Social Navigation in Individuals with Borderline and Avoidant Personality Disorder Symptoms

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Abstract

Social dysfunction is a critical feature of borderline personality disorder (BPD) and avoidant personality disorder (AvPD). The goal of this study was to investigate social deficits associated with these disorders using a naturalistic role-playing task where participants interact with fictional characters to accomplish social goals. Given the literature on social dysfunction in these disorders, the hypothesis was that people with BPD symptoms and people with AvPD symptoms will perform differently on the social-navigation task than healthy people. Data from a large and heterogeneous online sample of 460 participants was collected. Sample-wide AvPD-IS scores were negatively associated with the tendency to make decisions that give others power (r = -.11, p < .05), as well as the tendency to affiliate with others (r = -.12, p < .01). Additionally, the AvPD group (n = 41) showed a lower tendency to affiliate with others compared to healthy controls (n = 36; $t(75)$ = -2.91, p = < .01). There were no significant differences between the BPD group (n = 31) and healthy controls. Future analyses of this data such as utilizing a classification approach may help reveal group differences, and further studies examining these patterns in clinical samples should be undertaken.

1. Introduction

Personality disorders are characterized in the current psychiatric diagnostic system as pervasive, inflexible, and stable patterns of thinking, feeling, and behaving that cause significant distress or impairment (American Psychiatric Association [APA], 2013). Borderline personality disorder (BPD) is defined as "a pervasive pattern of instability in interpersonal relationships, self-image, and affects, and marked impulsivity" (APA, 2013). Hallmark features of BPD include frantic efforts to avoid real or imagined abandonment, as well as a pattern of unstable and intense relationships. Avoidant personality disorder (AvPD) is characterized by "a pervasive pattern of social inhibition, feelings of inadequacy, and hypersensitivity to negative evaluation" (APA, 2013). Data from the National Epidemiologic Survey on Alcohol and Related Conditions suggest a prevalence of about 5.9% for borderline personality disorder, and 2.4% for avoidant personality disorder (Hasin & Grant, 2015). In psychiatric outpatients, these personality disorders are the most frequent of all PDs, with a prevalence of 9.3% for BPD and 14.7% for AvPD (Zimmerman, Rothschild, & Chelminski, 2005). Considerable research has sought to identify the key elements of social dysfunction associated with these disorders.

1.1 Social Dysfunction in BPD

In a 2014 study, Hengartner, Müller, Rodgers, Rössler, and Ajdacic-Gross examined interpersonal functioning in all 10 personality disorders. The researchers examined 511 adults from the general population of Zurich, Switzerland. They measured PD dimensions with the Assessment of DSM-IV Personality Disorders Questionnaire (Schotte et al., 2004), a paper-pencil self-report instrument, and assessed indicators of interpersonal functioning with the Structured Psychopathological Interview and Rating of the Social Consequences of Psychological Disturbances for Epidemiology (Angst, Dobler-Mikola, & Binder, 1984). Results

showed that having borderline PD was significantly associated with all indicators of impaired

interpersonal functioning, including living alone, having no children, being unmarried, having

considerable distress and conflicts with friends, feeling lonely, and having no partner. These

findings suggest that individuals with BPD experience a solitary lifestyle, conflictual and

distressing social relations, and a lack of social support. Furthermore, the found associations

were particularly strong relative to other PDs, indicating that borderline symptomatology affects

deficits in social interactions even more profoundly than other PD dimensions. While this study's

strengths include its use of a large community sample, it is limited in that all data relied on

self-reports which produce the risk of response bias.

　　　　Wilson, Stroud, and Durbin (2017) conducted a meta-analysis of studies on the

association between personality disorders and interpersonal style. Interpersonal style was defined

using the interpersonal circumplex model, which posits that variables in the interpersonal domain

are arranged in a two-dimensional, circular space defined by the orthogonal dimensions of

agency (dominance vs. submissiveness) and communion (warmth vs. coldness). Results of the

review showed that BPD was associated with all problematic interpersonal traits, except

overnurturance and nonassertiveness (i.e., vindictiveness, coldness, intrusiveness,

domineeringness, social avoidance, exploitability). Furthermore, a measure of angular

displacements indicated the dominant-cold quadrant as the location, or "predominant

interpersonal theme," for BPD. Although the studies included in this meta-analysis do not

indicate causality between personality disorders and interpersonal functioning, Wilson et al.

suggest that this relationship is dynamic, with bidirectional associations developing over time.

　　　　Based on Wilson et al.'s (2017) study, McCloskey and colleagues (2020) hypothesized

that cold and dominant interpersonal problems would explain the association between BPD and

social dysfunction. The researchers examined 226 patients taking part in an outpatient treatment

program for personality dysfunction. They used the Wisconsin Personality Disorders

Inventory‑IV (Smith, Klein, & Benjamin, 2003) self-report questionnaire to assess PD

symptoms, the Inventory of Interpersonal Problems‑Circumplex Scale (Alden, Wiggins, &

Pincus, 1990) self-report questionnaire to assess difficulties in relating to others, and the Social

Adjustment Scale‑Self Report (Weissman & Bothwell, 1976) as a self-report measure of social

dysfunction. Though BPD symptoms were directly associated with dominant, submissive, and

overly nurturant interpersonal problems, the only significant indirect association between BPD

symptoms and social dysfunction was through overly nurturant interpersonal problems. The

researchers suggest that those with BPD may try to please and care for others in an effort to

avoid abandonment, which may result in them being off‑putting and thus avoided. Subsequently,

those with higher BPD symptoms and overly nurturant interpersonal problems may experience

short-lived relationships, which negatively impacts their satisfaction across multiple social

domains. This study is limited in that most of the data were collected using self-report

assessments, which produce the risk of response bias. Additionally, the correlational design fails

to establish directionality, or to provide information regarding stability of interpersonal problems

over time.

One study examined the social networks of individuals with BPD. Beeney, Hallquist,

Clifton, Lazarus, and Pilkonis (2018) conducted an ego-centered social network assessment of

142 individuals with BPD features from both clinical and community samples. Participants were

asked to list the 30 most significant people in their social network and to rate each one in terms

of amount of contact, social support, attachment strength, and negative interactions. To assess

social integration, participants were also asked to report the connection between people in their

networks. Results showed that higher BPD symptoms (as measured by clinician ratings) were associated with poorer social support, more frequent negative interactions, and less social integration. Specifically, participants with high BPD symptoms were most closely connected to those less central (i.e., less socially connected) to their networks. This pattern may reflect a social-cognitive deficit among individuals with BPD, pertaining to alertness to social factors such as influence and power. Alternatively, this finding could reflect a defensive process; central individuals may pose a greater risk for people with BPD and are therefore defensively avoided. Strengths of this study include its large sample size of participants with varying degrees of personality pathology. However, a limitation of ego-based SNA is that it does not indicate how changes in the social network might affect individuals with BPD, whereas whole-network approaches over time could provide a clearer picture.

In their 2015 study, Beeney and colleagues identified social-cognitive mechanisms that may link attachment disturbance to BPD. The researchers examined 150 adults with BPD features, including both psychiatric patients and community members. The Experience in Close Relationships Scale–Revised questionnaire (Fraley, Waller, & Brennan, 2000) was used assess attachment insecurity, and a clinician-rated DSM checklist (Beeney et al, 2015) was used assess BPD, AVPD, and ASPD dimensional scores. Through factor analyses of items selected from a large bank of self-report and clinician-rated measures, they identified three social-cognitive factors which they placed as latent factors within a structural equation model: a subjective sense of identity diffusion, self-reported difficulties with boundaries between self and others, and clinician-rated impairments in mentalization. It was found that both mentalization (the ability to understand the mental states of others) and self–other boundaries (difficulties with emotion contagion and feeling separate from others) mediated the relationship between attachment

anxiety and BPD symptoms. Findings suggest that attachment anxiety (i.e., hyperactivating behaviors, such as excessive proximity seeking) may manifest in BPD in the form of impaired mentalization and disrupted self-other boundaries. The dual presence of these deficits may help to explain the difficulties in social functioning that define BPD, namely severe self instability and problems understanding a chaotic interpersonal world. An important strength of this study is its use of multiple methods of assessments, including self-report and clinician-rated measures, which makes it less likely that results are due to shared method variance.

Gadassi, Snir, Berenson, Downey, Rafaeli (2014) investigated the affective reactions of individuals with BPD to social proximity. In a sample of 153 individuals (57 with BPD, 43 with AvPD, and 53 healthy controls), the researchers used a computerized experience-sample diary to assess daily variations in affect, interpersonal experiences, and behaviors. In each diary entry, participants noted whether they were alone or with others, and they rated on 5-point Likert scales the extent to which they were currently experiencing different emotions or moods. The researchers found that when alone, individuals in either PD group experienced more negative affect (specifically isolation, rejection, anger, and anxiety in both groups, as well as dissociation in the BPD group), and less positive affect compared with HCs. When in social proximity, those with BPD experienced increases in positive affect, as well as decreases in rejection, isolation, and dissociation. However, they also experienced increases in shame and anger (unique to BPD). Gadassi et al. suggest that the mixed affective reactions to social proximity found in the BPD group may contribute to the disturbed relationships of individuals with this disorder. A major limitation of this study is its use of self-report measures, which once again produce the potential for response bias. Additionally, the assessment of social proximity was limited to the presence of others and did not include information about the quality of those interactions or the interaction

partner(s). More dynamic measures of interpersonal experiences may be crucial to better understand these associations.

Research on social cognition in BPD is also relevant to understanding social functioning in this disorder. Roepke, Vater, Preißler, Heekeren, and Dziobek (2013) reviewed the literature on social cognitive impairments in BPD. Research on cognitive empathy showed that although individuals with BPD are generally able to make complex intentional attributions about others, they demonstrate negative, malevolent biases. It is further suggested that their evaluation of others is generally more extreme. Moreover, recent work has shown that individuals with BPD have subtle deficits in the ability to infer the emotions, thoughts, and intentions of others (Minzenberg et al., 2006; Dyck et al., 2009; Preißler et al., 2010; Dziobek et al., 2011). Research also indicates that BPD patients experience subtle deficits in emotional empathy, though findings are mixed (Harari et al., 2010; Dziobek et al., 2011). Reopke et al. suggest that evaluation biases and reduced cognitive empathy may contribute to impairments in establishing effective social interactions and long-term relationships in BPD.

One study investigated the neuronal correlates of social cognition in BPD. In a functional magnetic resonance imaging study, Mier and colleagues (2013) tested 13 patients with BPD and 13 healthy controls. Participants were shown a face stimulus preceded by a statement about a physical feature (neutral face processing task), an emotional state (emotion recognition task), or an emotional intention (affective Theory of Mind task), and they were asked to indicate whether the statement matched the picture. Though BPD patients showed no behavioral alterations on the social-cognitive tasks, they did show hypoactivation in areas of the mirror neuron system (BA 44, and STS during affective ToM) and hyperactivation in the amygdala. Meir et al. suggest that this pattern of activation reflects an affect dominated processing of social stimuli in BPD, which

may result in a negative bias or false attribution of intentions in real-life social interactions. A major short-coming of this study is its small sample size, which limits the generalizability of findings and reduces the power to detect group differences.

Lazarus, Cheavens, Festa, & Rosenthal (2014) published a review of the literature relevant to social cognition in BPD. The studies reviewed suggest that those with BPD tend to view others more negatively, and have more negative expectations for relationships, than healthy people. Additionally, studies examining Theory of Mind (ToM) in BPD yield mixed results. Some research suggests that individuals with BPD are less skilled at inferring the mental states of others, while additional studies report no differences. To explain these findings, Harari et al. (2010) suggest that affective empathy is intact in BPD, while cognitive empathy is impaired. A third finding consistently reported in the literature is an impairment in social problem-solving skills. Several studies suggest that when attempting to solve interpersonal difficulties, individuals with BPD tend to produce more passive means and less effective solutions. The reported impairments relating to perceptual biases, Theory of Mind, and social problem-solving are important to consider when investigating social functioning in individuals with BPD.

1.2 Social Dysfunction in AvPD

In Hengartner et al.'s (2014) study previously discussed, the researchers examined interpersonal dysfunction in all personality disorders. AvPD was significantly related to living alone, having no children, being unmarried, distress in friendships and conflicts with friends, and having no partner. These findings indicate the impaired interpersonal functioning associated with AvPD.

Wilson et al.'s study (2017), explained above, further contributed to the literature on interpersonal functioning in AvPD. Results of their meta-analysis showed that AvPD was

associated with the dysfunctional interpersonal traits of social avoidance, nonassertiveness, coldness, exploitability, vindictiveness, and overnurturance (in order of highest to lowest association). Furthermore, a measure of angular displacements indicated the submissive-cold quadrant as the predominant interpersonal theme for AvPD. This distinct interpersonal style may contribute to the social impairment characteristic of AvPD.

Based on Wilson et al.'s (2017) study, McCloskey and colleagues (2020) hypothesized that cold and submissive interpersonal problems would explain the association between AvPD and social dysfunction. Findings confirmed an indirect association of AvPD symptoms on social dysfunction through cold interpersonal problems. The researchers suggest that those with AvPD may try to engage in social distancing behaviors in an effort to avoid rejection and judgement. As a result of limiting contact, they may lack the social skills to establish and maintain various relationships. Surprisingly, the researchers also found a significant indirect association through overly nurturant interpersonal problems. They proposed that in established relationships, those with AvPD may demonstrate overly nurturing behavior, which may result in avoidance and rejection. Consequently, those with more AvPD symptoms may become withdrawn, which negatively impacts interpersonal relationships and contributes to social dysfunction.

Beeney at al. (2015) identified social-cognitive mechanisms that link attachment disturbance to AvPD. In their study described above, it was found that attachment anxiety was indirectly related to AvPD symptoms through self–other boundaries. The researchers suggest that for AvPD, problems with self-other boundaries may reflect a hypersensitivity to others' emotions and inhibited self-assertion for fear of rejection. Additionally, attachment avoidance (ie. deactivating behaviors such as denying vulnerability and threat) was directly associated with

AvPD symptoms. Consistent with attachment avoidance, AvPD is characterized by social

withdrawal, as well as emotional distance due to feelings of inferiority.

In Gadassi et al.'s study (2014) described earlier, the researchers investigated the

affective reactions of individuals with AvPD to social proximity. It was found that like BPD,

those with AvPD experience mixed affective reactions to social proximity. Within the AvPD

group, being in social proximity was associated with increases in positive affect, as well as

decreases in rejection, isolation, and dissociation. However, social proximity was also associated

with increases in shame and anxiety (unique to AvPD). The mixed reactions found in the AvPD

group may contribute to the social dysfunction of individuals with this disorder.

1.3 Social Space Mapping and Navigation

Social theory and empirical evidence indicate that social information varies continuously

along dimensions of power (i.e., hierarchy, dominance, rank) and affiliation (i.e., kinship,

intimacy, bonding). Tavares and colleagues (2015) tested whether the hippocampus tracks

multi-dimensional social information, using a role-playing game during functional magnetic

resonance imaging (fMRI). In the game, participants interacted with fictional characters and

made decisions that altered the relative power and affiliation of the characters. Choices

accumulated into a power by affiliation social coordinate for each character at each decision

point throughout the game (see Figure 1 for examples of characters' trajectories in 2D and 3D).

The researchers found that as participants made power and affiliation decisions, hippocampal

blood-oxygen-level-dependent (BOLD) activity correlated with the vector angle to the

characters' locations within the two-dimensional social space. In other words, the hippocampus

seemed to track the movement of the characters through social space. Furthermore, this

correlation was stronger in participants with less self-reported social avoidance (measured by the

Liebowitz social anxiety scale [Fresco et al., 2001]) and neuroticism (measured by the NEO personality inventory revised [Costa and McCrae, 2000]), suggesting that hippocampal social tracking relates to social skills in healthy individuals. This finding indicates the importance of social cognitive maps to real-world social behavior, and suggests a potential link between impaired social mapping and social dysfunction (Tavares et al. 2015; Schafer & Schiller, 2018).

1.4 The Present Study

The present study was an exploration into the social deficits associated with borderline personality disorder (BPD) and avoidant personality disorder (AvPD). To investigate social deficits associated with these disorders, a naturalistic role-playing task was used. This task had previously been used to show that different brain regions track information about evolving relationships in 2D space, and that this tracking relates to self-reported social function (Tavares et al. 2015). As such, this task was a good candidate to explore dynamic social functioning associated with these disorders.

On the basis of the literature on social dysfunction in these disorders, the hypothesis was that people with BPD symptoms and people with AvPD symptoms will perform differently on the task than healthy people. Specifically, the predictions were that people with BPD symptoms will affiliate more with others (i.e., make decisions that increase affiliation), as well as show greater inconsistency in their interaction styles. Additional predictions were that people with AvPD symptoms will affiliate less with others, give power more to others, and show greater rigidity in their interaction styles.

Preliminary data from clinically diagnosed patients completing this task showed some support for the hypotheses. The data revealed that those with AvPD gave power more compared to healthy controls, and showed greater rigidity compared to both HC and BPD. The goal of the

present study was to replicate and extend those findings in a large and heterogeneous online sample of n=460.

2. Methods

2.1 Participants

A total of 228 males and 231 females participated in this study. The age of the participants ranged from 18 to 77, with a mean age of 40.04 years (SD = 13.42). Participants were classified into BPD, AvPD, and healthy control groups. Demographic information for the different groups is presented in Table 1.

2.2 Procedure

The task was hosted on Prolific, an online platform designed to collect large amounts of behavioral data quickly. Participants completed the task, followed by a memory questionnaire (e.g., "Who invited you for a dinner at their place?"), which served as a proxy measure for attention during the task: participants who performed at chance or below were excluded. They then completed a series of questionnaires, probing their mental health. These questionnaires included the Zanarini Rating Scale for Borderline Personality Disorder (ZAN-BPD) and the Avoidant Personality Disorder Impairment Scale (AvPD-IS), both well validated questionnaires used to assess BPD symptom severity and AvPD disorder-specific impairment, respectively (Zanarini et al., 2003; Liggett et al., 2017).

2.3 Task Description

The social navigation task is a naturalistic role-playing game where participants interact with characters to achieve social goals (Tavares et al., 2015). Participants are instructed to not overthink responses and behave as they would in real life. They are then told that they have moved to a new town, and need to find a job and a place to live. In each interaction, participants

make decisions that alter the relative power (i.e., dominance) and affiliation (i.e., intimacy) with the character. For example, power interactions include characters making demands of the participant, that they can then agree or disagree to. Affiliation interactions include options to exchange personal information, physical proximity or touch. On the basis of participant decisions a 2D power-by-affiliation coordinate for each character at each interaction is defined, from which different geometric measures can be computed to capture different types of decision-making information. Gender and race of the specific characters are counterbalanced across participants.

Power tendency is the mean of all power decisions, which produces a value from -1 to +1. The greater the score, the more the participant has made decisions that give power.

Affiliation tendency is the mean of all affiliation decisions, also from -1 to +1. The greater the score, the more the participant has made decisions that increase affiliation.

Social consistency is the consistency of the decision direction (+1/-1) along the power and affiliation dimensions. This is measured by drawing a vector from the origin of the social space to the current coordinates of each character, and computing the sum of the vector lengths across all interactions.

2.4 Statistical Analyses

Geometric measures were computed from participants' performance on the task. Participants were classified into groups based on their questionnaire scores: those who scored in the 90th percentile (for the sample) on the ZAN-BPD comprised the BPD group, those who scored in the 90th percentile on the AvPD-IS comprised the AvPD group, and those who scored below the 10th percentile on both questionnaires comprised the HC group. Participants who scored in the 90th percentile on both the ZAN-BPD and the AvPD-IS were excluded. Linear regression was used to look for associations between questionnaire scores and task performance

measures. The Shapiro-Wilk test was utilized to test for sample distribution normality. If the

assumption of normality was met, Welch's *t*-test was used to look for group differences in the

mean of task performance measures. If not, the non-parametric Mann-Whitney U test was used.

Values of p < 0.05 were considered significant. All statistical analyses were done with Python on

Jupyter notebook, with functions imported from SciPy v1.4.1 and seaborn v0.11.1.

3. Results

Participants were only included in the analyses if they scored greater than chance (20%)

on the memory questionnaire. Participants (n = 458) were then classified into BPD (n = 31),

AvPD (n = 41), and HC groups (n = 36).

Linear regression analyses on the total sample revealed no significant associations

between ZAN-BPD scores and power tendency scores, affiliation tendency scores, or consistency

scores. Significant negative associations were found between AvPD-IS scores and power

tendency scores ($r = -.11$, $p < .05$), as well as AvPD-IS scores and affiliation tendency scores ($r =$

$-.12$, $p < .01$) (see Figure 2). There was no significant association between AvPD-IS scores and

consistency scores.

Comparisons between the BPD and HC groups revealed no significant differences in

power tendency, affiliation tendency, and social consistency. The AvPD group scored

significantly lower on affiliation tendency than the HC group ($t(75) = -2.91$, $p < .01$), but no

differences were found in power tendency and consistency. The AvPD also scored significantly

lower on affiliation tendency than the BPD group ($t(70) = 2.67$, $p < .01$), but no differences were

found for power tendency or consistency. (See Table 2)

4. Discussion

The purpose of this study was to test relationships between personality disorder dimensions and task performance measures in a large and heterogeneous online sample. The hypothesis was that people with BPD symptoms will affiliate more with others compared to healthy people, as well as show greater inconsistency in their interaction styles. Also, people with AvPD symptoms will affiliate less with others, give power more to others, and show greater rigidity in their interaction styles.

Results showed that AvPD-IS scores were negatively associated with affiliation tendency scores. In other words, those with higher AvPD-IS scores were less likely to affiliate with others. This finding is in accordance with literature that reports socially avoidant and cold interpersonal patterns in AvPD (Wilson et al., 2017; McCloskey et al., 2020). Moreover, consistent with the hypothesis, the AvPD group scored lower on affiliation tendency compared to healthy controls. This further indicates that social functioning in AvPD is marked by reduced affiliation, which may be understood as a behavioral strategy employed by those with AvPD to avoid rejection and judgement (Wilson et al., 2017).

Surprisingly, AvPD-IS scores were negatively associated with power tendency scores. In other words, those with higher AvPD-IS scores were less likely to give power to others. This seems to contradict research that indicates a nonassertive interaction style in AvPD (Wilson et al., 2017), along with preliminary results which showed higher power tendency in AvPD patients versus healthy controls. As such, this unhypothesized relationship requires further examination.

Also unexpectedly, ZAN-BPD scores had no association with affiliation tendency. Furthermore, though the BPD group scored higher on affiliation tendency compared to the AvPD group, there was no difference between the BPD group and healthy controls in this measure. This finding seems to contradict research that indicates an overly nurturant interpersonal problem in

BPD (McCloskey et al., 2020). However, given that there is also evidence indicating a cold interpersonal style (Wilson et al., 2017), this result may be reflective of an ambivalent and inconsistent affiliation pattern in BPD.

Results further showed that the BPD, AvPD, and HC groups did not differ from one another in the consistency of their decisions. This result contrasts the hypotheses that those with BPD symptoms will show greater inconsistency, and those with AvPD symptoms more rigidity, compared to healthy controls. The result also contrasts preliminary findings which showed more rigidity in AvPD patients versus healthy controls. This outcome may be related to the single assessment design of the task. For example, it is possible that the affective instability often shown in BPD is linked to changes in state which may fluctuate on a longer timescale than was measured here.

There are several future directions with which to explore this dataset. To start, one limitation of this study is that since PD symptoms were assessed using continuous measures, the thresholding for groups was to some extent arbitrary. That said, the 90th percentile of scores on the ZAN-BPD included scores of 8 or more, which is also the score indicative of a BPD diagnosis (Zanarini et al., 2003). This parallel gives some validity to using the 90th percentile of scores as a threshold for BPD classification. Future analysis that varies the threshold for the groups will help detect patterns within the data. This study is also limited by its focus on three specific measures computed from the behavioral data. Future exploration that considers a broader scope of variables, or that examines participant interactions with specific characters, may help reveal important group differences. A third direction with which to explore this dataset is to develop a model that uses variance in task measures to predict group membership. A classification approach (e.g., with a Support Vector Machine) might reveal differences that are

not apparent from a *t*-test, given that in classification you can include multiple predictor variables.

The patterns detected in this study could inform future studies. First, the indication that those with AvPD show lower affiliation tendency compared to healthy people should be further examined. Additionally, studies that investigate the relationship between AvPD symptoms and power tendency should be undertaken. Importantly, the online sample in this study was not a clinical sample, and it may be that different patterns become evident with a larger sample of people with truly clinical-level dysfunction. Although these findings are preliminary, they could potentially be used to inform clinical practice in working with people with AvPD and BPD. Clinical researchers should consider targeting the distinct social features examined in this study.
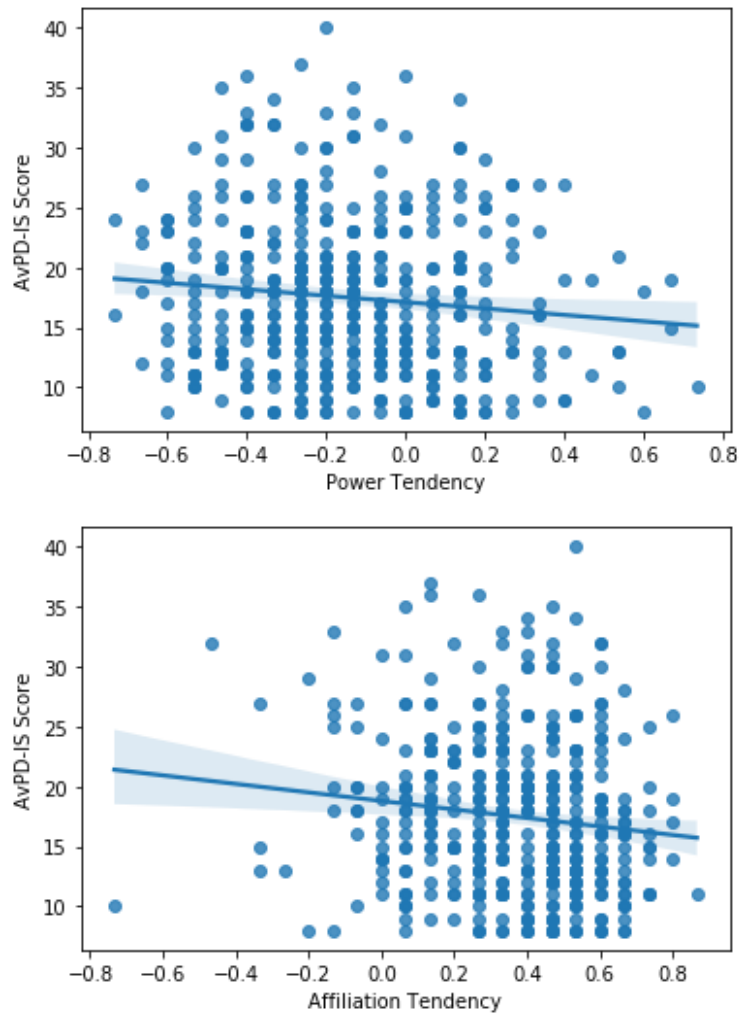
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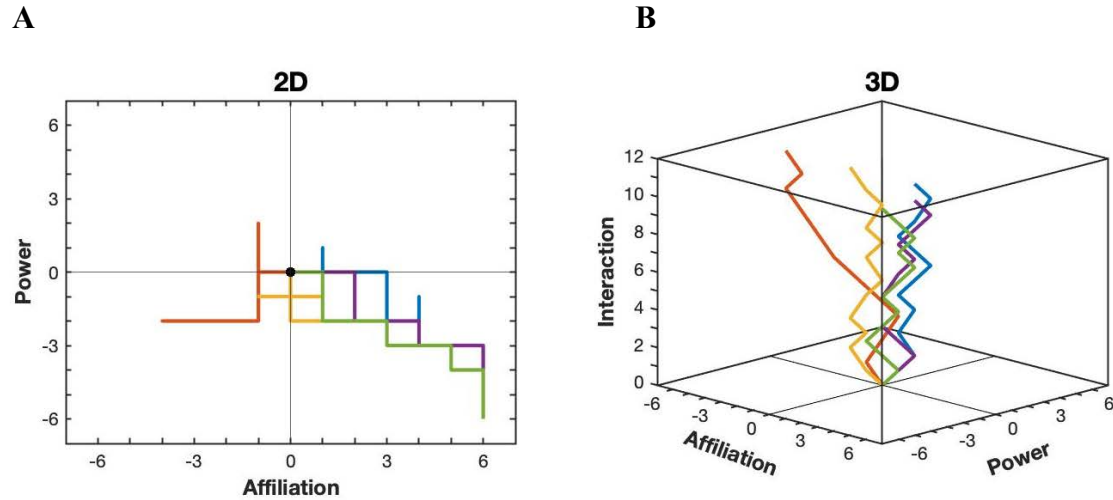
Figure 1. Participants' Behavior in the Task
(A) Example of characters' trajectories in a 2D view. The x axis represents affiliation, and the y axis represents power. Different colors represent the trajectories of different characters. Where characters' trajectories overlap, only one character's color is shown.
(B) Example of characters' trajectories in a 3D view. The x axis represents affiliation, and the y axis represents power, and the z axis represents the interaction number.

Table 1. Demographic Information for the Different Groups

	Whole Sample (*N* = 460)	BPD (*N* = 31)	AvPD (*N* = 41)	HC (*N* = 36)
Age:				
Mean	40.04	34.87	36.83	47.69
SD	13.42	12.34	10.75	14.22
Sex:				
Male	228	10	21	18
Female	231	21	20	18
Race:				
American Indian or Alaska Native	8	1	1	1
Asian	53	4	5	1
Black/African American	34	2	2	3
Latino/Hispanic	40	5	3	2
Multiracial	13	1	1	1
Native Hawaiian or Pacific Island	0	0	0	0
White	348	23	32	31
Other	4	1	1	0

Figure 2. AvPD-IS Associations with Affiliation Tendency and Power Tendency
Significant negative associations between AvPD-IS score and power tendency $(r = -.11, p < .05)$, and AvPD-IS score and affiliation tendency $(r = -.12, p < .01)$.

Table 2. Comparisons between BPD and HC, AvPD and HC, and BPD and AvPD on Task Measures

	BPD (N = 31)		AvPD (N = 41)		HC (N = 36)		BPD vs HC	AvPD vs HC	BPD vs AvPD
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**			
Power Tendency	-0.17	0.24	-0.16	0.25	-0.08	0.29	-1.4[a]	614.0[b]	623.0[b]
Affiliation Tendency	0.42	0.2	0.27	0.29	0.42	0.15	.08[a]	-2.91[a]*	2.67[a]*
Consistency	0.46	0.1	0.44	0.1	0.45	0.1	.70[a]	-.11[a]	.81[a]

[a]Welch's *t* statistic
[b]Mann-Whitney U statistic
*p < .01

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