We next explored whether a uniform interpersonal profile exists in this PD cohort by examining the sample's amplitude and goodness of fit (R^2). If one uniform interpersonal profile was not found to exist in the PD cohort (i.e., if $R^2 < .70$ and low amplitude), the ensuing steps would employ a comprehensive analytic strategy to detect distinct interpersonal subtypes in PD, based on the presence of agoraphobia (second step) and interpersonal clusters (third step). Whereas in the second step the PD cohort was divided based on the existence of an agoraphobia diagnosis (symptom-based clusters), in the third step a series of cluster analyses were conducted on the IIP-C data (empirically derived interpersonal clusters). The aim of the cluster analyses series was to detect homogenous subtypes or groups of similar individuals within a larger, heterogeneous sample. The clusters were constructed using the two IIP-C axes for dominance and affiliation as the criteria for similarity versus dissimilarity. Initially, the sample was cluster analyzed using the widely used K-means procedure with the squared euclidean distance measure. Next, to confirm the final cluster solution, Ward's hierarchical clustering procedure with the squared euclidean distance measure was conducted.

The K-means was chosen over another widely used method, the latent class analysis (LCA; Fraley, Raftery, Murphy, & Scrucca, 2012), for three main reasons. First, we followed the most conventional and agreed upon method in this field (e.g., Cain et al., 2010; Wright et al., 2009). Second, the data seem to be more congruent with the K-means assumptions than the LCA assumptions. Specifically, no significant differences were found between the empirically derived interpersonal clusters in their variances (for dominance, Levene's W = 1.28, $p = .26$; for affiliation, Levene's W = 0.16, $p = .69$), allowing the use of the K-means method. Additionally, based on the Shapiro-Wilk and Kolmogorov–Smirnov tests, it appears that for the affiliation dimension data were not normally distributed (Shapiro-Wilk: $ps < .0001$ for the two clusters, Kolmogorov–Smirnov: $p < .0001$ and $p = .001$ for Cluster 1 and Cluster 2, respectively), therefore violating the LCA assumption of normality. Third, the K-means approach shows better separation of fit to the data. Specifically, we empirically compared clustering results based on the K-means and the LCA (Fraley et al., 2012). Following Milligan and Cooper (1985), we focused on five clustering quality indices: Silhouette, Calinski, C-index, Davies Bouldin, and Gamma (see also Guerra, Robles, Bielza, & Larrañaga, 2012). Most of these indices supported the use of K-means in the current dataset.

In both the second and third steps, the comprehensive analytic strategy included the implementation of both circular statistics and the structural summary method (Wright et al., 2009). We hypothesized that interpersonal heterogeneity would be best captured by empirically derived interpersonal clusters,

rather than by symptom-based clusters. We planned a priori that if distinct interpersonal subtypes were found in Step 3, pathoplastic relationships between PD and interpersonal factors would be examined. Specifically, we planned to test whether distinct subtypes of interpersonal classification existed that were not accounted for by severity of PD, differential anxiety and depression comorbidities, agoraphobia co-occurrence, and general interpersonal distress.

Fourth, we examined the ability of the interpersonal clusters found in this study as well as the two profiles of PDA+ (patients with agoraphobia) and PDA− (patients without agoraphobia) to predict the development of the therapist-patient alliance throughout treatment. A three-level hierarchically nested model was used, with patient and therapist as random effects. SAS PROC MIXED procedure for multilevel modeling (Littell, Milliken, Stroup, Wolfinger, & Schabenberger, 2006) was employed. In this analysis we examined whether the interactions between the empirically derived interpersonal clusters and time and between the two profiles of PDA + and PDA− and time predicted the alliance throughout treatment, while introducing the main effects of time and the empirically derived interpersonal clusters and the profiles of PDA + and PDA into the analysis.

Results

Interpersonal Distress in Patients With Panic Disorder as a Function of Demographics

No significant differences were found in interpersonal distress scores for gender, age or race, except that White individuals reported significantly more distress ($M = 12.62$, $SD = 7.56$) than African Americans ($M = 8.86$, $SD = 14.36$), $t(186) = 2.27$, $p = .02$, $d = 0.33$, in the nonassertive octant, and older individuals reported more distress than younger individuals in the exploitable octant ($r = .15$, $p = .03$).

Step 1: Exploration of a Uniform Interpersonal Profile in Patients With PD

Descriptive statistics for the total severity of interpersonal problems and the eight octants of the entire sample of patients with PD are presented in Table 1. Focusing on the interpersonal

Table 1
Descriptive Statistics for the Inventory of Interpersonal Problems Unstandardized Scores

Variable	N	M	SD	α
Domineering	193	6.13	7.97	.88
Vindictive	195	6.10	7.21	.86
Cold	194	7.59	8.67	.90
Socially avoidant	193	9.71	9.77	.91
Nonassertive	192	11.93	9.65	.92
Exploitable	195	10.26	8.42	.86
Overly nurturant	192	11.31	9.05	.89
Intrusive	194	7.52	7.96	.86
Total	186	73.76	36.28	.97

Note. IIP = Inventory of Interpersonal Problems. IIP scales were not standardized on the respective norm.

profile of the whole PD cohort (the cohort's average profile across individuals) compared with a normative representative sample (Horowitz et al., 2000), we found that patients with PD reported more interpersonal distress than the normative cohort (elevation = .44), $t(984) = 5.92$, $p = .0001$, $d = 0.37$, and showed evidence of a primarily nonassertive interpersonal style, as indicated by an angular displacement of 288.83 degrees. Almost all interpersonal octants were found to be significantly different compared to the normative cohort. Specifically, compared to a normative cohort, patients with PD reported higher levels of distress on the domineering, cold/distant, social avoidance, nonassertive, exploitable, overly nurturant, and intrusive octants (all $ts \geq 2.87$, $ps \leq .004$, $d \geq 0.18$), as well as marginally higher levels in the vindictive octant, $t(991) = 1.79$, $p = .07$, $d = 0.11$.

The MDD comparison group was found to be significantly more distressed by interpersonal problems than Horowitz et al.'s normative samples (elevation = .96), and demonstrated a socially avoidant interpersonal style as indicated by an angular displacement of 227 degrees. The structural summary parameters of moderate amplitude (0.39) and high goodness of fit ($R^2 = .81$) indicated that the overall MDD cohort exhibited high interpersonal differentiation (i.e., high prototypicality; Gurtman & Pincus, 2003; Slaney et al., 2006). When the interpersonal profile of the whole PD cohort was compared with the MDD cohort, the PD cohort was found to report significantly less distress on the socially avoidant, nonassertive, exploitable, and overly nurturant octants compared to the MDD cohort (See Table 2). As can be seen in Figure 1a, patients with PD reported less general interpersonal distress than those with MDD (i.e., a lower mean level of the curve). However, no distinct interpersonal profile was found in the PD cohort. Specifically, the structural summary parameters of low amplitude (0.15) and low goodness of fit ($R^2 = .60$) indicated that the overall group exhibited low interpersonal differentiation (i.e., low prototypicality; Gurtman & Pincus, 2003; Slaney et al., 2006). These findings suggest an undifferentiated profile characterized less as a sinusoidal and more as a flat line. In other words, it seems that one homogenous interpersonal profile does not fit the data.

In sum, the results of the first step demonstrate that the PD cohort showed higher interpersonal distress than a normative cohort, but fewer interpersonal problems than a psychiatric cohort of patients with MDD. Of particular importance, as evidenced by the low amplitude and R^2, the PD population as represented in the current sample is not prototypical, and therefore the angular displacement, elevation, and amplitude are not representative of the cohort. To test the nature of this interpersonal heterogeneity, in the next two analytic steps we examined agoraphobia diagnosis and pathoplasticity as two potential pathways for detecting homogeneous subgroups in PD.

Step 2: Exploring Agoraphobia as a Marker for Distinct Interpersonal Profiles

The PD cohort was divided into PDA+ ($n = 153$) and PDA− ($n = 41$) profiles. The characteristics and distinctiveness of each

Table 2

Differences in Interpersonal Distress and Problems Between Panic Disorder and MDD Samples

IIP–C	Full sample MDD	Full sample PD	Test of difference	
	M (SD)	M (SD)	t	ES (d)
IIP				
Dominance	−0.28 (0.74)	−.16 (.72)	−1.51	−1.51
Affiliation	−0.22 (0.71)	0.04 (.59)	−3.84***	−0.88
Distress	1.24 (1.06)	0.55 (1.75)	4.25***	0.90
Octants				
Domineering	0.67 (1.2)	0.35 (1.87)	1.82	0.67
Vindictive	0.92 (1.12)	0.19 (1.46)	5.09***	0.93
Cold	1.15 (1.22)	0.37 (1.53)	5.13***	0.93
Socially avoidant	1.46 (1.33)	0.56 (1.71)	5.31***	0.93
Nonassertive	1.21 (1.22)	0.71 (1.57)	3.23**	0.84
Exploitable	0.90 (1.26)	0.40 (1.58)	3.21**	0.84
Overly nurturant	0.86 (1.12)	0.51 (1.64)	2.23*	0.85
Intrusive	0.60 (1.22)	0.44 (1.73)	.94	0.42

Note. PD = panic disorder; MDD = major depressive disorder; IIP–C = Inventory of Interpersonal Problems–Circumplex Scales; IIP = Inventory of Interpersonal Problems. Prior to analyses, IIP scales were standardized on the respective national gender norm.
* $p < .05$. ** $p < .01$. *** $p < .001$.

subgroup were explored with both circular statistics and the structural summary method.

Characterizing the two profiles of PDA+ and PDA− on the basis of the structural summary approach. The nonstandardized total distress mean scores (and standard deviations) were 76.87 (37.55) for the PD+ sample, and 61.83 (28.30) for the PD− sample. Figure 1b presents the circumplex locations of the predominant interpersonal problems reported by individuals

with and without agoraphobia. As shown in Figure 1b, patients in the PDA+ subgroup had higher interpersonal distress (i.e., a higher mean level of the curve) compared with the PDA− subgroup. The usefulness of dividing the PD cohort based on agoraphobia and the interpersonal distinctiveness of the profiles for patients with PDA+ and PDA− were evaluated by comparing their structural summary parameters with those of the overall cohort. As can be seen in Table 3, the interpersonal profile for the PDA+ subgroup had an elevated peak at 281.09° on the IPC, which is indicative of nonassertive-exploitable interpersonal problems (i.e., self-doubting and unassertiveness with a severe lack of self-confidence and self-esteem) and had an elevation of 0.59. The PDA− subgroup fell at 315.35° on the IPC, which is indicative of exploitable interpersonal problems (i.e., friendly submissiveness as a way to please other people and win their approval) and had a negative elevation of −0.11. Additionally, neither subgroup exhibited prototypical circumplex profiles (PDA+: $R^2 = .51$, Amplitude = .15; PDA−: $R^2 = .42$, Amplitude = .17). Therefore, it seems that both clusters exhibit less interpersonal profile prototypicality than the whole PD cohort, as evidenced by the lower amplitude and goodness of fit of the two subgroups ($R^2 ≤ .51$; see Wright et al., 2009 for more details) compared with those of the overall cohort, and by the negative elevation score of one of the subgroups.

Empirical comparison of PDA+ and PDA− subgroups using IIP-C means. We conducted between-subjects analyses of variance (ANOVAs) to determine whether there was a significant effect for subgroup membership on the IIP–C axes, amplitude, and elevation. As can be seen in Table 4, the two subgroups differed significantly in their elevation levels, with PDA+ reporting significantly more interpersonal distress than the PDA− subgroup. Specifically, individuals in the PDA+ subgroup reported significantly more
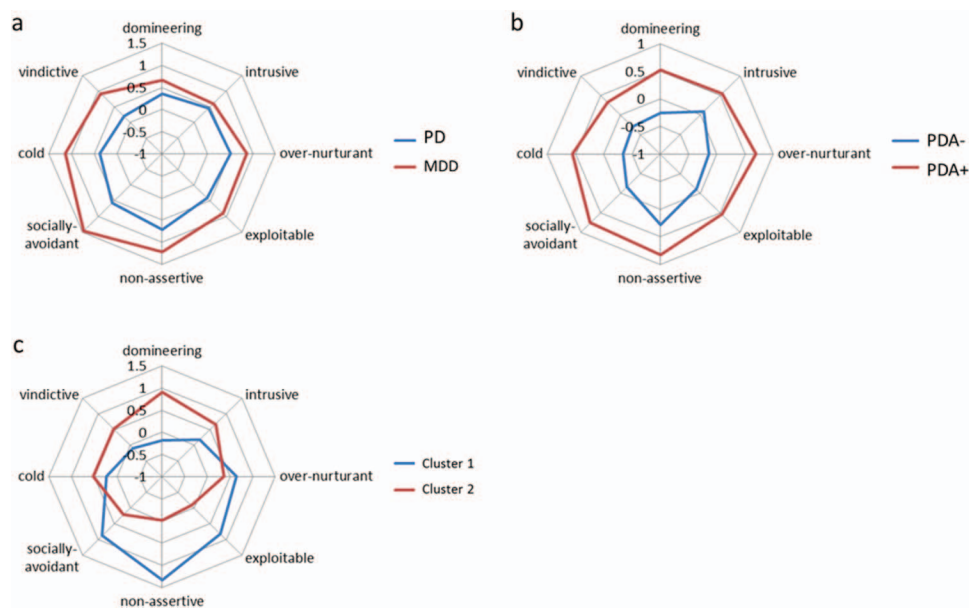

Figure 1. Diagrams comparing the interpersonal circumplex for different cohorts and subsamples. (a) Panic disorder (blue) versus major depressive disorder (red). (b) The two symptom-based clusters: panic disorder with (red) versus without (blue) comorbid agoraphobia. (c) The two empirically derived interpersonal clusters: domineering-intrusive (red) versus nonassertive (blue). See the online article for the color version of this figure.

Table 3

Comparison of Panic Disorder (PD) With Agoraphobia (PDA+) and Without Agoraphobia (PDA−) and the Two Interpersonal PD Clusters on Structural Summary Parameters

Group	N	Angle	Elevation	Amplitude	R^2
Whole PD sample	194	288.83°	0.44	0.15	.60
PDA+	153	281.09°	0.59	0.15	.51
PDA−	41	315.35°	−0.11	0.17	.42
Cluster 1	89	99.19°	0.38	0.42	.78
Cluster 2	105	281.67°	0.47	0.67	.81

Note. Angle = circumplex location of the predominant interpersonal problem in degrees; Elevation = an index measure of interpersonal distress; Amplitude = a measure of profile differentiation; R^2 = interpersonal prototypicality.

Table 5

Empirical Comparison of Panic Disorder (PD) With Agoraphobia (PDA+) and Without Agoraphobia (PDA−) and the Two Interpersonal PD Clusters Using the Circular Statistics

Group	Circular M	Circular variance	95% circular CIs
PDA+ ($n = 153$)	289.73°	80.31°	[277.00, 302.45]
PDA− ($n = 41$)	317.70°	78.87°	[293.55, 341.84]
Cluster 1 ($n = 89$)	98.70°	60.57°	[86.12°, 111.28°]
Cluster 2 ($n = 105$)	284.42°	40.11°	[276.74°, 292.05°]

Note. CI = confidence interval. All values reported in degrees; circular M = the average of the angular displacements for each individual within the cluster; circular variance = the dispersion of the angular displacements of individuals within a cluster around the circular mean; 95% circular CIs = 95% circular CIs that identify reliable differences in circular means.

interpersonal problems characterized as domineering, vindictive, cold, socially avoidant, exploitable, and overly nurturant. No significant differences were found between the groups in amplitude or on the two axes.

Empirical comparison of PDA+ and PDA− using circular statistics. To examine reliable differences in the circular means of the two subgroups, circular means, circular variances, and 95% circular CIs were calculated for each subgroup. As can be seen in Table 5, the CIs of the two subgroups overlap, providing evidence that individuals within them did not report distinct interpersonal problems.

In sum, the results of the second step demonstrate that the PDA+ subgroup showed higher levels of interpersonal distress than the PDA− subgroup. However, differentiation between subgroups with and without agoraphobia did not yield clear interpersonal prototypical profiles. Therefore, we proceeded to the third

step, wherein we aimed to identify distinct interpersonal profiles in PD on the basis of cluster analyses.

Step 3: Exploration of Distinct Interpersonal Profiles in PD on the Basis of Cluster Analyses

The goal of a cluster analysis is to detect homogenous subsamples from a heterogeneous sample. The clusters were constructed on the basis of the two IIP-C axes, dominance and affiliation, as the criteria for similarity versus dissimilarity.

Identifying clusters. To test the possibility that multiple groups of individuals with distinct interpersonal profiles exist within the cohort of patients with PD, we cluster-analyzed the scores on the two dimensions of the IIP–C. We examined two-, three-, and four-cluster solutions for the cohort of patients diag-

Table 4

Mean Comparisons of the Interpersonal Subtypes in Panic Disorder on the Basis of the Two Symptom-Based Clusters and the Two Empirically Derived Interpersonal Clusters

	Symptom-based clusters				Empirically derived interpersonal clusters			
	PDA− ($n = 42$)	PDA+ ($n = 158$)			Cluster 1 ($n = 89$)	Cluster 2 ($n = 105$)		
IIP-C	M (SD)	M (SD)	$F(1, 183)$	η^2	M (SD)	M (SD)	$F(1, 181)$	η^2
IIP-C axes and profile								
Dominance	−0.16 (0.82)	−0.16 (0.69)	0.00	.00	0.38 (0.41)	−0.70 (0.49)	269.24***	.58
Affiliation	0.11 (0.64)	0.02 (0.58)	0.75	.00	−0.04 (0.56)	0.17 (0.59)	6.88**	.03
Elevation	−0.13 (2.45)	0.58 (0.88)	8.96**	.04	0.37 (0.91)	0.47 (1.65)	0.25	.002
Amplitude	0.86 (0.60)	0.81 (0.43)	0.35	.00	0.68 (0.40)	0.94 (0.47)	16.59***	.08
IIP-C octants								
Domineering	−0.34 (3.08)	0.49 (1.32)	6.87**	.03	0.90 (1.34)	−0.17 (2.08)	17.67***	.08
Vindictive	−0.29 (2.28)	0.32 (1.11)	6.04*	.03	0.52 (1.24)	−0.08 (1.57)	8.68**	.04
Cold	−0.33 (2.28)	0.56 (1.19)	11.75**	.05	0.52 (1.25)	0.24 (1.72)	1.69	.09
Socially avoidant	−0.15 (2.46)	0.76 (1.39)	9.80**	.05	0.21 (1.26)	0.87 (1.96)	7.42**	.03
Nonassertive	0.29 (2.48)	0.81 (1.20)	3.59	.01	−0.01 (0.88)	1.32 (1.76)	42.9***	.18
Exploitable	−0.10 (2.59)	0.53 (1.14)	5.40*	.02	−0.08 (1.05)	0.81 (1.82)	16.96***	.08
Overly nurturant	−0.14 (2.56)	0.68 (1.24)	8.56**	.04	0.35 (1.19)	0.64 (1.94)	1.44	.007
Intrusive	0.01 (2.99)	0.50 (1.14)	2.64	.01	0.67 (1.25)	0.17 (1.99)	4.20*	.02

Note. IIP-C = Inventory of Interpersonal Problems Circumplex. Prior to analyses, IIP scales were standardized on the respective national gender norm. η^2 = measure of effect size in analysis of variance. A small effect size is considered to be .010 to .058, a medium effect, .059 to .137, and large effect ≥ .137 (Kirk, 1996). Kirk's criteria are for omega-squared; however, these criteria may be appropriately applied to interpreting partial eta-squared which is a similar measure of strength of association.
* $p < .05$.   ** $p < .01$.   *** $p < .001$.

nosed with PD. A two-cluster solution exhibited the most robust replication across Ward's (1963) hierarchical clustering method and an agglomerative clustering method (SPSS K-means; SPSS Inc., 2007) using squared euclidean distances. Because there were no highly discrepant cases in either cluster, all cases were included in subsequent analyses. A chi-square analysis indicated modest agreement between the two classification on cluster membership, $\chi^2(1) = 41.37$, $p < .0001$, $\kappa = .35$, $p < .0001$. Therefore, following Cain and colleagues (2010), we retained the K-means clusters for all subsequent analyses.

Characterizing the empirically derived interpersonal clusters based on the structural summary approach. As can be seen in Table 3, the interpersonal profile for Cluster 1 ($n = 89$) had an elevated peak at 99.19° on the IPC, a location that is indicative of domineering interpersonal problems characterized by controlling or manipulative tendencies, and the experience of loss of control as threatening. Cluster 2 ($n = 105$) fell at 281.67° on the IPC, a location that is indicative of submissive-exploitable interpersonal problems characterized by friendly submissiveness as a way to please others and win their approval, coupled with self-doubt and a severe lack of self-confidence. Figure 1c presents the circumplex locations of the predominant interpersonal problems reported by individuals in the two clusters. The opposing nature of the clusters can clearly be seen in Figure 1c, as indicated by the opposite sides of the peaks of the two curves. This appears to account for the low interpersonal prototypicality and the low amplitude (0.15) of the whole PD cohort, for whom the profile was essentially flat.

The interpersonal distinctiveness of the clusters can be appraised by comparing their structural summary parameters with those of the overall cohort. Specifically, each of the clusters exhibited better interpersonal prototypicality when compared to the whole PD cohort ($R^2 \geq .78$; see Wright et al., 2009 for more details). Additionally, the elevation remained positive for each cluster—providing additional support for the validity of the clusters—and the amplitude indicated better differentiated profiles for each cluster when compared to the profile for the whole PD cohort. Taken together, the findings indicated that the clusters are more prototypical and differentiated than the group as a whole and that individuals within each of the clusters reported distinct interpersonal subtypes with clear prototypical themes.

Empirical comparison of the two empirically derived interpersonal clusters by IIP-C subscales means. We conducted a between-subjects univariate ANOVA to determine whether there were significant differences in IIP-C octants, axes, amplitude, and elevation between the two clusters. As can be seen in Table 4, individuals in the first cluster reported significantly more interpersonal problems of a domineering, vindictive, and intrusive nature, whereas individuals in the second cluster reported significantly more interpersonal problems that were socially avoidant, nonassertive, and exploitable. Patients in the first cluster scored significantly higher on the dominance axis. No significant differences were found between the clusters on the affiliation axis. Also of importance, there were no significant differences between the clusters on the IIP-C parameter of elevation, which provides necessary evidence for pathoplasticity and for the validity of the two clusters.

Empirical comparison of the two empirically derived interpersonal clusters using circular statistics. Table 5 presents the circular means, variances, and 95% CIs for the two clusters. The

CIs of the two interpersonally based clusters do not overlap, providing further evidence that individuals within each of these clusters reported distinct interpersonal problems.

In sum, the findings support the validity of the two interpersonal clusters detected. Furthermore, it appears that the cohort contains clusters that effectively cancel each other out with their offsetting locations on the IIP-C, thus yielding a flat profile for the PD cohort taken as a whole.

Pretreatment symptom comparisons between the two empirically derived interpersonal clusters. If interpersonal pathoplasticity is to be an organizing explanation for the clusters observed, measures of pretreatment symptom severity and functional impairment should not differ between the groups. Otherwise such differences would serve as more parsimonious explanations for group distinctions (Wright et al., 2009). That is, pretreatment differences in such measures could indicate that the interpersonal subtypes we found provide no additional information not already accounted for by other measures. To assess these potential differences, a between-subjects multivariate analysis of variance using the HRSA, HRSD, PDSS, and the SDS was conducted. No main effect for cluster membership was observed in these four measures, $F(1, 66) = .08$, $p = .98$, $\eta^2 = 0.002$, providing support for interpersonal pathoplasticity in patients with PD in this cohort. Put another way, variations in interpersonal functioning across individuals with PD cannot be accounted for by differences in mood and anxiety symptoms.

Gender and diagnostic comorbidity. Similarly, for the two interpersonally based clusters to carry independent meaning, the variations observed should not be explained by differences between the two groups in gender or personality disorder comorbidities. We conducted chi-square analyses to evaluate differences between the clusters on these variables. Results indicated marginally significant differences in the percentage of men and women in each cluster, with the domineering cluster having a tendency to include more men than women, although not significantly, $\chi^2(1) = 2.94$, $p = .09$, Cramer's $\phi = 0.12$. Because nearly all participants (92.26%) showed Axis I comorbidity we did not compare groups with and without any Axis I comorbidity. There were no significant differences between clusters in the percentage of agoraphobia, $\chi^2(1) = .17$, $p = .67$, Cramer's V = 0.03; social phobia, $\chi^2(1) = 2.07$, $p = .15$, Cramer's V = 0.10; GAD, $\chi^2(1) = 2.00$, $p = .15$, Cramer's V = 0.10; or MDD, $\chi^2(1) = 0.37$, $p = .54$, Cramer's V = 0.04. Similarly, no significant differences in the percentage of personality disorders comorbidities were observed, $\chi^2(1) = .37$, $p = .54$, Cramer's V = 0.04. Additionally, no significant differences were found between clusters in the percentage of dependent ($\chi^2[1] = 1.57$, $p = .20$, Cramer's V = 0.20), obsessive–compulsive ($\chi^2[1] = 0.81$, $p = .36$, Cramer's V = 0.65), paranoid ($\chi^2[1] = 3.07$, $p = .09$, Cramer's V = 0.12), and borderline personality disorders ($\chi^2[1] = 1.42$, $p = .23$, Cramer's V = 0.08). In line with Przeworski et al.'s (2011) findings, significant differences were found only for avoidant personality disorder, $\chi^2(1) = 7.88$, $p = .005$, Cramer's V = 0.20, with higher rates of comorbidity for the nonassertive cluster. Finally, chi-square analyses indicated no significant differences in the percentage of patients in each cluster from each of the two sites that participated in the RCT, $\chi^2(1) = 0.34$, $p = .55$, Cramer's $\phi = 0.04$.

In sum, distinct interpersonal clusters in PD patients were identified in the third step. Subsequent analyses confirmed that the

differences between the clusters could not be entirely due to pretreatment symptom severity, comorbid diagnoses, or interpersonal distress, therein providing necessary and sufficient evidence to support the existence of distinct homogeneous subgroups in this PD cohort.

Step 4: The Clinical Utility of the Clusters in Predicting Alliance Development Throughout Treatment

The analysis examining the interaction between the empirically derived interpersonal clusters and time in prediction of alliance development throughout treatment resulted in a significant interaction, $F(1, 299) = 4.35$, $p = .03$. Specifically, the nonassertive cluster showed an increase in the alliance across treatment sessions ($\beta = 0.14$, $SE = .04$), $t(299) = 3.32$, $p = .001$, whereas in the domineering cluster the alliance showed no such increase ($\beta = 0.007$, $SE = .04$), $t(299) = 0.16$, $p = .86$. The analysis examining the interaction between the two profiles of PDA+ and PDA– and time also resulted in a significant interaction, $F(1, 306) = 4.93$, $p = .02$. The PDA+ cluster showed an increase in the alliance across treatment ($\beta = 0.12$, $SE = .03$), $t(306) = 3.59$, $p = .0004$, whereas in PDA– cluster the alliance showed no increase across sessions ($\beta = -0.03$, $SE = .06$), $t(306) = -0.58$, $p = .56$. Examining the two interactions in the same model (along with the main effects), we found both effects remained significant.

Discussion

We explored the interpersonal problems and levels of interpersonal distress that characterize individuals with PD to determine whether the disorder is characterized by a homogenous interpersonal profile or multiple distinct interpersonal clusters. Our findings revealed that the assessed PD cohort demonstrated higher levels of interpersonal distress than those of a normative cohort but lower levels than those of a cohort of MDD patients (see also Grosse Holtforth et al., 2014). The study found no single homogeneous interpersonal profile for patients with PD: When the PD cohort was examined as a whole, low prototypicality and profile differentiation were found, indicating no consistent interpersonal profile. These findings suggest that PD, categorized as a single diagnostic entity in *DSM–5* (American Psychiatric Association, 2013), shows a significant amount of reliable, within-group variation in interpersonal functioning.

Results showed that PD individuals were not homogenous regarding interpersonal problems when divided by the presence or absence of agoraphobia. When PD patients were classified using the *DSM–IV* (American Psychiatric Association, 2000) definition of agoraphobia, IIP-C reflected subgroup differences in the global severity of interpersonal dysfunctions, with the agoraphobic group evidencing the greatest difficulty. This finding complements previous reports on the associations between agoraphobia and interpersonal conflicts (Chambless, 2010), suggesting that agoraphobia is associated with a higher level of general interpersonal distress. The symptom-based clusters, however, could not be discriminated by core interpersonal problems, and therefore are not associated with distinct interpersonal profiles. These findings suggest that agoraphobia diagnoses and interpersonal clusters are discrete, perhaps orthogonal approaches to identifying subgroups in PD. This

suggestion is consistent with studies on symptom-based clusters in social phobia (Kachin et al., 2001) and PTSD (Thomas et al., 2014), delineating interpersonal aspects of personality largely unrelated to the symptoms or severity of psychopathology.

The findings focusing on empirically derived interpersonal clusters suggest that interpersonal dysfunctions in PD are manifested as two qualitatively distinct and opposite profiles: a nonassertive and a domineering–intrusive subtype. Interpersonal prototypicality and profile differentiation were found within the identified clusters, indicating that each cluster exhibited a consistent dysfunctional interpersonal theme. Thus, the investigation of interpersonal dysfunctions in PD led to qualitatively different clusters, which provided new information that did not overlap with the *DSM–IV* classification.

Individuals who fit the nonassertive PD profile are predominantly characterized by a highly nonassertive interpersonal theme, with marked fears of responsibility. Based on Horowitz et al. (2000), such individuals may view themselves as submissive and incapable of functioning independently, lacking self-confidence and self-esteem. They often avoid situations that require independence or asserting authority, claiming fear of another panic attack. A quote from a PD patient in the current RCT (with a profile angle of 282.33° on the IIP-C) demonstrates the interpersonal pattern of the nonassertive profile: "When I have to speak up and say what I think and how I feel with him, I just cannot do it. I get irritated and I'm not able to bring things up . . . trying to find a way to avoid them . . . I'm just trying to be ok with everybody. " This patient described a high tendency for self-doubt and evasion of social challenges. In an earlier treatment session she said: "I know I avoid stressful conversations . . . I intentionally avoid confrontations. Someone saying 'I need to talk to you' will throw me into panic mode." On another occasion she described in general her interpersonal relationships: "It's hard for me to get it out . . . I sugarcoat the entire thing . . . I can never come out and say, I do not like the way you did this."

This profile matches the theoretical conceptualization of complex agoraphobia, encompassing nonassertive fearful individuals with low self-sufficiency, who perceive themselves as incapable of functioning independently (Goldstein & Chambless, 1978; Milrod et al., 1997). This profile is also consistent with clinical observations of patients with PD as "soft, anxious, shy and dependent" (Marks, 1970, p. 541), having a history of dependence associated with unassertiveness (Chambless, Hunter, & Jackson, 1982; Kleiner & Marshall, 1985).

By contrast, individuals who fit the domineering–intrusive PD profile may try to control and manipulate others (Horowitz et al., 2000). They may perceive the loss of control during a panic attack as threatening because of associated feelings of lost dignity and fears of losing mental stability. These individuals tend to argue excessively with others, and may demonstrate a powerful need to feel engaged with others, and avoid spending time alone. A quote from a PD patient in the current RCT (with a profile angle of 85.19° on the IIP-C) demonstrates the interpersonal pattern of the domineering–intrusive profile: "I need to know that he cares and appreciates me. I get so angry at him when he treats me like this, when I do not know what is going on and where he is. At times I just want him to feel the way I do, to have a panic attack himself so he will understand and care about me more. Maybe then he would get that he needs to be there for me. " This patient described

herself as "too bossy" in interpersonal relationships: "I feel like I always have to be under control. Have to know exactly what everybody is doing, when, where, like everything."

Although substantially fewer clinical observations and empirical studies have addressed aspects of the domineering–intrusive PD profile than of the nonassertive one, the available literature supports the existence of this cluster. Some reports on PD patients describe these individuals as tending to become angry at their surroundings and to blame their parents and/or close attachment figures for their current state (Milrod, Busch, Cooper, & Shapiro, 1997; Rudden et al., 2003). There is also evidence of anger attacks in some PD patients (Gould et al., 1996).

The interpersonal heterogeneity resulting from the empirically derived interpersonal clusters has gone unrecognized in previous research on PD. The contrasting nature of the two clusters (their position at opposite ends of the IPC) may explain why they have not been empirically identified as distinct profiles. Specifically, when analyzed together, the two profiles cancel each other out because of their offsetting locations on the IIP-C. Thus, despite clinical observations that support each PD cluster, empirical identification of distinct profiles was made possible only with the pathoplasticity model, which examines interpersonal clusters.

The empirically derived interpersonal clusters distinguish PD patients not on a quantitative continuum, as the symptom-based clusters, but as qualitative, interpersonally based distinct clusters. A comparison between symptom-based and interpersonally based variability among PD patients suggests that interpersonally based clusters make a novel contribution to understanding interpersonal dysfunctions among these patients. Thus, interpersonal heterogeneity in PD can be conveyed by using empirically derived interpersonal clusters, but not by symptom-based clusters. Taken together, the findings may support an interpersonal pathoplasticity framework of PD and suggest that interpersonally based clusters can provide important new diagnostic information beyond what is generally available through diagnoses and measures of symptoms. These results are consistent with recent reports on GAD and social phobia, which include distinct interpersonal clusters rather than one homogenous profile (e.g., Kachin et al., 2001; Przeworski et al., 2011). The number of clusters in the current findings is consistent with the two-cluster solution identified in social phobia (Cain et al., 2010; Kachin et al., 2001), pathological perfectionism (Slaney et al., 2006), and fear of failure (Wright et al., 2009), but lower than in the four-cluster solution identified in PTSD (Thomas et al., 2014) and GAD (Przeworski et al., 2011). Differences may be due to diagnoses, sample properties, interpersonal measures, and analytical methods (Grosse Holtforth et al., 2014).

The empirically derived interpersonal clusters found in this study have implications for treatment, because they suggest that individuals with a nonassertive interpersonal style show greater strengthening of the therapeutic alliance throughout treatment. Specifically, whereas the domineering–intrusive cluster showed no changes in alliance throughout treatment, the nonassertive cluster showed a significant strengthening of alliance. These findings are consistent with the ability of interpersonal clusters to predict early alliance in depression (Grosse Holtforth et al., 2014), extending this finding to a PD cohort and to changes in alliance throughout treatment. The latter is of interest because previous findings suggest that strengthening of the alliance throughout treatment is important for treatment success (Zilcha-Mano, Dinger, McCarthy, & Barber, 2014).

The findings are consistent with previous studies demonstrating the clinical utility of empirically derived interpersonal clusters (e.g., Cain et al., 2010). They are also consistent with recent documentation of decrements in both therapists' adherence and competence when treating PD patients with higher interpersonal aggression (Boswell et al., 2013). This suggests that compared with patients with a nonassertive style, PD patients with domineering interpersonal style, who also show high interpersonal aggressiveness, may present a bigger challenge for therapists, not showing the expected strengthening of alliance throughout treatment and making it difficult for therapists to use therapeutic techniques competently. One reason could be that patients with domineering interpersonal style may present confrontational ruptures in alliance, such as efforts to control the therapist and reject the therapist's formulations or interpretation (Safran, Muran, & Eubanks-Carter, 2011). Such confrontational ruptures may impede the development of a strong alliance and reduce the therapist's opportunities to implement therapeutic techniques competently (as demonstrated by Boswell et al., 2013). It is therefore possible that PD patients with distinct interpersonal styles present different needs in therapy and may benefit from different therapeutic techniques (see also Gude & Hoffart, 2008). Differential treatment response as a function of interpersonal style has been demonstrated (e.g., Cain et al., 2010). After validating the existence of the two clusters in other cohorts of patients with PD, it will be important to empirically examine whether different techniques (e.g., learning how to express anger without losing control vs. learning how to release feelings of anger instead of keeping it bottled up) will be more effective for each of the two clusters.

The present study has several limitations. The data were collected from patients after the onset of PD. Therefore it is unknown whether the observed interpersonal characteristics resulted from or contributed to the development of PD, or whether they are somehow intertwined. Furthermore, the results of cluster analyses can be somewhat subjective when used in exploratory research. There is a lack of definite criteria for choosing the optimal number of clusters, and comparison of results of several algorithms is subjective. Different studies may reach different conclusions as a result of different data characteristics. Therefore, the identified clusters should not be interpreted as absolutely distinct types, but as aggregates of patients with similar interpersonal problems. Several other questions may arise regarding the generalizability of the findings. First, the present findings are based on intake evaluations of a RCT cohort of individuals before the start of psychotherapy. Therefore, the question remains whether the findings can be generalized to PD populations that do not seek treatment or are unwilling to participate in research trials. Second, there is a relatively high level of comorbidity of personality disorders in the PD cohort, and the profile of personality disorder rates in the present cohort may deviate from the average in PD samples. Third, our recruitment method (use of advertisements as well as referrals from professionals) may have affected the cohort interpersonal characteristics, and therefore the interpersonal subtypes based on it. Fourth, the findings regarding our MDD cohort should be further examined to ascertain their generalizability, because that cohort showed a distinct interpersonal style that contrast with the six clusters found by Cain et al. (2012) and the eight clusters found

by Grosse Holtforth et al. (2014). These differences may be attributable to differing sample properties, interpersonal measures, and analytical methods (Grosse Holtforth et al., 2014). Additionally, it should be noted that the MDD cohort reported in this study was recruited as part of a separate study (which took place at only one of the two sites of the current PD RCT), and different selection criteria were used.

Future studies should examine the utility of the proposed empirically derived interpersonal classifications in predicting or moderating therapy outcome. They should also implement tools other than the IIP-C, which served as the main measure in this study, together with non-self-report measures. As shown by Hoffart (1997, see also Gude & Hoffart, 2008), interpersonal problems in PD patients may decline throughout treatment. It is an open question whether the two interpersonal clusters identified in the present study will demonstrate consistency over time, and whether their "fingerprint" will be recognizable after the reduction in interpersonal distress associated with successful therapy. Additionally, in the present study, older individuals reported more distress than younger ones in the exploitable octant. Although this finding is based on an exploratory examination, it is consistent with findings in a normative cohort (Horowitz et al., 2000) and in an MDD cohort (Barrett & Barber, 2007). Future studies should examine whether a tendency of older individuals to feel more exploited than younger ones reflects the effects of life challenges and of ways of coping with them.

The present study is the first to identify two distinct interpersonal profiles in PD patients, nonassertive and domineering–intrusive. These profiles are supported by clinical observations that have described specific aspects of each but failed to identify them as distinct profiles. These profiles are not better explained by the severity of symptoms or comorbidity, but rather provide important information beyond DSM diagnoses for treatment planning. The interpersonal-based clusters were found to have implications for the development of alliance throughout treatment. Thus, classifying PD patients according to interpersonal profiles contributes unique information about these individuals and has implications for treatment.

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