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Associations between informant ratings of personality disorder traits, self-reports of personality, and directly observed behavior

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Abstract

Objective: Diagnoses of personality disorders (PD) must rely on judgments of observers—either clinicians or acquaintances—because personality disorders are primarily defined in terms of maladaptive interpersonal behavior. Little is known, however, about how closely acquaintances' judgments of PD traits relate to self-reports of theoretically relevant Big Five traits or directly observed behavioral outcomes in interpersonal situations. The present study examines associations between judgments of the 10 PD traits provided by close acquaintances, self-reports of PD-relevant Big Five personality traits, and observed interpersonal behaviors across three different three-person laboratory interactions (i.e., unstructured chat, cooperative task, competitive game).

Method: The sample consisted of 256 undergraduate students (130 females; $M_{age} = 19.83$, $SD = 1.25$). Four unacquainted observers independently rated participants' behaviors from video recordings.

Results: In line with previous work, informant reports of PD traits demonstrate strong convergent validity with relevant self-reported Big Five traits (as identified by Lynam & Widiger, 2001). Directly observed behavior is meaningfully associated with acquaintances' judgments and self-reports of PD-relevant traits, and the associations between these judgments and behavior are strongest for traits associated with histrionic and schizoid PD. Vector correlations between behavioral profiles associated with informant and self-reports show that both assessments have similar behavioral correlates. Associations between PD trait ratings and behavior appeared to differ as a function of gender, with males showing more and stronger correlations.

Conclusions: Informants' ratings of PD traits are impressively accurate, converging both with self-reports of relevant traits and directly observed interpersonal behavior. Therefore, a comprehensive understanding of PDs and associated traits can be augmented by information from multiple acquaintances who have the opportunity to observe how an individual interacts with others on a daily basis across diverse contexts.

KEYWORDS
informant report, personality disorder traits, personality judgment, realistic accuracy model, trait–behavior associations

1 | INTRODUCTION

Imagine that you are asked to provide an assessment of the less desirable aspects of an acquaintance's personality. This description might include, for instance, his or her excessive need to be the center of attention, or intense and uncontrollable emotional reactions to seemingly benign situations. There is a good chance that this person might not understand the maladaptive nature of his or her behaviors. However, does this mean that you, as an observer, can do so? Can

ordinary acquaintances judge personality disorder (PD) traits accurately on the basis of their daily experience? And can manifestations of PD traits—just like normal-range personality—be directly observed in (video-recorded) social interactions? These two questions are the foci of the present study.

1.1 | Personality disorders and the personality trait model

Personality traits reflect people's characteristic patterns of thoughts, feelings, and behaviors across a wide range of social and personal situations. Clinicians talk about personality *disorders* (PDs) in cases where personality traits become inflexible and cause substantial functional or subjective distress (American Psychiatric Association [APA], 2013), and approximately 10% of the population meet the criteria for one or more PDs (Trull, Jahng, Tomko, Wood, & Sher, 2010). PDs may, for instance, manifest as a continuous hunt for appreciation, excitement, and attention along with little consideration for others (narcissistic PD) or a preoccupation with fears of being rejected that may eventually lead to views of the self as inept, unappealing, and inferior to others (avoidant PD). In more technical terms and according to the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (*DSM-5*; APA, 2013, p. 647), PDs are characterized by: "an enduring pattern of inner experience and behavior that deviates markedly from the expectations of the individual's culture. ... This enduring pattern is inflexible and pervasive across a broad range of personal and social situations and leads to clinically significant distress or impairment in social, occupational, or other important areas of functioning" (see Table 1).

Past attempts to classify PDs along distinct categories were criticized as lacking cohesiveness and empirical support, so more recently developed dimensional approaches have sought to overcome those shortcomings (Kass, Skodol, Charles, Spitzer, & Williams, 1985; Krueger & Eaton, 2010; Widiger & Trull, 2007). The *DSM-5* (APA, 2013) includes a dimensional model of maladaptive traits consisting of five broad domains of negative affectivity, detachment, psychoticism, antagonism, and disinhibition (Livesley, 2001; Markon, Krueger, & Watson, 2005). These broad domains resemble—and have been empirically associated with—the Five-Factor Model (FFM) of personality (De Fruyt et al., 2013; Gore & Widiger, 2013; Thomas et al., 2013; Wright & Simms, 2014) and can be interpreted as maladaptive variants of the FFM (Clark, 2007; Widiger & Samuel, 2005).

According to this view, instruments assessing the *DSM* PD criteria assess the same underlying constructs as general personality inventories, just at more extreme levels. Broadly, high Neuroticism and low Agreeableness correlate with most of the PDs. Dependent PD, as an exception, is characterized by both high Neuroticism and high Agreeableness (Saulsman & Page, 2004). Relationships that more precisely discriminate between different PDs can be achieved at the facet level (Widiger, Trull, Clarkin, Sanderson, & Costa, 1994).

A substantial body of research empirically demonstrates that the FFM dimensions meaningfully map onto the features and symptoms of the PDs included within the *DSM-5* (APA, 2013; e.g., Bagby, Costa, Widiger, Ryder, & Marshall, 2005; Bagby, Marshall, & Georgiades, 2005; Bastiaansen, Rossi, Schotte, & De Fruyt, 2011; Chai et al., 2012; Costa & McCrae, 1990; Huprich, 2003; Nestadt et al., 2008; Quirk, Christiansen, Wagner, & McNulty, 2003; Reynolds & Clark, 2001; Saulsman & Page, 2004; Stepp, Trull, Burr, Wolfftenstein, & Vieth, 2005; Trull, 1992). Lynam and Widiger (2001) proposed a disorder-specific approach to identify distinct subsets of FFM facets characteristic of each PD (see Table 2 for an overview of the relationships they proposed). Their proposals are based on expert ratings (Livesley, 2005; Lynam & Widiger, 2001; McCrae, Löckenhoff, & Costa, 2005; Samuel & Widiger, 2004; Widiger, Costa, & McCrae, 2002; Widiger & Lowe, 2007) and codings of *DSM*-based diagnostic criteria (Widiger, Trull, Clarkin, Sanderson, & Costa, 2002), and they provide specific predictions of how normal-range Big Five traits and their facets can be expected to be related to PDs.

1.2 | Informant reports of personality disorders

In a wide range of research, acquaintances' ratings have shown good predictive validity for real-life outcomes, across both normative and pathological personality traits (Colvin & Funder, 1991; Oltmanns & Turkheimer, 2009). Because of the proposed close relationship between PD traits and the Big Five, it is reasonable to suspect that the perception and judgment of the two kinds of traits might be similarly valid. In most past research, the assessment of PDs is based on self-reports (e.g., First, Spitzer, Gibbon, & Williams, 1995). Self-reports are especially useful when assessing internal, nonevaluative traits and states (e.g., anxiety). Their major weakness, however, may be the assessment of externally visible behaviors, because people cannot perceive themselves from the physical perspective of another (Vazire, 2010). Some aspects of behavior are more, or even exclusively, visible from another person's perspective (Funder, 1995). According to models of interpersonal judgment (e.g., the realistic accuracy model [RAM], Funder, 1995, which is an extension of Brunswik's 1955 lens model), personality can be inferred accurately by informants in cases where the situation allows the target to express the trait and the observer to perceive behaviors associated with it. At the same time, observers construct inferences of personality by integrating observations of the target's behavior across the diverse situations of their acquaintanceship. Particularly for traits that

TABLE 1 Empirically derived dimensions of the 10 PDs and core symptoms/sample items from the Multisource Assessment of Personality Pathology (MAPP)

Diagnostic features of PD		RBQ items most highly correlated with trait	
PD with brief description A pattern of . . .	**Sample item of the MAPP**	**Item**	***r***
Avoidant "Social inhibition, feelings of inadequacy, and hypersensitivity to negative evaluation"	My acquaintance worries that other people will criticize or reject him/her.	Exhibits an awkward interpersonal style Seems detached from the situation	.22** .18**
Dependent "Submissive and clinging behavior related to an excessive need to be taken care of"	My acquaintance feels scared and uncomfortable when left alone to take care for him/herself.		
Obsessive-Compulsive "Preoccupation with orderliness, perfectionism, and control"	My acquaintance is a perfectionist and his/her perfectionism gets in the way of getting things done.	Seems interested in what someone had to say Other(s) seeks advice from P	–.30** .28**
Antisocial "Disregard for, and violations of, the rights of others"	My acquaintance seldom feels sorry or guilty for doing things that may have hurt others because s/he feels that his/her actions were justified.		
Histrionic "Excessive emotionality and attention seeking"	My acquaintance uses physical appearance to draw attention to him/herself.	Volunteers a large amount of information about self Initiates humor	.24***
Narcissistic "Grandiosity, need for admiration, and lack of empathy"	My acquaintance thinks s/he is unique, so he/she thinks only special people understand him/her.		
Schizoid "Detachment from social relationships and a restricted range of emotional expression"	My acquaintance is not interested in close relationships.	Keeps other(s) at a distance Laughs frequently	.19** –.19**
Schizotypal "Acute discomfort in close relationships, cognitive or perceptual distortions, and eccentricities of behavior"	My acquaintance is superstitious or believes in mind-reading.		
Paranoid "Distrust and suspiciousness such that others' motives are interpreted as malevolent"	My acquaintance is constantly on the lookout to make sure that other people are not taking advantage, lying to, or harming him/her.		
Borderline "A pattern of instability in interpersonal relationships, self-image, and affects, and marked impulsivity"	In close relationships (with friends and family members), my acquaintance often switches back and forth between loving a person and hating him or her.	Shows physical signs of tension or anxiety Exhibits a high degree of intelligence	.25* –.24*

Note. PD = personality disorder; RBQ = Riverside Behavioral Q-Sort. Brief descriptions of PDs are based on the *DSM-5* (APA, 2013, p. 645). Behavioral correlates for borderline and obsessive-compulsive traits were only found for males. Based on five independent randomization tests (Sherman & Funder, 2009), no statistically meaningful profiles of behavioral correlates emerged for dependent, antisocial, narcissistic, schizotypal, and paranoid informant reports of PD traits.
*$p < .05$. **$p < .01$. ***$p < .001$.

involve a substantial externalizing and evaluative component, informant reports have been shown to be reliable predictors (e.g., Extraversion, intelligence, or Conscientiousness; Carlson, Vazire, & Oltmanns, 2013; Vazire & Carlson, 2011). Because PD traits are unavoidably evaluative (Yalch & Hopwood, 2016) and substantially defined in terms of externalizing

TABLE 2 Lynam and Widiger's (2001) FFM facet trait prototypic ratings for *DSM* PDs adapted to BFI facets as reported in Soto and John (2009)

	AS	BPD	H	D	SZT	A	SZD	OC	N	P
Extraversion										
Assertiveness	HIGH			LOW		LOW	LOW		HIGH	
Activity	HIGH		HIGH				LOW			
Agreeableness										
Altruism	LOW			HIGH					LOW	LOW
Compliance	LOW			HIGH					LOW	LOW
Conscientiousness										
Order					HIGH			HIGH		
Self-discipline	LOW		LOW					HIGH		
Neuroticism										
Anxiety	LOW	HIGH		HIGH	HIGH	HIGH		HIGH	LOW	
Depression		HIGH							LOW	
Openness		HIGH	HIGH		HIGH		LOW			LOW
Aesthetics										
Ideas								LOW		

Note. FFM = Five-Factor Model: PD = personality disorder; BFI = Big Five Inventory; AS = antisocial; BPD = borderline; H = histrionic; D = dependent; SZT = schizotypal; A = avoidant; SZD = schizoid; OC = obsessive-compulsive; N = narcissistic; P = paranoid.

behaviors such as interpersonal conflict (e.g., deceitfulness, inappropriately provocative behaviors; Friedman, Oltmanns, Gleason, & Turkheimer, 2006), informant reports may add a crucial facet to their assessment (Miller, Pilkonis, & Morse, 2004).

Beyond the validity of informant reports for the assessment of PD traits, it is important to note that self-reports are fraught with substantial limitations. First, the self provides only one perspective, and psychometric theory establishes that the reliability of judgment increases with the number of independent respondents. A more accurate and reliable description of PD traits, therefore, might be obtained on the basis of multiple informant reports from acquaintances, friends, and family (Kaurin, Egloff, Stringaris, & Wessa, 2016; Klonsky, Oltmanns, & Turkheimer, 2002; Westen & Shedler, 1999). Second, people with PDs are often incapable of viewing themselves in realistic terms and are naïve to the consequences of their behavior for other people, which may be why informants report more PD traits than the targets themselves (e.g., Ferro & Klein, 1997; Mann et al., 1999; Modestin & Puhan, 2000; Peselow, Sanfilipo, & Fieve, 1995; Peselow, Sanfilipo, Fieve, & Gulbenkian, 1994; Zimmermann, Pfohl, Coryell, Stangl, & Corenthal, 1988).

Self-reports might also underestimate maladaptive behaviors because some PD traits are experienced as ego-syntonic (i.e., consistent with self-concept; Klonsky, Oltmanns, et al., 2002). Thus, individuals may have difficulties in observing how their behavior deviates from social norms (Carlson et al., 2013; Klonsky, Oltmanns, et al., 2002; Oltmanns & Strauss, 1998; Westen & Shedler, 1999).

Studies on the incremental value of informant reports for the assessment of PDs indicate that they provide information over and above self-reports (see Lawton, Shields, & Oltmanns, 2011, for analyses based on PD prototype scores; see also Miller, Pilkonis, & Clifton, 2005, for studies in psychiatric samples). Fiedler, Oltmanns, and Turkheimer (2004) and colleagues (Oltmanns, Gleason, Klonsky, & Turkheimer, 2005) paralleled the predictive validity of self- and peer ratings of PD traits for occupational outcomes. While self-reports of paranoid, borderline, and avoidant personality traits were positively associated with early discharge, peer reports of antisocial, schizoid, schizotypal, histrionic, and dependent personality traits were positively associated with early discharge. Thus, while self-reports of personality undoubtedly provide valuable information, it might be worth the effort to, when possible, supplement them with reports from knowledgeable informants.

1.3 | PDs and behavior

As was just summarized, most research on the value of informant reports for the assessment of pathological personality traits has focused on the amount of shared variance between self- and informant reports (see Oltmanns & Turkheimer, 2009, for an overview) or their association with

the FFM of personality (e.g., Thomas et al., 2013). To date, however, very little is known about how informant reports of PD traits relate to specific, relevant, directly observed behaviors. Establishing the connections between personality and behavior is one key, albeit difficult, goal of any personality assessment (e.g., Buss & Craik, 1983), both because (social) behaviors are importantly consequential and because they provide a validity criterion independent of possible biases in self- and informant reports. Many previous studies have shown that informant and self-reports are comparably accurate for the prediction of behaviors assessed in laboratory contexts. For instance, correlations between informant reports and behavioral codings based on the Riverside Behavioral Q-Sort were higher than those with self-reports (Kolar, Funder, & Colvin, 1996; see also John & Robins, 1994; Levesque & Kenny, 1993; Vazire & Mehl, 2008). Therefore, behavioral observation can provide an important test of the validity of informant or self-ratings (Vazire & Mehl, 2008).

However, little research has attempted to associate self- or peer ratings of PD-relevant traits with directly observed behavior. In one study (Leising, Sporberg, & Rehbein, 2006), clinician-based ratings of dependent and avoidant PD traits were associated with patterns of obedient behavior. Clinician reports of schizoid PD traits were associated with a more general lack of observed social competence. Surprisingly, no prototypical behavioral profiles were identified in that study for highly extraverted PD traits such as histrionic and narcissistic.

1.4 | The present study

The purpose of the present study is to explore associations of informant reports of PD traits not only with self-reports of relevant traits, but also with behaviors directly observed by independent raters across three different social settings in the lab. To the best of our knowledge, no study has systematically investigated the associations between informant reports of all 10 PD traits and directly observed, interpersonal behavior across diverse social interactions.

Our investigation is an exploratory analysis because previous relevant data on the relationship of informant reports of PDs and directly observed social behaviors are lacking. Basing our analyses on a sufficiently large sample size (i.e., to ensure adequate power) and applying rigorous tests of robustness of our analyses (i.e., randomization technique) is in line with state-of-the-art recommendations for replicable research (Asendorpf et al., 2013) and can help to focus future research attempts.

This study examines a nonclinical student sample, which can be useful for at least two reasons: First, findings from a nonclinical sample may more accurately reflect trait–behavior associations of PD traits because subjects in clinical samples often have considerable degrees of comorbid Axis I psychopathology. This circumstance likely inflates correlations independent of the assessed PDs (Lindsay & Widiger, 1995). Second, the absence of a clinical PD diagnosis does not necessarily imply the absence of disordered social and occupational interactions. In fact, the distinction between normal and abnormal personality has been described as fuzzy at best, and arbitrary at worst (O'Connor, 2002).

We will first assess how well PD traits are detected in everyday life by examining the consensus among well-acquainted informants for each of the 10 PD traits. To substantiate the meaning of variability in our informant ratings of PD traits, we will validate them against self-reports of normal-range personality (i.e., convergent validity). Previous studies in general population samples have demonstrated that measures of maladaptive personality traits load onto the same latent traits as those assessed by the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1992; Samuel, Simms, Clark, Livesley, & Widiger, 2010). Both scales show high convergence (rather than incremental validity), and this notion has been discussed to lie in the substantial coverage of maladaptivity within the items of the NEO-PI-R (i.e., Neuroticism, introversion, low Openness, antagonism, and low Conscientiousness; Samuel et al., 2010). We examine the relations between the FFM facets and *DSM-5* PD traits using previously published hypothesized relationships (i.e., FFM-based PD prototypes) by Lynam and Widiger (2001) as a theoretical basis for our validation. In addition, we will compare self- and informant reports of PD prototypes.

We then examine the extent to which informant reports and FFM-based prototypes of the 10 PDs are related to observable behaviors by analyzing associations between each of the 10 PD traits and objective ratings of social behavior across three laboratory settings. Finally, we will compare differential trait–behavior associations between genders on the basis of both accounts. Past research in clinical populations has generated contradictory findings about gender differences in behavioral expressions of PDs. Some studies have suggested that PD features are more commonly expressed by females (e.g., Widiger & Trull, 2007), others reported more behavioral displays of PDs in males (e.g., Barzega, Maina, Venturello, & Bogetto, 2001), and still others did not find any gender differences at all (e.g., Morey, Warner, & Boggs, 2002). Thus, the issue of gender differences in PD expression merits further exploration.

2 | METHOD

2.1 | Targets

The sample consisted of 256 (130 females; $M_{age} = 19.83$, $SD = 1.25$) undergraduate students from the University of

California, Riverside (UCR).[1] The decision to set the sample size at $N > 200$ was based on average effect sizes in personality psychology. As Allen and DeYoung (2017) point out, in personality science, median levels of effect sizes range from $r = .2$ to .3 and $r = .21$ on average (Hemphill, 2003). While analyses of "statistical power" have a long tradition in psychological research, they are fading from centrality as modern developments in data analysis move away from null hypothesis testing toward a focus on effect size (e.g., Cohen, 1994; Wilkinson, 1999). However, it can be noted that a minimum N of 180 gives a relationship with effect size $r = .30$ a 99% probability of attaining statistical significance at the .05 level (two–tailed), and the power to detect an effect size $r = .20$ is almost 80% (.783). Participants were scheduled to complete four sessions in the lab and were compensated with research credit and up to $115 for the completion of all visits. In line with the ethnic diversity of UCR's undergraduate population, the sample was 48.8% Asian, 23% Hispanic/Latino, 8.2% Caucasian, 4.3% Middle Eastern, 3.1% African American, and 12.5% other. Sample size varies by analysis due to occasional failures of video recording and participants' missing certain visits.

2.2 | Informants

Each participant was asked to nominate two peers who knew him or her well. These peers were then asked to come into the lab and provide informant reports of their acquaintance's personality. For this sample, data were collected from 453 informants (55% female). In 74% of the cases, they were friends of the target participant (remaining individuals: 16% roommates, 5% significant other, 2% classmates, 2% sibling, 1% coworkers). Again, in line with the ethnic diversity of UCR's undergraduate population, the sample was 46.1% Asian, 27.9% Hispanic/Latino, 10.2% Caucasian, 5.5% African American, and 10.2% other. On average, informants and target participants had known each other for 29.81 months ($SD = 41.35$; range = 1.00–264). When two informants were available (all but six cases), a composite of their ratings was created by averaging at the item level.

2.3 | Procedure

Participants came into the lab for four visits that were spaced approximately a week apart, in order to allow scheduling of all three sessions within a 10-week academic quarter. During the first visit, participants provided demographic information and completed personality questionnaires. In the three other visits, participants were assigned to interact with two other participants, both of whom they were previously unacquainted with. The composition of these triads changed across visits to ensure that participants never interacted with the same partners more than once. The first interaction was an unstructured chat, in which participants were invited to talk about "whatever you like" and left alone for 5 min. The second interaction was a cooperative task, in which each participant was rewarded with a $5.00 bonus if the triad completed a specified tinker-toy model within a 5-min time limit. The last interaction was a competitive task, in which participants played several rounds of the sound-repetition game "Simon" and the overall winner received $5.00. All tasks are modeled after—and refined from—ones used in previous research, which were found to evoke meaningful individual differences in behavior associated with personality as assessed outside the laboratory and other outcomes (e.g., Funder, Furr, & Colvin, 2000; Furr & Funder, 2004; Markey, Funder, & Ozer, 2003).

Data from this project were previously used in studies of different topics by Morse, Sauerberger, Todd, and Funder (2015) and Sauerberger and Funder (2017); all the analyses reported in this article are new.

2.4 | Behavioral assessment

In order to assess participants' behavior, we video-recorded each of the three interactions. These videos were then assessed by trained raters with the use of the Riverside Behavioral Q-Sort (RBQ; Funder et al., 2000). The Q-sort method is a forced-choice technique that results in a quasi-normal distribution of ratings (i.e., fewer items can be placed in more extreme categories). The RBQ includes 68 items (e.g., "Tries to undermine, sabotage or obstruct"). Raters watched the entire 5-min interaction of the triad and then rated the behavior of one participant in the triad using the RBQ. Each participant within each triad was assessed by four unique observers for each of his or her visits. Importantly, observers did not rate the behavior of anyone they knew outside the context of this study, nor the behavior of any participant more than once. The behavioral assessments showed good reliability (mean $\alpha = .80$). In cases where the reliability among the four raters of a video dropped below $\alpha = .70$ (approximately 20% of the videos), the research assistant who deviated most from the other three recoded the participants' behavior upon rewatching the video (without seeing the other ratings). For more details on how the RBQ is used for behavioral assessment, see Furr, Wagerman, and Funder (2010).

2.5 | Assessment of personality and the creation of FFM-based PD prototypes

Participants provided self-reports using the 44-item Big Five Inventory (BFI; John & Srivastava, 1999), and their scores were converted into FFM-based personality disorder prototypes based on the recommendations by Lynam and Widiger (2001). These prototypical profiles have shown satisfactory

predictive validity and strong temporal stability in a number of samples (e.g., Miller, Reynolds, & Pilkonis, 2004). In addition to the five domain scales (Extraversion, Neuroticism, Conscientiousness, Agreeableness, and Openness), the BFI-2 can be used to score more specific personality traits (i.e., facet scales) within each domain (Soto & John, 2009; see Table 2). These facets overlap with those assessed by the NEO-PI-R (Costa & McCrae, 1992) and are common to other Big Five facet models (e.g., DeYoung, Quilty, & Peterson, 2007; Saucier & Ostendorf, 1999; Soto & John, 2009). BFI scale reliabilities and other psychometric properties are similar to those of the much longer scales of Costa and McCrae's NEO Five-Factor Inventory (NEO-FFI; 1992; Soto & John, 2009).

To create personality disorder prototypes, we used the scoring technique (i.e., PD count method) developed by Miller, Bagby, Pilkonis, Reynolds, and Lynam (2005). A summed score across the most salient expert-rated FFM facets (Lynam & Widiger, 2001) for each PD is created. Facets that were rated as being prototypically high or prototypically low (see Table 2) are summed together, whereas those considered prototypically low are reverse scored so that all facets are scored in the direction of maladaptivity for that specific PD. PD scores based on the FFM PD count and *DSM*-based ratings have been shown to be substantially related, despite one being based on self-report data and the other using expert or informant ratings (e.g., Miller, Bagby, & Pilkonis, 2005; Miller et al., 2010; Miller, Morse, Nolf, Stepp, & Pilkonis, 2012).

2.6 | Assessment of depressive affect

To screen for Axis I pathology, we used the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996). The inventory has been used to assess depressive symptomatology in an extensive variety of both clinical and nonclinical settings and participant samples (Gotlib & Cane, 1989). It includes 21 items in which participants are asked to choose among four or five alternative statements that express varying degrees of depressive affect. For example, alternatives for the first item are "I do not feel sad" (scored 0), "I feel blue or sad" (scored 1), "I am blue or sad all the time and I can't snap out of it" (scored 2), "I am so sad or unhappy that it is very painful" (also scored 2), and "I am so sad or unhappy that I can't stand it" (scored 3).

2.7 | Assessment of personality pathology

Nominated informants described pathological aspects of the target's personality using the Multisource Assessment of Personality Pathology (MAPP; Okada & Oltmanns, 2009). This measure consists of 81 items based on the features of the 10 PDs listed in the *DSM-5* (APA, 2013; see also Table 1 for an overview). Items were constructed by translating the *DSM-IV* criteria into lay language. For instance, one of the criteria for narcissistic PD, "is often envious of others or believes that others are envious of him or her," was split into two items: "is jealous of other people" and "thinks other people are jealous of him/her"). Similarly, the schizotypal PD criterion "inappropriate or constricted affect" was split into the items "shows emotional responses that seem strange or 'out of sync'" and "is cold; doesn't show any feelings." Informants made ratings based on a scale ranging from 0 (*S/he is never like this [0% of the time]*) to 4 (*S/he is always like this [100% of the time]*).

3 | RESULTS

3.1 | Descriptive statistics and informant consensus

Only for the Antisocial, $t(232) = -2.00$, $p = .047$, Histrionic, $t(232) = 2.40$, $p = .017$, and Dependent, $t(232) = 3.50$, $p = .001$, subscales were there significant gender differences, with females scoring higher on the latter two. In general, scores on the MAPP were fairly normally distributed (see supplementary Figure S1). The means, standard deviations, ranges, reliabilities, and mean-level differences between genders of all inventories are presented in Table 3. All reliabilities were comparable to those obtained in previous studies (e.g. Carlson et al., 2013; Soto & John, 2009). Inventory scores were similar to those obtained in other general population samples. Importantly, with overall mean levels of 11.01 and a median value of 10, BDI-II sum scores indicate "minimal depression" according to standardized cut-offs of the scale. Therefore, depression levels do not point toward augmented Axis I pathology in our sample. Overall, the intraclass correlations (ICCs) of agreement among nominated informants were all relatively modest but in the statistically significant range (.21 up to .39) and similar to coefficients reported in clinical samples (Coolidge, Burns, & Mooney, 1995; Modestin & Puhan, 2000; Oltmanns & Strauss, 1998; see also Oltmanns & Turkheimer, 2009). Figure 1 gives a detailed overview of agreement scores across MAPP subscales divided by gender. As reported by Sauerberger and Funder (2017), behaviors rated with the RBQ showed strong consistency across situations. Consequently, a composite of RBQ ratings across all three in-lab visits was calculated by averaging the three scores on each RBQ item (mean r for the 68 items = .15). Subsequent analyses are reported across experimental conditions.

3.2 | Convergent validity of informant accounts of PD traits

Broadly, all PD traits were associated with low levels of Agreeableness and high levels of Neuroticism, confirming

TABLE 3 Means, standard deviations, and ranges for key personality variables across genders

Sample characteristics			Test statistics		
	Males	Females	Overall		
BFI (Self-report)*	***M* (*SD*); [range]**	***M* (*SD*); [range]**	**α**	$t_{(1,\ 232)}$	***p***
Antisocial	6.77 (3.08); [1.50, 17.00]	6.02 (2.59); [1.00, 14.00]	.584	**−2.00**	**.047**
Avoidant	5.65 (3.60); [0.00, 15.50]	6.00 (3.77); [0.50, 19.50]	.785	0.71	.482
Borderline	5.99 (3.79); [0.0019.00]	6.47 (4.06); [0.00, 21.00]	.766	0.093	.353
Dependent	4.54 (3.65); [0.00, 22.50]	6.39 (4.34); [0.00,19.50]	.826	**3.50**	**.001**
Histrionic	6.99 (3.72); [1.00, 20.00]	8.24 (4.19); [1.00, 19.00]	.723	**2.404**	**.017**
Narcissistic	1.83 (5.58); [1.00, 31.00]	1.97 (5.54); [0.50, 27.50]	.829	0.191	.849
Obssessive-compulsive	1.65 (3.99); [2.50, 21.50]	11.21 (3.31); [4.50, 19.00]	.568	1.174	.242
Paranoid	8.83 (4.77); [0.50, 24.00]	9.32 (4.23); [0.00, 20.00]	.787	0.829	.408
Schizoid	6.69 (3.19); [1.00, 16.50]	6.05 (2.66); [1.00, 12.50]	.690	−1.67	.097
Schizotypal	4.48 (2.36); [0.50, 12.50]	4.88 (2.39); [0.00, 15.00]	.580	0.11	.914
FFM-PD (Self-report)				$t_{(1.\ 255)}$	*p*
Antisocial	−7.21 (1.99); [–12.90, –2.68]	−7.56 (1.71); [–13.67, –3.83]	.600	−1.48	.142
Avoidant	−0.19 (1.37); [–3.80, 2.80]	0.07 (1.21); [–3.80, –2.85]	.681	1.63	.105
Borderline	5.16 (1.74); [1.15, 8.65]	5.80 (1.72); [0.65, 9.10]	.565	**2.81**	**.003**
Dependent	−10.31 (1.10); [–13.25, –6.58]	−10.94 (1.11); [–13.92, –7.42]	.649	**−4.59**	**.000**
Histrionic	0.14 (0.91); [–2.83, 2.39]	0.27 (.88); [–3.33, 2.56]	.644	1.125	.262
Narcissistic	−9.82 (1.87); [–14.50, –5.58]	−10.61 (1.62); [–14.92, –5.12]	.470	**−3.60**	**.000**
Obssessive-compulsive	5.39 (1.55); [0.40, 8.70]	6.00 (1.42); [1.20, 9.50]	.649	**3.28**	**.001**
Paranoid	−8.45 (1.71); [–12.83, –3.35]	−8.33 (1.60); [–13.90, –3.73]	.571	0.56	.577
Schizoid	−6.70 (1.02); [–9.48, –4.23]	−6.83 (.93); [–9.78, –4,38]	.820	−1.08	.283
Schizotypal	−6.05 (1.38); [–9.23, –3.13]	−6.32 (1.23); [–10.30, –2.95]	.673	−1.68	.094
BFI (Self-report)					
Extraversion	3.16 (0.78); [1.13–4.88]	3.34 (0.58); [1.00, 5.00]	.841	1.90	.058
Assertiveness	2.93 (0.87); [1.00, 4.80]	3.06 (0.67); [11.00, 5.00]	.821	1.35	.178
Activity	3.53 (0.81); [1.50, 5.00]	3.68 (0.73); [1.00, 5,00]	.721	0.159	.114
Agreeableness	3.75 (0.53); [2.00–5.00]	3.89 (0.47), [2.00, 5.00]	.688	**2.14**	**.033**
Altruism	3.92 (0.53); [2.00, 5.00]	4.02 (0.55); [2.00, 5.00]	.576	1.495	.136
Compliance	3.65 (0.72); [1.67, 5.00]	3.79 (0.60); [2.00, 5.00]	.484	1.678	.095
Conscientiousness	3.89 (0.60); [1.67, –5.00]	3.41 (0.55); [2.00, 5.00]	.758	0.382	.703
Order	2.93 (0.93); [1.00, 5.00]	3.00 (0.953); [1.00, 5.00]	.563	0.640	.523
Self-discipline	3.36 (0.62); [1.80, 5.00]	3.37 (0.62); [2.00, 5.00]	.661	−0.115	.909
Neuroticism	2.67 (0.70); [1.25, 4.25]	2.99 (0.70); [1.00, 5.00]	.807	**3.68**	**.000**
Anxiety	2.74 (0.82); [1.00, 4.50]	3.13 (0.84); [1.00, 5.00]	.810	**3.791**	**.000**
Depression	2.44 (0.87); [1.00, 4.50]	2.27 (0.76); [1.00, 5.00]	.520	**2.773**	**.006**

(Continues)

TABLE 3 (Continued)

Sample characteristics			Test statistics		
	Males	Females	Overall		
BFI (Self-report)*	*M* (*SD*); [range]	*M* (*SD*); [range]	α	$t_{(1, 232)}$	*p*
Openness	3.54 (0.50); [2.10, –4.70]	3.51 (0.53); [2.00, 5.00]	.645	−0.499	.618
Aesthetics	3.21 (0.72);1.00, 5.00]	3.37 (0.73); [1.00, 5.00]	.408	1.766	.079
Ideas	3.64 (0.52); [1.60, 5.00]	3.50 (.53); [2.00, 5.00]	.547	**−2.245**	**.026**

Note. PD = personality disorder; FFM = Five-Factor Model; BFI = Big Five Inventory. *N* informant reports of PD traits: males = 113; females = 120; *N* self-reports of FFM traits: males = 126; females = 130. The FFM descriptions are based on prototypes developed by Lynam and Widiger (2001).
*[Correction added on 11 May 2018, after first online publication: Column header has been amended.]

previous findings, and these associations were stronger when assessed at the facet level of personality domains (see supplementary Tables S2 and S3 for details of the BFI facet- and domain-level associations with PD traits). In addition, Extraversion was a discriminating dimension because the direction of its relationship differed across the PDs (e.g., positive relationship with antisocial PD, negative with schizoid PD). Overall, convergent validity coefficients were comparable to other studies that have assessed levels of shared variance between FFM-based PD prototypes and instruments assessing the *DSM* PD criteria (e.g., Miller, Bagby, Pilkonis, Reynolds, et al., 2005; see Widiger, Gore, Crego, Rojas, & Oltmanns, 2017, for an overview). Self–peer agreement coefficients for each MAPP PD trait and BFI-based PD prototype (i.e., convergent validity) are presented in Table 4. Self–peer agreement coefficients ranged between .16 for MAPP Paranoid to .38 for MAPP Antisocial (median $r = .23$). Only in the case of dependent PD traits was the convergence between informant reports and FFM PD counts not statistically significant. Supplementary Table S1 parallels our findings on the basis of informant reports of the BFI. The correlations between self- and informant-reported BFI prototypes were as follows: antisocial ($r = .57$), borderline ($r = .35$), histrionic ($r = .42$), dependent ($r = –.39$), schizotypal ($r = .44$), avoidant ($r = .52$), schizoid ($r = .58$), obsessive-compulsive ($r = .40$), narcissistic ($r = .52$), and paranoid ($r = .29$). All were significant at the $p < .001$ level, and the median correlation was $r = .43$.

3.3 | Relations of PD traits and social behaviors directly observed in the lab

To examine the relationship between the informant reports for each of the PD traits assessed by the MAPP or FFM-based PD prototypes with the RBQ, each composite RBQ item was correlated with each individual MAPP score or FFM-based PD prototypes count score, respectively. Given the high number of nonindependent statistical tests and the subsequent inflation of results by spurious correlations, we used Sherman and Funder's (2009) randomization test, in which the chance distribution of significant correlates is estimated across a random 10,000 trials. This allowed us to assess whether the number of correlations between the MAPP and RBQ was significantly higher than what would be expected by chance (Sherman & Funder, 2009). To avoid focusing attention on findings that could merely be measurement noise, we chose to report only on those PD traits for which a non-chance level of behavioral correlates emerged.

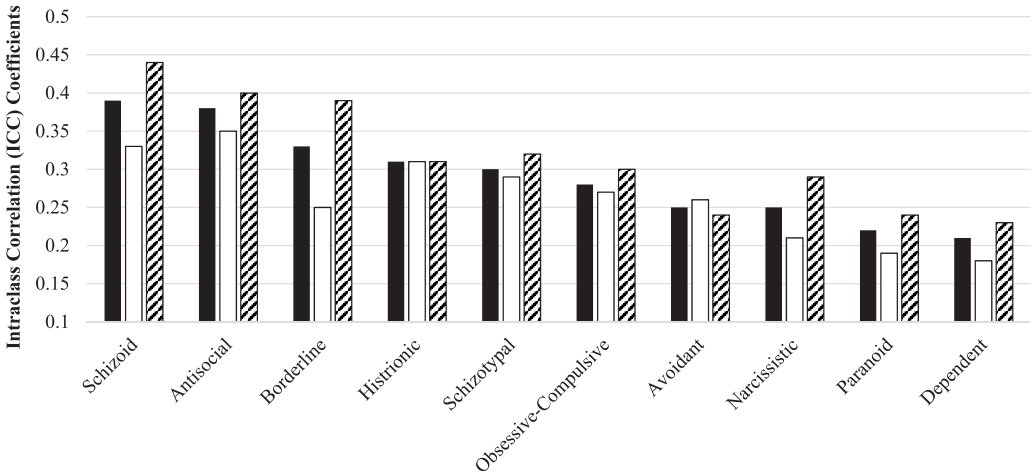

FIGURE 1 Informant agreement for pathological personality traits. Informant agreement is based on ICCs; solid bars denote ICCs for the entire sample ($N = 233$), white bars ICCs for males, and striped bars ICCs for females ($n = 120$)

TABLE 4 Convergent validity: Zero-order correlations of FFM trait prototypic profile (FFM-PP) of *DSM* PDs (self-report) and MAPP informant reports of PD traits

	Informant-Reported PD traits									
FFM-PP	**AS**	**BPD**	**H**	**D**	**SZT**	**A**	**SZD**	**OC**	**N**	**P**
AS	**.375**	**.189**	**.391**	.049	**.214**	**−.187**	**−.152**	.023	**.338**	**.158**
	.000	**.004**	**.000**	.460	**.001**	**.004**	**.021**	.726	**.000**	**.016**
BPD	−.021	**.210**	.056	**.217**	.027	**.273**	.025	.011	−.016	.058
	.745	**.001**	.391	**.001**	.679	**.000**	.709	.872	.813	.376
H	**.251**	**.133**	**.303**	.107	**.175**	−.040	−.127	−.042	.127	.063
	.000	**.042**	**.000**	.102	**.007**	.548	.054	.522	.052	.341
D	**.206**	.084	.106	−.026	.090	**−.147**	.013	−.040	**.239**	.094
	.002	.199	.105	.693	.169	**.025**	.842	.539	**.000**	.155
SZT	**.292**	.050	**.219**	.002	**.199**	**−.166**	−.114	−.103	.069	−.017
	.000	.451	**.001**	.979	**.002**	**.011**	.083	.116	.298	.801
A	**−.266**	.001	**−.253**	**.134**	**−.180**	**.331**	**.172**	−.003	**−.199**	−.056
	.000	.989	**.000**	**.042**	**.006**	**.000**	**.008**	.959	**.002**	.395
SZD	**−.284**	−.097	**−.352**	.074	**−.221**	**.277**	**.185**	−.041	**−.293**	**−.129**
	.000	.140	**.000**	.263	**.001**	**.000**	**.005**	.538	**.000**	**.050**
OCD	**−.199**	.042	−.018	.081	−.098	**.177**	−.019	**.273**	.063	**.130**
	.002	.523	.788	.218	.135	**.007**	.773	**.000**	.335	**.047**
N	**.273**	.021	**.211**	−.097	**.131**	**−.293**	−.108	.014	**.258**	.074
	.000	.750	**.001**	.138	**.045**	**.000**	.099	.831	**.000**	.257
P	.017	**.257**	.085	**.264**	.010	**.311**	.070	**.136**	**.139**	**.159**
	.796	**.000**	.197	**.000**	.884	**.000**	.285	**..038**	**.034**	**.015**

Note. FFM = Five-Factor Model: PD = personality disorder; MAPP = Multisource Assessment of Personality Pathology. AS = antisocial; BPD = borderline; H = histrionic; D = dependent; SZT = schizotypal; A = avoidant; SZD = schizoid; OC = obsessive-compulsive; N = narcissistic; P = paranoid. FFM trait prototypic profiles are based on expert ratings from Lynam and Widiger (2001). Boldfaced correlations are statistically significant.

3.3.1 | Informant reports

For the entire sample (see Table 5), randomization analysis indicates the chance of finding 12 significant correlations for avoidant PD traits at the $p < .05$ level is $p = .003$. For histrionic PD traits, the chance of finding 22 significant correlations at the $p < .05$ level is $p = .0012$, and for schizoid personality pathology traits, the chance of finding 21 significant correlations at the $p < .05$ level is $p = .003$. The overall pattern of correlations depicted in Table 5 overlaps between avoidant and schizoid trait–behavior associations ($r = .387$, $p = .0025$), indicating that those who were rated highly on avoidant and schizoid traits displayed behaviors that were observed to be less socially skilled, insecure, and talking negatively about one's self. However, in contrast to the fearful and timid situational detachment that is characteristic for those high on avoidant personality pathology traits, individuals who score high on the schizoid trait dimension were not only observed to be deliberately distanced from the others, but their behavior was also visibly irritated and hostile.

Vector correlations between schizoid and histrionic trait–behavior associations were $r = -.877$, $p < .0001$,[2] indicating that behaviors associated with these traits are dramatically different from each other. As opposed to an unconventional appearance accompanied by visible insecurity and antagonistic behavior, associated with high peer ratings of schizoid traits, those whom peers rated highly on histrionic traits were observed to act in a cheerful, enthusiastic, and energetic

TABLE 5 Unique and shared correlations of avoidant, histrionic, and schizoid PD traits with behaviors across all visits for the entire sample

		PD trait		
Item #	**RBQ item**	**H**	**SZD**	**A**
1	Interviews others (if present)	.17*		
2	Volunteers a large amount of information about self	.24***	−.13*	
3	Seems interested in what someone had to say			
4	Tries to control the situation			−.15*
7	Exhibits social skills	.21**	−.17**	−.15*
8	Is reserved and unexpressive	−.20**		.17**
9	Laughs frequently	.16*	−.19**	
10	Smiles frequently	.14*	−.18**	
11	Is physically animated; moves around			
12	Seems to like other(s) present		−.17*	
13	Exhibits an awkward interpersonal style	−.17**		.22**
15	Shows high enthusiasm and a high energy level	.20**		
16	Shows a wide range of interests		–.15*	
17	Talks at rather than with other(s)			
18	Expresses agreement frequently	−.14*		
19	Expresses criticism			
20	Is talkative	.22***	−.17*	−.18**
21	Expresses insecurity	−.17**	.17**	.14*
22	Show physical signs of tension or anxiety	−.16*		
23	Exhibits a high degree of intelligence	−.19**		
25	Initiates humor	.24***	−.16*	−.14*
27	Exhibits condescending behavior			
28	Seems likable		−.17*	
31	Acts irritated		.15*	
32	Expresses warmth			
33	Tries to undermine, sabotage or obstruct		.13*	.14*
34	Expresses hostility		.14*	
35	Is unusual or unconventional in appearance		.15*	
36	Behaves in a fearful or timid manner	−.21**		.17**
39	Expresses guilt		.16*	
40	Keeps other(s) at a distance	−.20**	.19**	
41	Shows interest in intellectual or cognitive matters	−.17**		
42	Seems to enjoy the situation		−.18**	

(Continues)

TABLE 5 (Continued)

Item #	RBQ item	PD trait		
		H	SZD	A
44	Says negative things about self		.16*	.14*
47	Expresses self-pity or feelings of victimization	−.17**	.19**	
49	Behaves in a cheerful manner	.14*		
50	Gives up when faced with obstacles			
52	Offers advice			
53	Speaks fluently and expresses ideas well		−.14*	
55	Behaves in a competitive manner			.18**
56	Speaks in a loud voice	.13*		
60	Seems detached from the situation	−.17**		.18**
62	Acts playful	.21**		
63	Other(s) seeks advice from P			
67	Exhibits physical discomfort or pain		.14*	
Overall number of significant correlates		22	21	12
p of finding number of significant correlates		.001	.003	.032

Note. PD = personality disorder; A = avoidant; H = histrionic; SD = schizoid; RBQ = Riverside Behavioral Q-Sort.
*$p < .05$. **$p < .01$. ***$p < .001$.

manner. Consistent with this observation, vector correlations between the patterns of trait–behavior association were $r = –.339$, $p < .0001$ for avoidant and histrionic traits.

3.3.2 | Self-reported FFM-based PD prototypes

Further evidence for the validity of informant accounts is provided by behavioral profiles based on FFM PD prototypes. In line with findings on behavioral profiles of informant ratings, results indicate the chance of finding 37 significant correlations at the $p < .05$ level is $p < .0001$ for schizoid PD traits, the chance of finding 36 significant correlations at the $p < .05$ level is $p < .001$ for avoidant PD traits, and the chance of finding 26 significant correlations at the $p < .05$ level is $p < .0001$ for histrionic PD traits. In addition to those PD traits, we found more than a chance number of significant behavioral correlates for antisocial, borderline, schizotypal, narcissistic, and paranoid PD prototypes. The results are depicted in Table 8. Again, vector correlations of behavioral profiles for schizoid and avoidant PD prototypes were highly correlated ($r = .678$, $p < .0001$), and both were negatively correlated with histrionic PD prototypes (avoidant: $r = –.241$, $p = .0014$; schizoid: $r = –.786$, $p < .0001$).

3.4 | Gender differences within trait–behavior associations

To assess gender differences, vector correlations compared the correlational profile of RBQ ratings with MAPP subscale scores and self-reported FFM-based PD prototypes, respectively, in separate analyses for males and females. The overall pattern of results is reported in Table 5 and was distinctive for males and females (see Tables 6–8).

3.4.1 | Informant reports

Across all 10 subscales of the MAPP, the most similar patterns of correlates for males and females with respect to RBQ items and MAPP scores emerged for the highly extraverted Histrionic ($r = .65$, $p < .0001$) subscale of the MAPP. For the antisocial PD trait, the vector correlation across genders was $r = .08$, $p = .10$. A reverse pattern of trait–behavior profiles for males and females emerged not only for highly neurotic traits such as borderline ($r = –.47$, $p < .0001$) and paranoid PD traits ($r = –.27$, $p = .0012$), but also for schizoid ($r = –.25$, $p = .0014$) and schizotypal PD traits ($r = –.35$, $p < .0001$). The least similar trait–behavior correlations were found for internalizing traits such as dependent ($r = –.03$, $p = .32$) and avoidant PD traits ($r = .08$, $p = .10$). In the case

TABLE 6 Unique and shared correlations of avoidant, borderline, histrionic, obsessive-compulsive, and schizoid PD traits with behaviors across all visits for males

		PD trait				
Item #	**RBQ item**	**A**	**B**	**H**	**OC**	**SZD**
1	Interviews others (if present)					
2	Volunteers a large amount of information about self			.26*		−.35**
3	Seems interested in what someone had to say				−.30**	−.33**
4	Tries to control the situation	−.23*				−.23*
5	Dominates the situation					−.24*
6	Appears to be relaxed and comfortable	−.27*				−.38***
7	Exhibits social skills	−.29**		.26*		−.40***
8	Is reserved and unexpressive	.26*		−.26*		.34**
9	Laughs frequently	−.23*			−.24*	−.45***
10	Smiles frequently	−.27*			−.23*	−.40***
11	Is physically animated; moves around			.30**		
12	Seems to like other(s) present		−.19*		−.28**	−.35**
13	Exhibits an awkward interpersonal style	.33**		−.27*		.37***
15	Shows high enthusiasm and a high energy level	−.26*		.26*		−.41***
17	Talks at rather than with other(s)				.23*	.26*
18	Expresses agreement frequently				−.22*	
19	Expresses criticism		.23*		.21*	
20	Is talkative	−.29**		.25*		−.34**
21	Expresses insecurity		.22*	−.23*		.33**
22	Show physical signs of tension or anxiety	.27*	.25*			.35**
23	Exhibits a high degree of intelligence		−.24*	−.26*		
24	Expresses sympathy	−.26*				
25	Initiates humor			.23*		−.29**
27	Exhibits condescending behavior				.25**	
28	Seems likable					−.33**
30	Appears to regard self as physically attractive			.28*		
31	Acts irritated		.19*		.20*	.35**
32	Expresses warmth		−.25**		−.23*	−.36**
33	Tries to undermine, sabotage or obstruct	.39**				.25*
34	Expresses hostility	−.29**			.26**	.33**
35	Is unusual or unconventional in appearance	−.35**				.32**
36	Behaves in a fearful or timid manner	.28*		−.24*		.35**

(Continues)

TABLE 6 (Continued)

Item #	RBQ item	PD trait A	B	H	OC	SZD
37	Is expressive in face, voice or gestures			.23*		
39	Expresses guilt	.23*				.29*
40	Keeps other(s) at a distance	.24*		−.24*		.43***
41	Shows interest in intellectual or cognitive matters		−.19*	−.23*		.26*
42	Seems to enjoy the situation	−.33**	−.31**		−.19*	−.45***
44	Says negative things about self	.29*				.39***
47	Expresses self-pity or feelings of victimization					.31**
49	Behaves in a cheerful manner	−.37**	−.23*		−.21*	−.43***
50	Gives up when faced with obstacles		.20*			.23*
52	Offers advice				.20*	
53	Speaks fluently and expresses ideas well	−.29**				
55	Behaves in a competitive manner	−.25*				
56	Speaks in a loud voice	−.25*				−.30**
58	Makes or approaches physical contact with other(s)					
59	Engages in constant eye contact with someone					
60	Seems detached from the situation	.29*		−.29**		.42***
61	Speaks quickly			−.23*		
62	Acts playful				−.19*	−.33**
63	Other(s) seeks advice from P				.28**	
64	Concentrates on or works hard at a task					
65	Engages in physical activity					
66	Acts in a self-indulgent manner					.33**
67	Exhibits physical discomfort or pain					.33**
68	Behaves in a stereotypically feminine style or manner			−.27*		.11
Overall number of significant correlates		20	11	16	16	37
p of finding number of significant correlates		.005	.045	.015	.015	<.000

Note. PD = personality disorder; A = avoidant; B = boderline; H = histrionic; OC = obsessive-compulsive; SZD = schizoid; RBQ = Riverside Behavioral Q–Sort.
*$p < .05$. **$p < .01$ ***$p < .001$.

of obsessive-compulsive traits, the similarity of trait–behavior associations across gender was $r = –.16$, $p = .021$.

For males (see Table 6), we found more correlations than expected by chance for five PD traits: For avoidant personality pathology traits, the chance of finding 20 significant correlations at the $p < .05$ level is $p = .006$; for borderline personality pathology traits, the chance of finding 11 significant correlations at the $p < .05$ level is $p = .045$; for histrionic personality pathology traits, the chance of finding 16 significant correlations at the $p < .05$ level is $p = .016$; for obsessive-compulsive personality pathology traits, the chance of finding 16 significant correlations at the $p < .05$ level is $p = .015$; for schizoid personality pathology traits, the chance of finding 37 significant correlations at the $p < .05$ level is $p = .001$.

For females (see Table 7), we only found more correlations than expected by chance for histrionic PD traits, where

TABLE 7 Correlations of histrionic PD traits with behaviors across all visits for females

Item #	RBQ item	Histrionic
2	Volunteers a large amount of information about self	.35**
7	Exhibits social skills	.18*
9	Laughs frequently	.21*
10	Smiles frequently	.18*
12	Seems to like other(s) present	.21*
15	Shows high enthusiasm and a high energy level	.23*
20	Is talkative	.23*
22	Show physical signs of tension or anxiety	−.21*
25	Initiates humor	.29**
36	Behaves in a fearful or timid manner	−.20*
40	Keeps other(s) at a distance	−.24**
47	Expresses self-pity or feelings of victimization	−.19*
48	Expresses sexual interest	−.18*
49	Behaves in a cheerful manner	.20*
62	Acts playful	.26**
64	Concentrates on or works hard at a task	−.23*
Overall number of significant correlates		16
p of finding number of significant correlates		.009

Note. PD = personality disorder; H = histrionic; RBQ = Riverside Behavioral Q-Sort. *$p < .05$. **$p < .01$. ***$p < .001$.

the chance of finding 16 significant correlations at the $p < .05$ level is $p = .009$. Here, the vector correlation of male and female trait–behavior associations was $r = .65$, $p < .0001$.

3.4.2 | Self-reported FFM-based PD prototypes

In line with results based on informant reports, the most similar patterns of behavioral correlates across genders emerged for those PD traits mapping onto the Extraversion dimension of the FFM, such as histrionic ($r = .65$, $p < .0001$), schizoid ($r = .83$, $p < .0001$), avoidant ($r = .75$, $p < .0001$), and narcissistic traits ($r = .62$, $p < .0001$). Surprisingly, FFM-based prototypes for antisocial PD yielded highly similar behavioral profiles across genders ($r = .71$, $p < .0001$). The least similar behavioral profiles across genders emerged for dependent ($r = .25$, $p = .0012$), obsessive-compulsive ($r = .14$, $p = .032$), and borderline ($r = .08$, $p = .222$) PD prototypes. As noted above, the low convergence among behavioral profiles may be explained by weak representations of specific PD traits (e.g., obsessive-compulsive, dependent) by the FFM due to a lack of items that assess maladaptive personality at both the high and low extremes of relevant domains (e.g., Haigler & Widiger, 2001).

For males (see Table 8), significant trait–behavior correlations were more numerous than expected by chance for eight FFM-based PD scores: For antisocial PD traits, the chance of finding 28 significant correlations at the $p < .05$ level is $p = .006$; for borderline PD prototypes, the chance of finding 10 significant correlations at the $p < .05$ level is $p = .050$; for histrionic PD prototypes, the chance of finding 18 significant correlations at the $p < .05$ level is $p = .007$; for schizotypal PD prototypes, the chance of finding 25 significant correlations at the $p < .05$ level is $p = .0009$; for avoidant PD prototypes, the chance of finding 31 significant correlations at the $p < .05$ level is $p < .0001$; for schizoid PD prototypes, the chance of finding 31 significant correlations at the $p < .05$ level is $p < .0001$; for narcissistic PD prototypes, the chance of finding 14 significant correlations at the $p < .05$ level is $p = .024$; and for paranoid PD prototypes, the chance of finding 17 significant correlations at the $p < .05$ level is $p = .013$.

For females (see Table 8), we found more correlations than expected by chance for five PD prototypes: For antisocial PD traits, the chance of finding 22 significant correlations at the $p < .05$ level is $p = .0007$; for histrionic PD prototypes, the chance of finding 13 significant correlations at the $p < .05$ level is $p = .022$; for avoidant PD prototypes, the chance of finding 20 significant correlations at the $p < .05$ level is $p = .002$; for schizoid PD prototypes, the chance of finding 29 significant correlations at the $p < .05$ level is $p < .0001$; and for narcissistic PD traits, the chance of finding 15 significant correlations at the $p < .05$ level is $p = .011$.

3.4.3 | Similarity of behavioral profiles associated with informant- and self-reported PD traits

To further test the convergent validity of informant-reported PD traits and self-report-based prototype counts of PDs, we looked at the vector correlations between the behavioral profiles associated with both. Across all PD traits that yielded a substantial set of behavioral correlates on the basis of informant reports, the vector correlations were as follows: For avoidant PD traits, vector correlations between trait–behavior profiles based on both accounts were $r = .77$, $p < .001$; for schizoid, $r = .77$, $p < .0001$; and for histrionic, $r = .89$, $p < .0001$. For obsessive-compulsive and borderline, the vector correlations were $r = –.05$, $p = .445$ and $r = .33$, $p < .0001$, respectively. Across genders, this pattern was mainly replicated for males (avoidant $r = .84$, $p < .001$;

TABLE 8 Randomization test based on number of significant correlations between self-report-based FFM facet trait profiles of *DSM* PDs across genders for the composite of all visits

		Informant-reported PD traits									
		AS	**BPD***	**H**	**D**	**SZT**	**A**	**SZD**	**OC**	**N**	**P**
Total	*N*	**28**	6	**26**	5	**28**	**36**	**37**	3	**23**	**21**
	p	**.000**	.170	**.000**	.249	**.000**	**.000**	**.000**	.508	**.001**	**.003**
Female	*N*	**22**	2	**13**	3	3	**20**	**29**	2	**15**	10
	p	**.000**	.722	**.022**	.524	.516	**.002**	**.000**	.706	**.011**	.061
Male	*N*	**20**	10	**18**	3	**25**	**31**	**31**	3	**14**	**17**
	p	**.006**	.060	**.007**	.499	**.000**	**.000**	**.000**	.485	**.024**	**.013**

Note. $N_{all} = 232$; $n_{females} = 119$, $n_{males} = 113$. FFM = Five-Factor Model; PD = personality disorder; AS = antisocial; BPD = borderline; H = histrionic; D = dependent; SZT = schizotypal; A = avoidant; SZD = schizoid; OC = obsessive-compulsive; N = narcissistic; P = paranoid. Significant amounts of behavioral correlates are boldfaced.

*[Correction added on 11 May 2018, after first online publication: Column values have been amended.]

schizoid $r = .85$, $p < .0001$; histrionic $r = .85$, $p < .0001$; obsessive-compulsive $r = .14$, $p = .445$; borderline $r = .59$, $p < .001$). Except for histrionic PD ($r = .59$, $p < .0001$), vector correlations for females were extremely low (avoidant $r = .06$, $p = .359$; schizoid $r = –.08$, $p = .221$; obsessive-compulsive $r = .17$, $p = .009$; borderline $r = .00$, $p = 1.00$).

4 | DISCUSSION

We set out to investigate four questions. First, would self-reports of PD prototypes as proposed by Lynam and Widiger (2001) converge with peer reports of PD traits? Second, do peers agree in their perceptions of PD traits of others? Third, how do PD traits as rated by everyday acquaintances and directly observed social behavior (as video-recorded in the laboratory) correlate with each other? And, finally, are these correlational relationships replicated on the basis of self-reports of PD prototypes?

Our results suggest that ordinary acquaintances can accurately perceive PD traits characterized by hyper-social (i.e., histrionic), withdrawn (i.e., schizoid), and socially phobic (i.e., avoidant) behaviors and that their perceptions converge with self-perceptions of target subjects. Importantly, in all analyses, self-reported PD prototypes show similar behavioral profiles as do informant reports. From the perspective of the realistic accuracy model (Funder, 1995), this finding implies that "relevant" indications of personality pathology are indeed expressed in ordinary daily interaction, and are both "detected" and correctly "utilized" by acquaintances.

4.1 | Convergence of PD traits with the Five-Factor Model

Although previous studies have confirmed the validity of PD prototypes, much of the research was focused on self-reports in clinical or community samples (e.g., Miller, Bagby, & Pilkonis, 2005; Miller et al., 2010). The present study broadens the scope of PD prototypes to a healthy student sample from their own and additional informant perspectives. Broadly, with regard to the relationship of FFM dimensions and PDs, our results are in line with what has been previously reported: Informant reports of Neuroticism, Extraversion, Agreeableness, and Conscientiousness are relevant to the prediction of PD traits; Openness, however, was less informative (Lynam & Widiger, 2001; Samuel & Widiger, 2008).

We also find evidence of good convergent validity for all PD traits (i.e., subscales of the MAPP), with the exception of dependent PD traits. This, however, is not an unusual finding. In particular, studies have found that PD traits high on Conscientiousness (obsessive-compulsive), Agreeableness (dependent), and Openness (schizotypal) are more weakly represented by the FFM because neither the NEO-PI-R nor the BFI include an adequate number of items composed to assess maladaptive personality at both the high and low extremes of those domains (e.g., Haigler & Widiger, 2001). Particularly strong patterns of convergent validity emerged for avoidant, antisocial, borderline, histrionic, obsessive-compulsive, and narcissistic prototypes, possibly because these PD traits map very well onto the Extraversion or Conscientiousness dimension of the FFM. Both dimensions are readily observable and may therefore result in higher self–peer agreement (e.g., Funder, 1995; Naumann, Vazire, Rentfrow, & Gosling, 2009; Vazire, 2010). Congruence levels of self- and peer-reported prototypes were very similar to those previously reported (Miller, Pilkonis, et al., 2004: $r = .47$; Lawton et al., 2011: $r = .46$). With regard to the method variance of both peer versus self-report and normal-range versus PD trait–specific items, it is not unexpected that correlations between the self-reported prototypes and informant-reported MAPP scores are lower (median $r = .24$) than those between self- and informant-reported prototypes.

4.2 | Detectability of personality disorder traits by acquaintances

In our sample, histrionic traits were associated with behaviors best described as exaggerating the expression of emotions, socially domineering, and cheerful. The finding that peer reports of histrionic PD traits were associated with observable interpersonal behaviors is consistent with previous work on informant agreement and the predictive value of peer reports for more extraverted forms of PD traits for Big Five profiles (Carlson et al., 2013). However, our findings are inconsistent with a previous study in which interview-based judgments of histrionic traits made by clinicians did not relate to behavioral patterns. In that study, subjects engaged in role-plays where they could show assertive behaviors across three different socially difficult situations (e.g., waitress brings wrong drink; Leising et al., 2006). Compared to Leising and colleagues' study, our situations put fewer constraints on participant behavior, and this difference may possibly explain why our findings diverge. More situational "degrees of freedom" may have opened spaces for behavioral displays linked to attempts of impression management typically associated with histrionic traits (e.g., dramatic, vivacious, enthusiastic, and flirtatious behaviors; APA, 2013). To examine this possibility, future research should examine behavior in a wider variety of settings; regrettably, direct behavioral observation remains relatively rare in psychological research (Baumeister, Vohs, & Funder, 2007).

Our findings somewhat diverge from theoretical perspectives that might have predicted internalizing traits to be much less observable than externalizing ones (Carlson et al., 2013). Schizoid and avoidant traits were perceived by informants and raters at levels of reliability comparable to histrionic traits, which are hyper-social and extremely externalizing. Potentially, distress (for both the target and the perceiver) associated with different PD traits may moderate their observability in addition to highly externalizing behavioral patterns (Yalch & Hopwood, 2016). Some traits might tend to bother people in a way that is not noticeable to others (e.g., paranoia linked to unconventional beliefs and circumstantial thinking, depersonalization, and derealization in schizotypal PD), whereas for other traits, intra- and interpersonal distress might be easily perceived (e.g., rejection associated with withdrawal in schizoid PD traits; Leising et al., 2006).

In the case of avoidant and schizoid PD traits, the trait–behavior profiles were similar, suggesting some shared but also unique behavioral features of each trait. Behavioral profiles associated with avoidant traits were more strongly characterized in terms of social anxiety, worry, unassertiveness, and attempts to overly accommodate others, potentially due to an extreme sensitivity toward negative evaluation. Schizoid traits, in contrast, were associated with lack of feeling and behaviors that were characterized as cold, aloof, irritable, socially disinterested, and potentially domineering.

Although PD traits are increasingly seen as extremes of normal-range personality, and even though internal consistencies were acceptable in our sample, it is important to note that PDs and related traits are not conceptualized as unidimensional, with one single profile that is valid for all individuals. Each PD is classically characterized by seven to nine criteria, of which a set minimum number (usually four to five) must be met for diagnosis. Consequently, high scores on a given PD trait could be obtained in many different ways, as could even the clinical diagnosis of a PD. For instance, borderline PD could be characterized as either someone with highly pronounced self-destructive tendencies or someone with extremely high aggressive potential in interpersonal encounters. Similarly, someone diagnosed with paranoid PD could be described as either someone with excessive sensitivity to interpersonal rejections along with a highly self-referential attitude, or someone highly suspicious who is preoccupied with unconfirmed conspiratorial explanations of events. Moreover, PD trait indicators vary in the degree to which they represent acute, dysfunctional behaviors that may resolve in shorter time periods (e.g., aggression, suicidality, ideas of reference) or long-standing maladaptive characteristics (e.g., rigidity, difficulty delegating, affective instability, feelings of social inadequacy; Clark, 2009). The heterogeneity of symptom duration may (additionally) affect behavioral expressions of PD traits across individuals, thereby limiting the validity of one single correlational profile across all participants. This, in turn, may partly illuminate why we did find strong and consistent behavioral correlates for some traits and less convincing correlates or none for others.

Nonetheless, our results were consistent in additional analyses based on self-reported PD prototypes: First, where statistically meaningful numbers of behavioral correlates emerged for informant-reported PD traits, they also did so for self-reported PD prototypes. Second, vector correlations between the behavioral profiles from the two sources were high, indicating that self-reported BFI-based PD prototypes yield similar behavioral correlates as peer-reported PD scale scores.

4.3 | Gender differences

Across genders, we found strong and somewhat surprising differences in the degree of association between PD traits and behavior, being stronger among male than female participants. While one possibility that might be suggested is that levels of trait variability differed across genders, therefore augmenting the number of correlates for males, this does not seem to be the case. As depicted in supplementary Figures S1a and S1b, the distributions of all informant-reported PD

traits are comparable between males and females. In fact, they overlap for the vast majority of PD traits for which significant amounts of behavioral correlates emerged (i.e., avoidant, borderline, narcissistic, paranoid, and schizoid).

In addition, we compared mean levels of both informant-reported PD traits and self-reported FFM-based PD prototypes across genders. Again, the differences across genders seem negligible for our analyses (Table 3) because most of the significant differences emerged for scales for which meaningful profiles of behavioral correlates failed to emerge (e.g., antisocial, dependent). However, informant-reported scores for dependent and histrionic PD traits were elevated in females. This finding taps neatly into a longtime debate about sex-biased diagnostic constructs and criteria of PD traits (Kaplan, 1983; Ross, Frances, & Widiger, 1995). Within this debate, some PD constructs have been characterized as "exaggerations of gender roles" (Rienzi & Scrams, 1991, p. 978) or even as "sexist characterizations of females or the feminine gender" (Widiger, 1998, p. 96). In particular, dependent and histrionic PDs appear to invoke social constructions of gender-stereotypic behaviors (Sprock, Blashfield, & Smith, 1990) that are "diagnosed as . . . disordered if the role is filled too well" (Rienzi & Scrams, 1991, p. 978). Therefore, it is possible that feminine behaviors are likely "unfairly pathologized" (Widiger, 1998, p. 114) within the *DSM*. Consequently, expressing typically feminine behaviors could lead to a diagnosis of PD, whereas typically male behaviors would not (Kaplan, 1983; see also Klonsky, Jane, Turkheimer, & Oltmanns, 2002).[3]

Two implications for our results arise from this analysis: First, higher values of informant-reported PD traits may be influenced by inherent sex biases of PD criteria. Social behavior expressed by females, therefore, appears to be unrelated to interpersonal perceptions of enhanced PD traits, explaining fewer behavioral correlates for males than females in our sample. Second, because male behavior, at a baseline, is less likely to be linked to PD traits (Slavney, 1984), even smaller behavioral deviations in males may be interpreted as PDs, leading to a higher number of behavioral correlates for males than females in our sample. However, disentangling these potential sources of bias and determining causes of observed gender differences in behavioral expressions of PDs will require skilled clinicians and multimethod assessments.

Past research has shown differences in manifestations of PDs for males and females that are likely—yet not entirely—attributable to sex-role socialization and associated constraints of behavioral expressions. The behavior of women is sometimes said to be more socially controlled due to developmental stereotyping (e.g., Lynam & Widiger, 2007). For example, females are more strongly reinforced for prioritizing the needs of others, which may train their awareness to recognize implicit social affordances. In line with this suggestion, women may express enhanced wariness and restraint, particularly in stressful social situations (e.g., Tomova, Von Dawans, Heinrichs, Silani, & Lamm, 2014), potentially as a means to meet implicit demands of the situation to maintain interpersonal relationships (e.g., Taylor et al., 2000). Female participants with marked histrionic personality features in our sample were perceived to exhibit social skills, such as being talkative and vivacious. Histrionic traits in males, in contrast, were associated with expressions of self-assurance (e.g., "appears to regard self as physically attractive").

Some PD traits are more congruent with male sex roles and therefore perhaps more socially acceptable in men; for instance, men in a general population sample report more borderline PD–associated traits, yet receive fewer diagnoses (Busch, Balsis, Morey, & Oltmanns, 2016). This finding mirrors the general notion of more prevalent externalizing disorders in boys compared to girls, potentially because boys are more likely reinforced for aggressive behavior (Kingsbury & Coplan, 2012). Accordingly, in our sample, males high in borderline PD traits were characterized by the appearance of emotionally dysregulated reactive-aggressive dominance (a somewhat externalizing behavior profile of dislike and criticism toward others, and physical signs of tension, irritation, and dissatisfaction). In a similar vein, obsessive-compulsive PD traits were associated with expressions of criticism and displays of condescendence and hostility, yet individuals high in obsessive-compulsive PD traits were frequently asked for advice by their group members.

5 | LIMITATIONS AND FUTURE DIRECTIONS

A comprehensive understanding of PDs and associated traits and behaviors can, we believe, be augmented by information from multiple acquaintances who observe how an individual interacts with others on a daily basis across diverse contexts. This is in line with a number of studies investigating the value of informant reports for the assessment of PD traits, which have come to conclude that the independent information provided by informants tells us something important about PDs that is not tantamount to that provided by the individual (Fiedler et al., 2004; Oltmanns et al., 2005), most likely because for many PDs, a lack of self-awareness is characteristic. We do acknowledge, however, that our study was limited to informant reports of PD traits without direct complementation by self-reports of PD traits (i.e., self-reports of the MAPP). It has been argued that informant reports of PD traits are less suitable than self-reports for the assessment of most internalizing PDs (i.e., PDs defined by high Neuroticism; Carlson et al., 2013). Thus, we have limited insight into how well both converge in our sample and how well self-reports of PD traits would relate to behavioral outcomes. The

provision of self-reports of PD prototypes, however, may have compensated (yet not fully eliminated) this shortcoming of our study. Beyond the use of self-reports of PD traits, this approach ensures that the shared variance is the result of substantive associations as opposed to methodological overlap.

Another restriction of our study that may warrant further attention in future studies, yet may not have limited the scope of our results, is that our informants and raters did not provide self-ratings of their personalities. Therefore, associations between specific biases in the perception of PD traits of each informant is limited (Srivastava, Guglielmo, & Beer, 2010; Wood, Harms, & Vazire, 2010). Averaging across two informant reports, however, may have reduced the influence of perceiver effects related to each informant (Hofstee, 1994). Relatedly, we did not include the measure of acquaintance level as a covariate in our analyses, an important moderator of the validity of informant reports for the assessment of PDs (Ambady, Bernieri, & Richeson, 2000; Letzring, Wells, & Funder, 2006). Our decision is based on the fact that variability levels in that variable were low (i.e., more than 70% of the informants were friends of the target subject), limiting the value and impact of those analyses.

Finally, our direct behavioral observation was limited to three laboratory situations in which participants engaged in unstructured, cooperative, or competitive interactions. This is an important aspect of this study, as direct behavioral observation is a difficult, expensive, and still relatively rare method of psychological research (Baumeister et al., 2007). However, it remains to be seen to what degree and how PDs might manifest in observable behavior in other settings that could vary in evocativeness, such as being stressful, threatening, or consequential. This is an important and indeed necessary direction for future research.

The present study explored the ability of ordinary acquaintances to detect PD trait expressions, as demonstrated by associations between their judgments of PD traits, self-reports of PD traits, and directly observed behavior. Although obvious parallels exist in the interpersonal perception literature of normal-range personality, and although our analyses were augmented by rigorous randomization techniques, the trait–behavior associations reported in this study need to be interpreted with caution because they arose from exploratory analyses. Therefore, future studies are warranted that systematically test predictions of trait observability in the context of personality pathology in independent, sufficiently large, and potentially clinically representative samples, following contemporary recommendations for replicable research (Asendorpf et al., 2013).

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CONFLICT OF INTERESTS

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

ENDNOTES

[1] N varies by analysis due to missing data per visit (unstructured: $N = 190$; cooperative: $N = 205$; competitive: $N = 211$). Missing data come from two sources: irrecoverable video recordings and participant nonattendance.

[2] Because these p-value levels are based on results from 10,000 randomized trials, ps of less than .0001 cannot be exactly computed and are denoted as $p < .0001$.

[3] Jane, Oltmanns, South, and Turkheimer (2007) conducted an item response theory analysis on diagnostic criteria of PDs derived from a clinical interview. While the authors did not find any gender biases for borderline, histrionic, and dependent PDs, they do note that it is still possible "that other sources of bias, including assessment and clinical bias (Widiger, 1998), are still at work in relation to these disorders. The results do show that the group means are higher in women than in men, an expected result considering the higher prevalence rate of these disorders for women" (p. 173).

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