Affective Science (2020) 1:117–127
https://doi.org/10.1007/s42761-020-00017-7

RESEARCH ARTICLE

Attachment and Borderline Personality Disorder: Differential Effects on Situational Socio-Affective Processes

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Received: 19 December 2019 / Accepted: 24 August 2020 / Published online: 18 September 2020

Abstract

Insecure attachment and borderline personality disorder (BPD) are defined by similar affective and interpersonal processes. Individuals diagnosed with BPD, however, represent only a subset of those described as insecurely attached, suggesting that attachment may hold broader relevance for socio-affective functioning. Based on a 21-day ecological momentary assessment protocol in a mixed clinical and community sample ($N = 207$) oversampled for BPD, we evaluate the discriminant validity of each construct as it influences daily interpersonal interactions. We find that insecure attachment is associated with elevated perceptions of interpersonal disaffiliation and maladaptive strategies for affect regulation, whereas enacted interpersonal hostility is more distinctive for BPD. In a series of sensitivity analyses, we further highlight potential caveats to these findings when studying both constructs concurrently. Together, our results suggest that both insecure attachment and BPD contribute to problematic affective and interpersonal processes, but that they do so at different stages of the unfolding social interaction, which has important implications for their maintenance and treatment.

Keywords Attachment · Borderline personality disorder · Ambulatory assessment · Multilevel structural equation modeling · Daily socio-affective processes

Perceptions of interpersonal disaffiliation, poor emotion regulation, and disrupted relationship experiences are central to both the construct of insecure attachment and the diagnosis of borderline personality disorder (BPD; Agrawal et al., 2004). Theoretical accounts of BPD emphasize the role of disrupted early relations in its etiology and progression (Meyer & Pilkonis, 2004; Linehan, 2018). However, only a subgroup of those described as insecurely attached develops symptoms of BPD (Lyons-Ruth et al., 2005), implicating partially, but not fully, overlapping interpersonal and affective liabilities (Levy & Blatt, 1999). To address this issue of conceptual redundancy, we evaluated the shared and distinctive contributions of insecure attachment and BPD features to socio-affective processes that characterize interpersonal interactions in daily life in a mixed clinical and community sample of adults.

Attachment theory (Bowlby, 1988) provides a conceptual framework to explain how experiences in close relationships contribute to generalized patterns of affect and cognition (Collins et al., 2004). Individual differences in attachment are organized along two dimensions—anxiety and avoidance. Theoretically, each attachment orientation is related to a distinct pattern of maladaptive interpersonal and affect-regulatory strategies, both of which increase the likelihood of negative affective experiences (Brennan et al., 1998). Together, these patterns may be understood as protective efforts to navigate relationships characterized by rejection and inconsistency (Putnam & Silk, 2005; Sadikaj et al., 2013), a notion that resonates with theories suggesting that core etiological mechanisms of BPD are shaped by an invalidating developmental environment (Fonagy et al., 2018; Linehan,

Handling Editor: David Almeida

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s42761-020-00017-7) contains supplementary material, which is available to authorized users.

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2018; Miskewicz et al., 2015). Research supports the relationship between the two, with ~ 90% of patients diagnosed with BPD being described as insecurely attached (Levy, 2005). However, because the defining features of BPD overlap conceptually and empirically with outcomes described by attachment theory (Brennan et al., 1998; Meyer et al., 2001), this observation appears to be tautological. Yet, insecure attachment is also found in many individuals from nonclinical samples (e.g., Ainsworth et al., 1978; Milyavskaya & Lydon, 2013). Estimates from community samples suggest that 55–65% of adults are securely attached, whereas 10–15% are avoidantly and 15–20% anxiously attached (Van IJzendoorn et al., 1992) with BPD constituting a small subset of those with insecure attachment (i.e., prevalence rates of ~ 1.5% in the general population; Lenzenweger et al., 2007).

Such epidemiological data support theoretical notions that insecure attachment is a vulnerability factor in the pathogenesis of BPD. However, efforts to arrive at conclusions about how attachment relates to BPD are complicated by methodological issues such as the diversity of attachment measures, the use of heterogeneous samples, and a reliance on cross-sectional study designs (Agrawal et al., 2004; Meyer et al., 2004).

As a way to address these limitations, Contemporary Integrative Interpersonal Theory of personality and psychopathology (Hopwood et al., 2019; Wright et al., 2020) provides an ideal framework for studying the shared and distinct contributions of insecure attachment and BPD to impairments in socio-affective functioning. Key to interpersonal theory is the assumption that individual differences are reflected in characteristic patterns of affective and behavioral processes arising during social interactions in response to perceived internal (i.e., mental construal) and external (i.e., proximal behavior of others) social cues (Kiesler, 1996; Wright et al., 2017). Previous work (Leary, 1957; Wiggins, 1991) has established two orthogonal dimensions that organize interpersonal perception and behavior and together form the interpersonal circumplex: agency (i.e., dominance vs. submissiveness) and communion (i.e., affiliation vs. quarrelsomeness). As an integrative model, interpersonal theory encompasses the mental representations central to attachment theory as well as the affective and interpersonal processes that define BPD. It also provides a neutral set of concepts to evaluate how distinct constructs affect the direction and strength of momentary interpersonal and affective processes, allowing investigators to avoid the conceptual circularity and confounding effects inherent in previous studies.

In the past, this framework has been applied to study interpersonal patterns in BPD and—to a lesser extent—insecure attachment orientations. For example, Sadikaj et al. (2013) found that perceptions of others' quarrelsome behavior (i.e., dissaffiliative behavior) predicted one's own quarrelsomeness and that this association was facilitated by negative affect. Importantly, relative to controls, individuals with a BPD diagnosis were more likely to respond to perceptions of quarrelsomeness with negative affect (although the ensuing link between negative affect and quarrelsome behavior was not specific to BPD). Others have investigated similar processes in BPD, generally demonstrating that individuals with a BPD diagnosis were more likely to perceive others as less benevolent on average, but also to respond to those perceptions with increased negative affect (Ebner-Priemer et al., 2015; Hepp et al., 2017).

Studies of insecure attachment and interpersonal processes in everyday life parallel those results. Sadikaj et al. (2011) examined the relationship between attachment and within-person changes in affect in response to perceptions of an interaction partner's agreeable behavior. Anxious and avoidant attachment orientations both enhanced the link between perceptions of another's less agreeable behavior and negative affect, albeit to different degrees. These specific results are consistent with previous findings suggesting that insecurely attached individuals describe their social interactions to be less satisfying and respond to perceptions of interpersonal coldness with heightened negative affect (Campbell et al., 2005; Gallo & Matthews, 2006; Kafetsios & Nezlek, 2002; Pietromonaco & Barrett, 1997).

Both sets of studies accord with theoretical models of BPD that emphasize sensitivity to rejection or coldness from others (Miskewicz et al., 2015). However, they also align with notions of heightened sensitivity to threat cues as described in insecure attachments in nonclinical samples (Levy et al., 2006a). The goal of the present study was to identify more clearly the shared and specific contributions of each construct to the behavioral and affective processes that may derail social interactions in daily life. To accomplish this aim, we examined the interpersonal and affective patterns relevant to two critical pathways: The momentary elevation of negative affect in response to perceptions of one's interaction partner (*interpersonal sensitivity*) and the unfolding interpersonal behavioral response (*behavioral reactivity*).

Method

All procedures were approved by the University of Pittsburgh institutional review board (Protocol 12030125).

Participants

Couples were recruited via flyers posted in psychiatric treatment clinics. Current outpatients were screened by phone for both BPD and any other personality disorder (PD) using the McLean Screening Instrument for BPD (Zanarini et al., 2003) and the Inventory of Interpersonal Problems PD Scales (Pilkonis et al., 1996). Patients were excluded from enrolling

in the study if they met criteria for a lifetime diagnosis of bipolar disorder or psychosis. Although the parent study included a total of 260 participants (i.e., 130 couples), not all participants provided the necessary data for inclusion in our study. Participants were excluded if they did not provide any Ecological Momentary Assessment (EMA) reports ($n = 8$), did not provide EMA reports about interpersonal interactions ($n = 42$), or did not finish reports on interpersonal situations ($n = 3$). Excluded participants did not differ from included participants on key variables of the study (e.g., age, gender, BPD severity; mean p value > .09). Thus, the final sample size for this study was 207 participants. These participants included slightly more females (54%) than males and were predominantly white (74%). The mean age was 30.5 (SD = 6.8), and $n = 43$ (21%) met the diagnostic threshold for BPD, with the majority of participants ($n = 146$, 71%) having at least one criterion. Due to missing data, sample sizes across models vary slightly.

Procedure

Following the baseline assessment where participants completed clinical interviews and self-report measures, they received a smartphone equipped with an application devised for this study and instructions for its use. Every day for 3 weeks, records of their setting, situation, mood, and interpersonal behavior were completed following every interpersonal interaction that lasted at least 10 min. As participants submitted responses, data were transferred to a secure database accessible to study staff via a virtual Web server. Enabling access to data in real time allowed study staff to monitor compliance daily. If a participant did not complete at least one interpersonal interaction record per day, study staff called the participant and assessed whether any interpersonal interactions had occurred that day and, if necessary, discussed and solved any technical or motivational issues. Participants were compensated $40 for completion of the interview, and up to $165 for completion of the ambulatory assessment. Rates of compliance were generally good: The average percent of days in which participants completed at least one entry was 84%, with an average of $M = 67$ interactions per participant.

Measures

Experiences in Close Relationships-Revised

The Experiences in Close Relationships-Revised (ECR-R) (Fraley et al., 2000) is a self-report measure of adult attachment that has been used and validated in BPD samples (Levy et al., 2005). It consists of 36 items, which measure romantic attachment along two dimensions: avoidance (18 items; for example, I prefer not to show a partner how I feel deep down) and anxiety (18 items; for example, I worry about being abandoned). Participants responded to each item using a 7-point scale from 1 ("strongly disagree") to 7 ("strongly agree"), rating the extent to which each item is descriptive of how they usually feel and behave in romantic relationships. Ratings were then averaged to compute scores for each dimension. High scores reflected more anxious and avoidant attachment orientations. Internal consistencies of both scales were excellent in our sample, with $\alpha = .91$ (95% CIs: 0.90; 0.91) for avoidance and $\alpha = .93$ (95% CIs: 0.93; 0.93) for anxiety.

Personality Disorder Features

Participants were interviewed using the Structured Interview for DSM-IV Personality (SIDP-IV; Pfohl et al., 1997). Interviewers rated each PD criterion on a scale ranging from 0 to 3. We operationalized BPD features as the dimensional sum of the BPD criteria scores; in a supplementary analysis (Table S3 and S4), we used the total of the remaining PD criteria as a covariate. To determine interrater agreement, video recordings of the SIDP-IV interviews from a sample of five participants were reviewed and scored independently by seven research team members (intraclass correlations: PD = .97; BPD = .90).

Momentary Interpersonal Behavior of Self and Other

The participant's interpersonal behaviors and the participant's perceptions of the other's behavior during the interaction were assessed using the Social Behavior Inventory (SBI; Moskowitz, 1994). The SBI is a checklist of 46 behavioral items (rated yes or no) designed to fit the structural model of the interpersonal circumplex used by Contemporary Integrative Interpersonal Theory (Wiggins, 1991). In line with Sadikaj (2013), participants responded to a checklist with a subset of 12 items to describe their own behavior during each interaction. These 12 behavioral items measured each of the four poles of the interpersonal circumplex (i.e., dominant vs. submissive; agreeable vs. quarrelsome). From these, we created two subscales corresponding to dominance (*Dominance = Dominant – Submissive*) and affiliation (*Affiliation = Agreeable – Quarrelsome*). Prior work has treated the four scales as separate, but we collapsed them based on theoretical grounds, and to reduce number of statistical models/tests, as we have done in our prior work (Wright et al., 2017). Participants rated their perceptions of the interaction partner's behaviors on a subset of 7 items that did not vary and that were scored similarly for dominance and affiliation. The proportion of between-person variance, calculated using the intraclass correlation, for the dominance dimension was .12 for perceived and .07 for enacted dominance, and for

the affiliation dimension was .16 for perceived and .17 for enacted affiliation.

Momentary Affect

Each electronic diary record presented 19 negative affect adjectives on a 5-point scale (1 = *very slightly or not at all*, 5 = *extremely*) from the Positive and Negative Affect Schedule-Extended version (PANAS-X; Watson & Clark, 1999).

Analytic Plan

We used multilevel structural equation modeling (MSEM) to test shared and specific contributions of insecure attachment and BPD on socio-affective processes in daily social interactions. MSEM can accommodate momentary events nested within persons and allows for the estimation of random effects (i.e., intercepts and slopes that vary across individuals). MSEM allows for the decomposition of the total variance of each within-person assessed variable into the latent between-person level variance and the within-person level residual variance (Fig. 1). This decomposition is done in a standard multilevel model when estimating a random intercept for an outcome/dependent variable, but like with single-level SEM, all variables can be either predictors or outcomes. Thus, in MSEM this latent decomposition is possible for all momentary variables in the model. The advantage is that this flexibility adjusts for differences in reliability of measurement across individuals who provide discrepant numbers of observations. In the current study, the between-person variance reflects individual differences in the observed variables, and the within-person variance reflects situation-to-situation departures from each individual's mean on these variables. Thus, the MSEM used in this study estimates separately the between-person portion of the model, which represents average associations among individual differences in observed variables collapsed across all situations (akin to cross-sectional designs), and the within-person level portion of the model, which represents associations among variables that fluctuate from situation-to-situation. Because all the modeled associations are among concurrently assessed variables and not lagged, this means that the within-person associations reflect situation-to-situation dynamic processes, but they do not directly establish temporal precedence.

All models were estimated in Mplus (version 8.3; Muthén and Muthén, 2019). Bayesian estimation based on the Gibbs sampler (Gelman et al., 2004) was used because it provides a true latent decomposition into within- and between-person variance for both the predictor and outcome variables when random effects are specified. Significance for all model parameters was based on 95% Credibility Intervals (CIs), with CIs that excluded zero indicative of a parameter that differed significantly from zero.

Figure 1 provides a diagram of the two key estimated models. As outlined above, literature suggests that sensitivity to interpersonal threat cues (*interpersonal sensitivity*) is amplified in BPD and insecure attachment (e.g., Meyer & Pilkonis, 2004; Sadikaj et al., 2013).

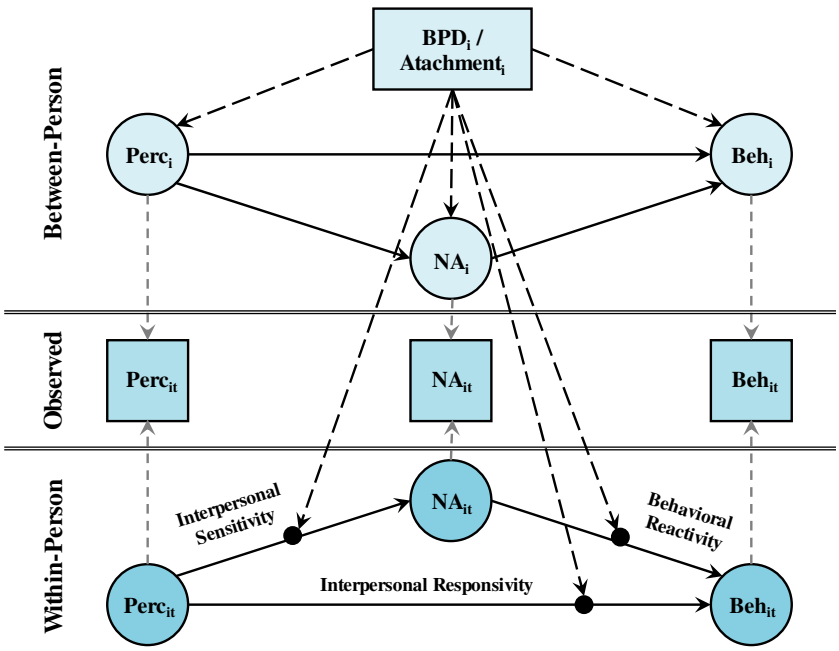

Fig. 1 Simplified diagram of the general framework of socio-affective processes as tested in multilevel structural equation models in this study. The lower and upper section depicts the latent decomposition of observed momentary variables into between-persons (subscript *i*) and within-person (subscript *it*) variance. The bottom panel depicts the within-person portion of the model, and the top panel depicts the between-persons portion of the model. Solid circles denote random slopes on within-person regression paths. *BPD* borderline personality disorder, *Beh* behavior, *Perc* perception, *NA* negative affect

Moreover, hostile *behavioral reactivity* in response to interpersonal perceptions is a key symptom of BPD, and similar—yet less severe—patterns are also observed in insecurely attached individuals (Brennan et al., 1998; Linehan, 2018). In model set 1, we examined *interpersonal responsivity* and *behavioral reactivity* at the within-person level in an unconditional model with no substantive between-person predictors of individual differences in the within-person paths, thereby serving as a baseline for interpreting subsequent effects. *Interpersonal responsivity* refers to the prediction of one's own situational behavior by momentary perceptions of other's behavior, and *behavioral reactivity* to the prediction of one's own momentary behavior by momentary negative affect. At the same time, model set 1 also regressed ratings of momentary negative affect on momentary perceptions of the other's behavior, a path we referred to as *interpersonal sensitivity* (see Fig. 1 for an overview of momentary within-person links). Importantly, negative affect was situated as an intervening variable to account for the associations between perceptions of others' and one's own behavior. Within-person regression paths were estimated as randomly varying across individuals. At the between-person level, the average of one's own behavior was regressed on average negative affect and perceptions of others', while negative affect was additionally regressed on perceptions of others'.

In a subsequent step (model set 2), we introduced insecure attachment and BPD features as joint moderators of individual differences in all within-person paths, as well as predictors of individual differences in interpersonal perceptions, negative affect, and one's own behavior.

To determine the robustness of our analyses, we examined the extent to which our results would be affected by theoretically plausible alterations of the operationalization of between-person level effects. These sensitivity analyses are summarized in Table 4 and detailed in the supplementary files. Full model specifications can be found at https://osf.io/k5pxc/. Model set 2a tested attachment and BPD as between-person predictors in two separate models. This modeling decision is based on the observation that insecure attachment and BPD empirically overlap, and it allowed us to assess each predictor's separate predictive validity. Model set 2b examined the differential contribution of the two attachment dimensions. Therefore, we entered anxious and avoidant attachment independently as between-person predictors in two separate models. Finally, to further isolate the specific effects of anxious or avoidant attachment and BPD, and parse out variance attributable to general interpersonal dysfunction, model set 2c included a covariate that was calculated as the sum of the remaining PD features to adjust for general interpersonal functioning (PD; model set 2c).

Sex and age (centered on mean age) were also included as covariates in all models at the between-person level, and observation number (i.e., time centered on mean of observations) was included as a within-person covariate (see Wright et al. [2017] for a similar approach).

Coefficients for covariates will not be presented for parsimony. Along with other parameters not reported in the tables (e.g., residual variances), covariances among between-person variables are not depicted in the diagrams, but full specifications and detailed output from all models can be found online at https://osf.io/de246/. Table 1 summarizes pooled within-person correlations among the variables along with correlations among the random intercepts at the between-person level.

Results

Model Set 1: Momentary Socio-Affective Processes

We first tested whether perceptions of others' behavior and one's own behavior were associated (i.e., within-person interpersonal responsivity path), and whether negative affect could account for this link. The results of this model are presented on the left side of Table 2. We found that perceptions of others' lower affiliation significantly predicted higher negative affect (i.e., *interpersonal sensitivity* within-person path), and higher negative affect significantly predicted lower affiliative behavior (i.e., *behavioral reactivity* within-person path). The indirect effect was significant, yet the direct association (i.e., *interpersonal responsivity* within-person path) remained significant as well, suggesting negative affect only partially accounted for the within-person link between perceptions of affiliation and one's own affiliative behavior. When predicting one's own dominant behavior from perceptions of affiliation, we found a significant but modest direct effect, but negative affect did not significantly account for this association. Specifically, though perceptions of less affiliation by others predicted more negative affect (*interpersonal sensitivity* within-person path) as was the case in the prior model given it is the same path, negative affect did not predict dominant behavior (*behavioral reactivity* path; right side of Table 2). Across both model specifications, significant between-person main effects of perceptions of others' behavior ($Perc_i$), one's own behavior (Beh_i), and negative affect (NA_i) indicate that those variables varied significantly across participants, suggesting that individual differences (i.e., PD, BPD, insecure attachment) may account for these variation patterns (see model set 2).

Table 1 Descriptive statistics and correlations at the between-person and within-person level

Correlations	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Negative Affect	–	-.02	**-.27**	**.15**	**-.31**					
2. Self-dominance	-.02	–	**-.15**	-.03	.08					
3. Self-affiliation	**-.20**	-.11	–	-.08	**.34**					
4. Other dominance	.08	-.01	-.03	–	**-.22**					
5. Other affiliation	**-.27**	.12	.40	**-.15**	–					
6. BPD features	.09	-.03	-.14	-.09	-.09	–				
7. avoidant attachment	**.20**	-.07	**-.15**	**-.18**	**-.18**	**.38**	–			
8. anxious attachment	**.19**	-.05	-.10	-.02	-.10	**.49**	**.48**	–		
9. age	-.06	.05	-.03	-.05	-.04	.02	.03	-.06	–	
10. sex	.03	.03	-.00	.03	.06	**.21**	-.01	**.19**	**-.20**	–
Descriptives										
M / % female	0.27	0.46	0.83	0.37	0.80	3.75	2.65	3.37	30.53	~54%
SD	0.48	1.23	1.13	0.80	0.88	4.03	0.92	1.28	6.79	

Person-level $N = 207$; momentary-level $N = 11{,}024$, 0 = male, 1 = female; between-persons correlations are reported *below* the diagonal; within-person correlations are shown *above* the diagonal. Values in bold are those for which the credibility interval did not contain zero

BPD borderline personality disorder

Model Set 2: Moderation of Momentary Socio-Affective Processes by Insecure Attachment and BPD

Next, we tested whether insecure attachment features moderated the three within-person paths described above. Individual differences in the strength of the *interpersonal sensitivity*, *behavioral reactivity*, and *interpersonal responsivity* paths were regressed on insecure attachment features as well as BPD, as were the intercepts of interpersonal perceptions, one's own behavior, and negative affect.

Neither insecure attachment nor BPD features had an effect on the interpersonal sensitivity path when both were included in the model. However, both insecure attachment and BPD features moderated the behavioral reactivity within-person path (link between negative affect and affiliative behavior; left side of Table 3). Specifically, while insecure attachment dampened the negative association (i.e., made it weaker) between negative affect and affiliative behavior, BPD features amplified this same relationship. In addition, we found that insecure attachment was associated with higher negative affect and perceptions of lower affiliation in others at the between-person level, whereas BPD features were associated with lower affiliative behavior.

Table 2 Model set 1: key coefficients from multilevel models accounted for by negative affect (na)

	Perceived affiliation → affiliative behavior		Perceived affiliation → dominant behavior	
	Est	β (95% CIs)	Est	β (95% CIs)
Between-person				
Beh_i	.168	.143 (− .162, .496)	*.274*	*.828* (*.359*, *1.317*)
NA_i	*.257*	*.878* (*.709*, *1.041*)	*.816*	*.874* (*.702*, *1.037*)
$Perc_i$	*.817*	*2.304* (*2.011*, *2.604*)	*.257*	*2.303* (*.023*, *2.613*)
$Perc_i \rightarrow Beh_i$	*.953*	*.715* (*.622*, *.787*)	*.290*	*.310* (*.144*, *.459*)
$NA_i \rightarrow Beh_i$	.073	.045 (− .065, .154)	− .153	− .135 (− .285, .014)
Within-person				
Interpersonal sensitivity	− *.128*	− *.278* (− *.299*, − *.256*)	− *.129*	− *.279* (− *.300*, − *.256*)
Behavioral reactivity	− *.614*	− *.196* (− *.222*, − *.171*)	− .031	− .005 (− .034, .021)
Interpersonal responsivity	*.351*	*.268* (*.247*, *.288*)	*.136*	*.094* (*.071*, *.115*)
Indirect effect	*.084*	(*.063*, *.107*)	− .013	(− .032, .005)

Except for the indirect effect, CIs refer to standardized βs which allow comparability across coefficients, while unstandardized coefficients allow to interpret intercepts of our models. Standardizations are derived from MPlus based StdYX parameters, which are done to unit variance. Therefore, the intercept is not zero. The standardized intercept reflects the intercept divided by the model-estimated SD of the dependent variable. $N = 207$; momentary-level $N = 11{,}519$; values in italics are those for which the credibility interval did not contain zero

Perc. perceived affiliation or dominance, *Beh*. affiliative or dominant behavior

Table 3 Model set 2: moderation of momentary socio-affective processes by insecure attachment and BPD

	Perceived affiliation → affiliative behavior		Perceived affiliation → dominant behavior	
	Est.	β (95% CIs)	Est.	β (95% CIs)
Between-person				
$Perc_i$ → Beh_i	*.957*	*.714* (*.610*, *.796*)	*.285*	*.282* (*.097*, *.448*)
NA_i → Beh_i	.129	.081 [− .036, .195)	− .133	− .113 (− .272, .075)
IA → Beh_i	− .001	− .002 [− .100, .099)	− .006	− .024 (− .160, .111)
BPD → Beh_i	− *.023*	− *.140* (− *.237*, − *.044*)	.002	.015 (− .119, .143)
IA → NA_i	*.051*	*.240* (*.125*, *.345*)	*.051*	*.240* (*.126*, *.349*)
BPD → NA_i	.000	.005 (− .117, .131)	.001	.006 (− .116, .132)
IA → $Perc_i$	− *.074*	− *.290* (− *.394*, − *.170*)	− *.074*	− *.290* (− *.394*, − *.170*)
BPD → $Perc_i$	− .004	− .033 (− .16, .091)	− .004	− .033 (− .161, .091)
Within-person				
Interpersonal sensitivity	− *.052*	− *.269* (− *.293*, − *.248*)	− .048	− .270 (− .292, − .248)
Behavioral reactivity	− *1.016*	− *.196* (− *.223*, − *.169*)	.056	.000 (− .030, .033)
Interpersonal responsivity	*.421*	*.271* (*.252*, *.289*)	.082	.423 (− .318, 1.264)
Indirect effect	.058	(− .011, .142)	− .016	(− .049, .010)
Cross-level interaction				
IA → interpersonal sensitivity	− .012	− .130 (− .255, .003)	− .012	− .133 (− .258, .003)
BPD → interpersonal sensitivity	.001	.022 (− .117, .160)	.001	.026 (− .114, .159)
IA → behavioral reactivity	*.085*	*.245* (*.069*, *.398*)	− .016	− .059 (− .278, .168)
BPD → behavioral reactivity	− *.030*	− *.182* (− *.332*, − *.011*)	*.027*	*.215* (*.005*, *.421*)
IA → interpersonal responsivity	− .016	− .128 (− .289, .044)	.024	.165 (− .013, .329)
BPD → interpersonal responsivity	− .001	− .025 (− .210, .150)	− *.018*	− *.271* (− *.447*,-*.076*)

Except for the indirect effect, CIs refer to standardized βs which allow comparability across coefficients, while unstandardized coefficients allow to interpret intercepts of our models. Person-level: $N = 198$; momentary-level $N = 11{,}519$; values in italics are those for which the credibility interval did not contain zero

IA insecure attachment, *BPD* borderline personality disorder, *Perc* perceptions, *Beh* behavior

In addition to those findings, for dominant behavior (right side of Table 3), BPD features dampened the positive link between perceptions of other affiliation and dominant behavior (interpersonal responsivity) and amplified dominant behavioral reactivity to negative affect.

Sensitivity Analyses

To check the robustness and clarify the interpretation of the observed effects, we examined the extent to which results from model 2 were affected by a series of changes in model specification at the between-person level.

Model Set 2a

To clarify further the nature of effects observed in model 2, we re-ran the model twice, (a) once without the inclusion of BPD symptoms as a predictor and (b) once without the inclusion of insecure attachment (i.e., we ran two separate models). These analyses yielded a significant negative moderation of interpersonal sensitivity by insecure attachment, along with a positive between-person effect on negative affect and a negative between-person effect on perceptions of others' affiliation. Similar, but weaker, effects emerged for BPD for individual differences in negative affect and perception. In addition to these findings, a negative between-person effect on own affiliative behavior emerged, whereas BPD did not moderate any of the three within-person paths outlined in Fig. 1 (see Table 4).

For dominant behavior, our analyses yielded a negative moderating effect of insecure attachment on interpersonal sensitivity as with the prior models above, whereas BPD only negatively moderated the path of interpersonal responsivity.

Model Set 2b

We next examined Model 2 by decomposing insecure attachment into its constituent dimensions of anxiety and avoidance and entering both separately into two independent models.

Table 4 Overview of key estimates of model set 2 across sensitivity analyses

	Perceived Affiliation → Affiliative Behavior							Perceived Affiliation → Dominant Behavior						
	2	2a		2b		2c		2	2a		2b		2c	
		ATT	BPD	ANX	AVO	ANX	AVO		ATT	BPD	ANX	AVO	ANX	AVO
between-person														
ATT→Beh_i	/	/		/	/	/	/	/	/		/	/	/	/
BPD→Beh_i	-		-	-	-	/	/	/		/	/	/	/	/
PD→Beh_i						/	/						/	/
ATT→NA_i	+	+		+	+	+	+	+	+		+	+	+	+
BPD→NA_i	/		+	/	/	-	-	/		+	/	/	-	-
PD→NA_i						+	-						+	+
ATT→$Perc_i$	-	-		-	-	-	-	-	-		-	-	-	-
BPD→$Perc_i$	/		-	/	/	-	/	/		-	/	/	-	/
PD→$Perc_i$						/	/						/	/
cross-level interaction														
ATT→Interpersonal Sensitivity	/	-		/	/	-	/	/	-		/	/	-	/
BPD→Interpersonal Sensitivity	/		/	/	/	/	/	/		/	/	/	/	/
PD→Interpersonal Sensitivity						/	/						/	/
ATT→Behavioral Reactivity	+	/		+	+	/	+	/	/		/	/	/	/
BPD →Behavioral Reactivity	-		/	/	/	-	-	+		/	+	+	/	/
PD→Behavioral Reactivity	/					/	/						/	/
ATT→Interpersonal Responsivity	/	/		/	/	/	/	/	/		/	/	/	/
BPD→Interpersonal Responsivity	/		/	/	/	/	/	-		-	/	-	-	-
PD→Interpersonal Responsivity						/	/						/	/

List of moderators across model sets: model 2: ATT and BPD as joint moderators; model 2a: IA and BPD as separate moderators in two independent models; model 2b: ANX and AVO as separate moderators in two independent models, each together with BPD; model 2c: like 2b, but amended by a PD control variable. Cells that are grayed out indicate that parameters were not estimated

BPD borderline personality disorder, *PD* general personality pathology (i.e., the sum of PD features except for BPD), *ATT* attachment, *ANX* anxious attachment, *AVO* avoidant attachment, *Beh* behavior, *Perc* perception, *NA* negative affect

+Indicates a significant positive

−A significant negative effect

/A nonsignificant effect

The pattern of results remained largely the same for each dimension of attachment. Anxious and avoidant attachment were positively associated with individual differences in the negative affect, and BPD features evidenced a significant negative between-persons association with affiliative behavior. Both anxious and avoidant attachment orientations positively moderated the link between negative affect and own affiliative behavioral reactivity. BPD, in contrast, had no moderating effect on any of the paths in our model (Table S1).

For dominant behavior (Table S2), we found that BPD amplified the link between negative affect and one's own dominance (i.e., behavioral reactivity) as well as the link between perceived affiliation and dominance (i.e., interpersonal responsivity), but only when entered jointly with avoidant attachment.

Model Set 2c

After adding all other PD features to our set of predictors, anxious attachment moderated the interpersonal sensitivity path, whereas BPD moderated affiliative behavioral reactivity. When BPD was entered jointly with avoidant attachment, both moderated the behavioral reactivity path, yet in different directions (i.e., avoidant: positively; BPD: negatively).

When predicting dominant behavior from perceived affiliation, anxious attachment continued to enhance affiliative interpersonal sensitivity, whereas BPD dampened the interpersonal responsivity link between perceptions of other affiliation and own dominant behavior. When entered together with avoidant attachment orientations, only BPD negatively moderated the interpersonal responsivity link. PD, in contrast, had no additional moderating influence on any of the paths.

Also, because it can be argued that the effects of attachment should be most pronounced within the context of situations that activate the attachment system, such as those involving close relationship partners (e.g., Sadikaj et al., 2011), we controlled for interactions occurring between both partners. Moreover, controlling for interactions within couples had no impact on the pattern of results.

Note that including the effects of attachment orientation and BPD simultaneously in models reveals their potentially unique effects, but not the effect of their common variance. Thus, to examine the impact of what these constructs *share* on socio-affective functioning in daily life, we modeled in an exploratory analysis a latent, between-person factor comprising the pooled variance of insecure attachment orientations and BPD features. This analysis revealed a positive between-person effect on negative affect and a significant negative effect on perceptions of the other's affiliative and own affiliative behavior. Neither effects for own dominant behavior nor cross-level interaction effects emerged.

Discussion

BPD and insecure attachment orientations are characterized by similar socio-affective processes: Patients diagnosed with BPD, but also individuals described as insecurely attached, are inclined to perceive interpersonal situations negatively and exhibit stronger negative affect in response, potentially resulting in maladaptive interpersonal behavioral responses. Using Contemporary Integrative Interpersonal Theory's notion of the interpersonal situation as context (Hopwood et al., 2019), we evaluated the discriminant validity of BPD and attachment for socio-affective processes (*interpersonal sensitivity* and *responsivity*, *behavioral reactivity*) in daily social interactions.

Across a series of sensitivity analyses (Table 4), BPD features were reliably related to less affiliative interpersonal behavior, whereas insecure attachment was more consistently related to amplified experiences of negative affect in interpersonal situations and less affiliative perceptions of others. Regarding cross-level interactions, the pattern of results was more ambiguous because it varied as a function of modeling decisions.

The distinctive outcomes most relevant to BPD features emerged in the context of dominant behavior, where the *behavioral reactivity* and *interpersonal responsivity* paths were moderated by BPD. Specifically, the generally negative association between perceived affiliation and dominant behavior was less pronounced in people diagnosed with BPD, whereas the positive link between negative affect and dominant behavior was amplified in the same group.

In line with the main effects reported above, the distinctive outcomes most relevant to insecure (particularly anxious) attachment emerged in the *interpersonal sensitivity* path. However, across sensitivity analyses, this cross-level interaction effect only emerged when insecure attachment was entered as the only predictor, or in combination with general PD features. Overall, our finding that perceptions of others' disaffiliation and negative affect were more strongly pronounced in insecurely attached individuals mirrors previous work by Sadikaj, et al. (2011). It is also consistent with theoretical work emphasizing the role of invalidating relationship experiences for the development of heightened emotional sensitivity in BPD (Linehan, 2018). Complementing previous findings by Sadikaj et al. (2011), however, we further demonstrated that when controlling for BPD features, the moderating effect of insecure attachment on the within-person *interpersonal sensitivity* link disappeared. Across sensitivity analyses, this effect only appeared when insecure attachment was entered without BPD (model 2a), or when controlling for general PD (model 2c).

The path most difficult to interpret for both constructs was the within-person disaffiliative *behavioral reactivity* path (left side of Table 4), which was moderated by both insecure attachment and BPD, albeit to different degrees and in different directions. Whereas BPD dampened the association between perceived affiliation and own affiliative behavior, insecure attachment enhanced this link. Because this effect was variable across sensitivity analyses (left side of Table 4), it needs to be interpreted with caution. Importantly, the effect did not emerge when we entered insecure attachment or BPD as single predictors. Therefore, it is possible, that when controlling for the overlapping features in each construct, the remaining variance may have caused a spurious suppression effect. However, using a latent variable to isolate BPDs and IAs shared variance only had significant effects on individual differences, not the cross-level interactions. Overall, these supplementary analyses offer further evidence that both insecure attachment and BPD contribute to challenging affective and interpersonal processes, but that they do so at different stages of the unfolding social interaction.

Our findings also diverge somewhat from previous work. In contrast to Sadikaj et al. (2013), who reported an effect of BPD features on the relationship between perceived quarrelsome behavior and negative affect, the pattern in our analyses consistently suggests no role of BPD features in moderating that momentary association. Our results may diverge due to methodological differences. For example, we applied a dimensional approach to operationalizing BPD, and Sadikaj et al. (2013) used an extreme-groups design (BPD patients vs. healthy controls). Sampling extremes of the BPD severity distribution leads to the exclusion of its central portions, and the results in enhanced power for statistical tests (e.g., Preacher et al., 2005).

We acknowledge that sampling may also have had an effect on our results. Our data were drawn from a study designed primarily to study BPD, 43 of the participants met diagnostic threshold for BPD, and others had subthreshold BPD. Thus, patients in this sample were more prone to dysregulation and insecure forms of attachment than healthy community samples. At the same time, this higher base rate likely increased the power of our analyses to detect meaningful discriminant validity between the constructs. While we view this as a strength, this same study design should be repeated in nonclinical samples. Moreover, for all personality disorders, relationship experiences and enhanced affective reactivity play a significant role in their etiology and maintenance (e.g., Wright et al., 2017). Thus, future studies with distinct (clinical) sample compositions should test the transdiagnostic validity of our results for other psychopathologies.

Finally, it is important to note that SIDP-IV questions specifically encourage respondents to talk about usual behaviors and long-term aspects of social functioning by prompting them to "remember what you are like when you are your usual self." This emphasis on behavior, in comparison with the emphasis on worries and feelings throughout the ECR-R items,

may have amplified the conceptual distinction between the two constructs assessed in this study.

Beyond novel insights into key distinctive socio-affective features of attachment and BPD, our research underscores the crucial role that attachment has on the exacerbation and maintenance of BPD. Given the differences in prevalence rates, with BPD accounting for just a fraction of those described as insecurely attached, future research might focus on general processes of modifying relational templates as a potential mechanism for preventing the development of full-blown BPD under circumstances of elevated insecure attachment. In the past, experiences in close relationships have been recognized as putative mechanisms of change (Fonagy et al., 2002; Levy et al., 2006b).

In our study, insecure attachment orientations predicted greater interpersonal negativity and affective dysregulation as well as their association in daily social interactions when compared with BPD features. This is a critical finding, given that the co-occurrence of strongly felt emotions, together with the inability to tolerate such affect, has been recognized as a perpetuating factor in BPD (Linehan, 2018). Our analyses also strengthen the notion that BPD features relate more strongly than insecure attachment to hostile interpersonal behaviors that emerge from perceived hostility and invalidation (e.g., Critchfield et al., 2004; Scott et al., 2014).

In summary, this study provides a comprehensive model of how insecure attachment operates to predispose individuals to enhanced negativity towards social environments and maladaptive affect-regulatory strategies, whereas enacted interpersonal hostility may be more reflective of BPD in the context of insecure attachment.

Additional Information

Funding This research and the efforts of the authors were supported by grants from the National Institute of Mental Health (R01 MH056888, Pilkonis; L30 MH101760, Wright; K01 MH109859, Beeney; K01 MH101289, Scott). The opinions expressed are solely those of the authors and not those of the funding source.

Data Availability The study reported in this article was not formally preregistered. All data and materials have been made publicly available via the Open Science Framework (OSF) and can be accessed at https://osf.io/de246/.

Conflict of Interests The authors declare that they have no conflicts of interest.

Ethical Approval All procedures were approved by the University of Pittsburgh Institutional Review Board (Protocol #12030125).

Informed Consent Informed consent were obtained after a detailed study explanation.

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