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Mating strategies and experience of early adversity in female patients with Borderline Personality Disorder: Insights from Life History Theory

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Highlights

- Borderline Personality Disorder (BPD) is characterized by a “fast” life history strategy.
- People with BPD tend to show less parental investment and engage in sexual relationships earlier than controls.
- The experience of early adversity seems to predispose to the choice of faster life history strategies.
- Depressiveness plays a significant role in mate choice, suggesting nonrandom mating in BPD.

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Abstract

Borderline personality disorder (BPD) is a psychiatric condition which severely affects psychological well-being. Etiological explanations of BPD include the experience of early adversity, but how this impacts on risk-taking and impulsivity in relation to sexuality and mating has remained elusive. Here, we tested the hypothesis that people with BPD adopt a “fast” life history strategy which impacts their mate choice and sexual behavior.

Sixty female patients with BPD and 45 controls were given 3 hypothetical vignettes depicting a “Predictably Safe”, an “Unpredictably Safe-Risky”, and a “Predictably Risky” life conditions, requiring the participant to put herself imaginatively into the described situation. Participants also completed questionnaires about their psychosexual development, depressiveness, and childhood experiences.

Patients with BPD were significantly more likely to expect less parental investment from their hypothetical partners in the predictably safe condition, and to consent to sexual affairs at an earlier age than controls. Correlation analyses suggest that subjective depressiveness, childhood trauma, rearing style of patients’ parents, and actual psychosexual development impacted on mate choice in the hypothetical scenarios. In addition, findings may also corroborate ideas of nonrandom mating in patients with BPD, which may be taken into consideration when interpersonal difficulties with romantic partners are dealt with in psychotherapy.

Key words: Borderline Personality Disorder; Life History Theory; nonrandom mating; childhood trauma; parental rearing style; risk-taking; interpersonal behavior.

1. Introduction

Borderline personality disorder (BPD) is characterized by difficulties in emotion regulation, heightened impulsivity and risk-taking, fluctuations in self-schema, and problems with maintaining trustful interpersonal relationships (American Psychiatric Association, 2013). Self-injurious behaviors occur in over 60% of people with BPD, and the suicide risk, as well as general mortality among people with BPD is markedly increased (Soloff, Lis, Kelly, Cornelius, & Ulrich, 1994; Kjaer, Biskin, Vestergaard, & Munk-Jørgensen, 2015). In consideration of such substantial health risks and reports of prevalence rates of BPD of up to 6% in the general population (Grant, Chou, Goldstein, Huang, Stinson, Saha, & Ruan, 2008), it is imperative and therapeutically meaningful to achieve a comprehensive understanding of the development of BPD.

Biopsychosocial frameworks such as Linehan's (1993) biosocial theory of BPD posit that individuals who grew up experiencing considerable emotional invalidation by caregivers or significant others in general during the early years of their lives and who already possessed a biological predisposition toward hyperactivity and hyperarousal, may be at risk of emotion dysregulation, a key driver postulated to be instrumental in the subsequent progression toward BPD (reviewed in Cavazzi & Becerra, 2014). Data from a host of empirical studies have generally endorsed the main tenets of the biosocial theory (e.g., Arens, Grabe, Spitzer, & Barnow, 2011; Chapman, Leung, & Lynch, 2008; Sauer & Baer, 2010). In addition, neuroimaging studies have highlighted deviant emotion processing in BPD (e.g., Driessen, Hermann, Stahl, Zwaan, Meier, Hill, & Petersen, 2000; Whittle, Chanen, Fornito, McGorry, Pantelis, & Yücel, 2009), while other research has focused on the role of neurotransmitters such as serotonin (e.g., Norra, Mrazek, Tuchtenhagen, Gobbelé, Buchner, Saß, & Herpertz, 2003; Ni, Sicard, Bulgin, Bismil, Chan, McMMain, & Kenneldy, 2006) or neuropeptides (Stanley and Siever, 2010; Bertsch, Schmidinger, Neumann, & Herpertz, 2013; Cicchetti,

Rogosch, Hecht, Crick, & Hetzel, 2014; Brüne, 2016), as well as genetic contributions to BPD (Distel, Trull, Derom, Thiery, Grimmer, Martin, & Boomsma, 2008; Ni, Sicard, Bulgin, Bismil, Chan, McMain, & Kennedy, 2007; reviewed in Amad, Ramoz, Thomas, Jardri, & Gorwood, 2014).

However, several issues concerning BPD need to be reframed in a broader theoretical context. For example, it seems to be problematic to view BPD as a clinical syndrome with identifiable brain lesions (e.g., Whalley, Nickson, Pope, Nicol, Romaniuk, Bastin, Semple, McIntosh, & Hall, 2015), particularly in light of observations suggesting that interpersonal difficulties of patients with BPD are less prevalent outside emotionally challenging situations, and that over time many patients experience a substantial reduction in self-mutilating behavior and impulsivity (Zanarini, Frankenburg, Henne, & Silk, 2003). In addition, in contrast to most psychiatric conditions with an “organic” basis, BPD does not worsen with increasing age, which warrants an explanation. This does not challenge neurobiological approaches to BPD *per se*, but specifically one-sided interpretations in favor of a “defect” model of BPD. Finally, both risk-taking behavior and depression are key features of BPD, whereby people with depression are usually risk-averse, rather than risk-prone, the latter being a typical feature of BPD (Smoski, Lynch, Rosenthal, Cheavens, Chapman, & Krishnan, 2008). Brüne (2016) has therefore proposed a model of BPD based on behavioral ecology (i.e. Life History Theory), which integrates biological and behavioral research into a coherent picture of BPD (Brüne, 2016).

1.1. Perspectives from Life History Theory

Based on both Chisholm’s (1996) attachment model and Belsky, Steinberg, & Draper’s (1991) “evolutionary theory of socialization”, an evolutionary approach of BPD suggests that the condition is an extreme version of a series of adaptive responses that are activated via an unconscious evaluation early in life of resources in one’s future environment (Brüne, Ghiassi,

& Ribbert, 2010; Brüne, 2016). Such a formulation is grounded on the principles of Life History Theory (LHT), an evolutionary framework which posits that living organisms (including humans) adopt a “faster strategy” (e.g. achieving puberty and attempting to mate and propagate one’s genes more swiftly, at the expense of investing resources in development and long-term survival) when faced with severe difficulties and uncertainty in their early environments, and vice versa (Ellis, Figueredo, Brumbach, & Schlomer, 2009; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2011; Griskevicius, Tybur, Delton, & Robertson, 2011). A LHT approach has recently been introduced by Del Giudice (2015) to frame psychopathological conditions along a continuum ranging from fast to slow life history strategies. Accordingly, a faster strategy appears to characterize several symptoms of BPD, including impetuosity, a tendency toward unrestricted sociosexuality, and having multiple mating partners (Brüne, 2014, 2016).

Indeed, consistent with a faster life-history strategy, persons with BPD have been shown to have sexual intercourse with a considerably higher number of different persons (Sansone, Lam, & Wiederman, 2011), and tend to be at a higher risk of getting pregnant during their youth and of bearing more children compared to their healthier counterparts (De Genna, Feske, Larkby, Angiolieri, & Gold, 2012). Moreover, in accordance with a LHT approach, a substantial proportion of people with BPD have experienced severe adversity early in their lives (e.g. Bandelow, Krause, Wedekind, Broocks, Hajak, & Rüther, 2005; Hurlbert, Apt, & White, 1992; Zonarini, Gunderson, Marino, Schwartz, & Frankenburg, 1989).

1.2. Hypotheses

This study sought to further examine the relevance of LH strategies in delineating BPD. Specifically, we were interested in the question how people with BPD – compared to psychologically healthy individuals – would respond to hypothetical scenarios that differed in

terms of domains that are directly relevant to the selection of an individual's LH strategy (e.g., parental investment, timing of first sexual intercourse, and mating strategies). To this end, we adopted a methodological approach developed by Cohen and Belsky (2008) who designed the "Birkbeck Mating Questionnaire" (BMQ; Cohen, 2004), which consists of three hypothetical scenarios reflecting different degrees of resource availability. The three vignettes describe a "predictably safe", a "predictably unsafe" and an "unpredictably safe-risky" situation based on the availability of resources including an individual's hypothetical education/income level, employment status, relationship status, as well as some physical and psychosocial aspects of the neighborhood, work and home environments.

We predicted that patients with BPD would differ from unaffected controls in that they chose (no conscious decision implied!) "faster" LH strategies, which might become particularly overt in the "predictably safe" condition, where unaffected controls would be more likely to more often choose "slow" LH strategies. Moreover, we hypothesized that preferences for mates, willingness to have sexual intercourse and investment in own offspring would depend on patients' early experiences including parents' (invalidating) rearing styles and history of traumatic events.

We further considered the possibility that "assortative mating" could impact on our results. This idea originated from two sources of evidence. One concerns research reports suggesting that assortative mating, that is, mate choice based on similarity in psychological traits, is present in people with psychiatric conditions (Maes, Neale, Kendler, Hewitt, Silberg, Foley, Meyer, Rutter, Simonoff, Pickles, & Eaves, 1998). This has foremost been shown for individuals with affective disorders, anxiety disorder or substance abuse (reviewed in Mathews and Reus, 2001; Nordsletten, Larsson, Crowley, Almqvist, Lichtenstein, & Mataix-Cols, 2016), but may also pertain to BPD (Distel, Rebollo-Mesa, Willemsen, Derom, Trull, Martin, & Boomsma, 2009). In addition, studies suggest that assortative mating may not only be true for antisocial personality traits (which may be associated with BPD; Galbaut du Fort,

Boothroyd, Bland, Newman, & Kakuma, 2002). Secondly, it seems that nonrandom mating can also involve family constellations in which depressed women choose antisocial men as partners, which may create a situation in which a child is at increased risk of developing psychopathological conditions (Marmorstein, Malone, & Iacono, 2004), which makes sense in LHT perspective, because Belsky et al. (1991) identified internalizing problems such as depression and anxiety in females as a consequence of environments fostering “fast” LH strategies. We therefore sought to examine the effect of subjective depressiveness on mate preferences in the hypothetical scenarios, in light of predictions that people with BPD would vastly differ from controls in regard of depressiveness ratings.

We finally sought to explore, based on the work of Ellis et al. (2009) and Belsky and co-workers (Steinberg & Draper, 1991; Belsky, 2012), whether timing of puberty (i.e. indicators of physical maturation) would be associated with the chosen mating strategy and how real-life experiences such as age at first sexual intercourse and number of sexual partners would impact on individual’s response pattern to the hypothetical ecological scenarios.

2. Methods

2.1. Sample characteristics

One hundred fifty-seven individuals (142 females) participated in the study of which 107 persons were diagnosed with BPD according to DSM-IV criteria and a structured clinical interview, German version (Wittchen and Fydrich, 1997). All patients were recruited from an in-patient unit with a treatment focus on dialectical behavior therapy. Fifty-two subjects formed the control group, the majority of which were recruited from the local university. Ten participants who did not report their responses for large parts of the BMQ were excluded – the remaining ones with sporadic missing data have had these data replaced with the mean value of the particular item. As the current study was primarily concerned about mating behaviors in

fecund women we further excluded all male participants and female participant who were older than 30 years of age. Thus, the final number of female participants suitable for the main analyses was 105 (60 in the BPD group, 45 controls). An additional questionnaire was given to examine the participants' recall of onset of pubertal markers such as age at menarche, breast development, age at first sexual intercourse as well as to gather information about their current relationships status and actual sexual behavior. The demographics for both the BPD and the control groups are summarized in Table 1.

--- please insert Table 1 about here ---

2.2. Experimental Design

To test whether mating and caregiving behaviors are contingent on diagnosis and/or ecological context, a two (Group: BPD, Control) by three (Ecological Condition: 'Predictably Safe', 'Unpredictably Safe-Risky', 'Predictably Risky') design was used, following the approach developed by Cohen and Belsky (2008). In essence, each participant first read a hypothetical vignette that required the participant to imagine themselves in that particular situation and that she was interested in having "some kind of romantic relationship". The three self-descriptive hypothetical situations differed with respect to the availability and predictability of resources including the individual's hypothetical income level, employment status, relationship status, as well as physical and psychosocial aspects of the neighborhood, work and home environment. The three vignettes described a 'Predictably Safe' environment, an 'Unpredictably Safe-Risky' environment, and a 'Predictably Risky' environment (Cohen and Belsky, 2008). After reading of each vignette, participants were asked to complete the Birkbeck Mating Questionnaire (BMQ) developed by Cohen (2004). The BMQ is a 32-item self-rating questionnaire comprising items tapping into the participant's willingness to engage in a short or long-term relationship and qualities of a hypothetical mate, particularly his

willingness to invest resource in a hypothetical family. According to a factor analysis (Cohen, 2004) the BMQ yields seven subscales including the (1) 'Economic Resources' subscale reflecting the importance of the hypothetical partner's occupational and financial situation; (2) 'Parental Investment of the hypothetical partner' comprising items examining the relevance of the hypothetical partner's willingness to have children and family-orientedness; (3) Cues to Commitment' describing the significance of the hypothetical partner's emotional availability and trustworthiness; (4) 'Alpha Qualities' of the hypothetical partner; (5) 'Timing of First Sexual Intercourse' reflecting the participant's willingness to have sex with the hypothetical partner; (6) 'Physical Attractiveness and Intelligence' of the hypothetical partner; (7) 'Mating Strategies' indicating the desired length of relationship with the hypothetical partner and partner's sexual faithfulness. All BMQ subscales have shown good psychometric properties (Cohen, 2004).

2.3. Depressive symptoms

Depressive symptoms were examined using the revised Beck Depression Inventory (original version published by Beck, Ward, Mendelson, Mock, & Erbaugh, 1961). The BDI-II is a 21-item self-rating scale of symptoms associated with depression. It has extensively been used in clinical studies. The German version of the BDI-II has good psychometric properties (Cronbach's alpha 0.84; reviewed in Kühner, Bürger, Keller, & Hautzinger, 2007).

2.4. Childhood Trauma Questionnaire

The Childhood Trauma Questionnaire (CTQ) comprises 28 questions tapping into five subdomains, referred to as "emotional abuse", "physical abuse", "sexual abuse", "emotional neglect" and "physical neglect". In the present study, we used a German version, which revealed sufficient psychometric properties (Cronbach's alpha 0.8), except for the physical

neglect scale (Cronbach's alpha 0.4; Klinitzke, Romppel, Häuser, Brähler, & Glaesmer, 2012).

2.5. Recalled parental rearing style

Recalled parental rearing style was examined using the German translation of a self-rating questionnaire ("Fragebogen zum erinnerten elterlichen Erziehungsverhalten"; (FEE; Schumacher, Eisemann, & Brähler, 2000). The FEE consists of 24 items for the assessment of adult persons' memories concerning their parents' rearing styles and practices. The FEE represents a validated German version of the EMBU (acronym for "Egna Minnen Beträffande Uppfostran"), originally developed and published in Sweden (Perris, Jacobson, Lindström, von Knorring, & Perris, 1980). The FEE/ EMBU yields six subscores, i.e. "rejection and punishment", "emotional warmth", and "control and overprotection", derived separately for maternal and paternal behavior. Studies in clinical samples have shown a high stability of perceived parental rearing styles, suggesting that the FEE does not simply reflect distorted memories of patients with psychiatric illnesses (Richter & Eisemann, 2000). The scale has good psychometric properties (Cronbach's alpha for subscales between 0.72 and 0.89; Schumacher, Eisemann, & Brähler, 2000). Group differences in the experience of early adversity and biological indicators of pubertal timing are shown in Table 2.

--- please insert Table 2 about here ---

3. Results

3.1. Repeated-measures MANOVA

We first aimed to examine whether the different ecological conditions (i.e. predictably risky, unpredictably safe/risky, and predictably safe) had an effect on BMQ ratings. Accordingly, we

conducted a repeated-measures multivariate analysis of variance (rmMANOVA) to examine the main effects of Ecological Condition in the entire sample (Table 3). Specifically, we entered the 7 subscales of the BMQ as “factor 1” in the analyses and the 3 ecological conditions as “factor 2” in a general linear model (GLM) with data for BPD patients and controls pooled. The multivariate model was significant for BMQ (Wilk’s lambda 0.031; $F = 513.487$; $df = 6$; $p < 0.001$), ecological condition (Wilk’s lambda 0.703; $F = 21.977$; $df = 2$; $p < 0.001$), and the interaction of the two (Wilk’s lambda 0.653; $F = 4.169$; $df = 12$; $p < 0.001$). Since Mauchly’s test of sphericity was significant for all conditions (all $p < 0.001$), we performed a Greenhouse-Geisser correction, showing that the within-subject effects remained significant for BMQ ($F = 373.462$; $p < 0.001$), ecological condition ($F = 25.369$; $p < 0.001$) and the interaction of the two factors ($F = 10.219$; $p < 0.001$).

We then performed a series of GLM analyses fitting the seven BMQ subscales individually into repeated-measured analyses, and subsequently focused on pairwise comparisons among the three ecological conditions (i.e. ‘Predictably Risky’ versus ‘Unpredictably Safe-Risky’, ‘Unpredictably Safe-Risky’ versus ‘Predictably Safe’, and ‘Predictably Risky’ versus ‘Predictably Safe’) whenever the Greenhouse-Geisser corrected model was significant. The GLM were significant for all seven BMQ factors. Pairwise comparisons revealed that participants did not discriminate between the ‘Predictably Risky’ and the ‘Unpredictably Safe-Risky’ condition significantly, except for the factor ‘Parental Investment’, where all pairwise comparisons were highly significant ($p_s < 0.003$). However, pairwise comparisons were significant for the contrasts ‘Predictably Risky’ versus ‘Predictably Safe’, as well as for contrasts between ‘Unpredictably Safe-Risky’ and ‘Predictably Safe’, for all factors with one exception (‘Economic Resources’). Overall, these analyses suggest that participants discriminated between the three ecological conditions, though the risky and the unpredictable scenarios were dealt with in similar ways. Scoring and standard deviations are shown in Table 3.

--- please insert Table 3 about here ---

We then continued by calculating another GLM with the same two factors and, in addition, “group” (i.e. BPD vs. controls) as between-group variable, as well as BDI scores as co-variate, based on the large differences between groups in subjective depressiveness and the theoretical consideration that depression may be linked to nonrandom mating and therefore impact on individuals’ BMQ ratings. Here, we found a significant three-way interaction of BMQ*ecology*group when controlled for depressiveness ($F = 2.476$; $df = 5.397$; $p = 0.027$, Greenhouse-Geisser corrected).

3.2. Post-hoc t-tests for “Ecological Condition”

Post-hoc t-tests of group differences for BMQ variables in each ecological condition revealed that the groups differed only with respect to “Parental Investment” in the ‘Predictably Safe’ condition where people with BPD had significantly lower scores (20.36 ± 7.36) compared to controls (23.60 ± 5.73), suggesting that individuals with BPD had significantly fewer expectations with regard to their hypothetical partners’ investment ($t = -2.454$; $df = 104$; $p = 0.016$). Moreover, t-test analyses also showed that individuals in the BPD group were significantly more likely to desire having sexual intercourse earlier in the relationship with her partner as compared to the control group in all ecological conditions (Predictably Risky: $t = -2.143$; $df = 104$; $p = 0.035$; Unpredictably Safe/Risky: $t = -2.568$; $df = 104$; $p = 0.012$; Predictably Safe: $t = -2.325$; $df = 104$; $p = 0.022$). These comparisons remained statistically significant following a sequential correction (estimated false discovery rate 0.25) for multiple tests according to Benjamini and Hochberg. All other comparisons were not significantly different between groups (all $p_s > .05$).

3.3. Additional explorative analyses

We also sought to explore whether depressiveness, early adversity and experiences with primary caregivers would correlate with mate choice ratings in the three different hypothetical scenarios (data for both groups pooled). Here, we restricted our analysis to the BMQ factors “Parental Investment” and “Timing of First Sexual Intercourse”, as these factors seemed to have the largest discriminative value between groups. As expected, we found significant correlations between childhood trauma and parental rearing style with individuals’ expectations regarding parental investment expressed by a hypothetical partner, and correlations with one’s willingness to engage in sexual intercourse with a hypothetical partner in the three ecological conditions. In addition, we found significant correlations of BMQ scorings with depressiveness, as well as multiple correlations between depressiveness and adversity as well as recalled parenting.

We also found multiple correlations between individuals’ actual psychosexuality and mate choice preferences in the hypothetical scenarios. Moreover, the number of sexual partners in the last year and number of one-night stands correlated with depressiveness and adversity, as well as with recalled rearing style of the participants’ parents. In contrast, menarche was not correlated with any one of the other items. Findings are shown in Table 4.

Table 4. Correlations between hypothetical mate choice, subjective depressiveness, experience of adversity and actual sociosexuality (data pooled for BDP and controls)

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Based on these multiple correlations, we performed a series of linear regression analyses, whereby “Parental Investment” in the “predictably safe” scenario, and “Timing of First Sexual Intercourse” in all three hypothetical conditions were fitted as dependent variables in

the equation. Depressiveness (BDI score), traumatization (CTQ total score) and diagnosis were entered as independent variables using a stepwise model. Interestingly, “Parental Investment” and “Timing of First Sexual intercourse” in the predictably safe scenario were best predicted by “group” (for “Parental Investment”: $F = 5.825$, $df = 1$, $p = 0.018$; $\beta = 0.234$; for “Timing of First Sexual Intercourse”: $F = 4.880$, $df = 1$, $p = 0.029$; $\beta = 0.215$), whereas none of the other variables reached significance. In the unsafe and unpredictable scenarios, the single-best predictor was depressiveness (i.e. BDI score; for “Timing of First Sexual Intercourse” in the unpredictably safe/risky scenario: $F = 6.931$, $df = 1$, $p = 0.01$; $\beta = -0.253$; for “Timing of First Sexual Intercourse” in the predictably risky scenario: $F = 10.489$, $df = 1$, $p = 0.002$; $\beta = -0.307$), suggesting that more depressiveness was associated with greater willingness to engage in early sexual intercourse.

We then continued by fitting the actual “number of sexual partners” as dependent variable in the regression equation, and depressiveness, traumatization and the scores for “Parental Investment” in the predictably safe scenario, and “Timing of First Sexual Intercourse” in all three scenarios as independent variables in the equation. Here, we found that the actual number of sexual partners (“one night stands”) was best predicted by traumatization (i.e. CTQ score), which explained about 20% of the variance ($F = 22.132$, $df = 1$, $p < 0.001$; $\beta = 0.446$), whereby “Timing of First Sexual Intercourse” in the unpredictable scenario added a small amount to the variance ($F = 4.536$, $df = 1$, $p < 0.036$; $\beta = -0.209$; change in $R^2 = 0.04$). Finally, we entered depressiveness (BDI score) as dependent variable in another regression and found that traumatization (CTQ score) explained almost 50% of the variance alone ($F = 99.646$, $df = 1$, $p < 0.001$; $\beta = 0.705$; $R^2 = 0.497$). Together, while depressiveness did not predict indiscriminate sexuality per se, there seemed to be an indirect effect expressed via mate choice behavior. Moreover, traumatization was a direct predictor of both, actual sexual behavior and depressiveness. The model is shown in Figure 1.

--- please insert Figure 1 about here ---

4. Discussion

Previous work suggests that features associated with the clinical condition of BPD can be interpreted as indicators of resource allocation following a fast LH strategy (Brüne, 2014, 2016). Based on adverse experiences with early caregivers, it seems that patients with BPD develop mistrustful inner working models of others' emotional availability and reliability (Fonagy, 1991), which in turn predisposes them to act in more opportunistic ways regarding interpersonal relationships including mate choice and sexuality (summarized in Brüne, 2016).

The present study sought to explore this from a new angle by utilizing three hypothetical vignettes describing personal situations that differed with regard to one's own mate choice strategies and expectations from a hypothetical mate. We predicted that patients with BPD would adopt a "riskier" and more opportunistic mating strategy compared to controls. We further hypothesized that effects of depressed mood and the experience of early adversity would impact on nonrandom mating and individuals' actual sociosexuality.

Accordingly, we first examined whether subjects would discriminate sufficiently well between the three hypothetical ecological conditions and found that overall this was the case, although the discrimination between a 'Predictably Risky' and an 'Unpredictably Safe-Risky' scenario was weaker than the discrimination of the two from a 'Predictably Safe' scenario.

With regard to the expected differences between people with BPD and unaffected participants, we found that individuals with BPD were significantly more likely than controls to expect from their hypothetical partners less parental investment in their offspring when they imagined themselves living in safe and predictable conditions. Moreover, people with BPD were significantly more likely to report engaging in sexual intercourse more readily in all hypothetical scenarios compared to the control group. Thus, it seems that people with BPD

stick to interpersonal opportunism even when environmental conditions would rather foster a “slow” LH strategy. This interpretation was corroborated by linear regression analyses and seems compatible with our proposed LH model of BPD (Brüne et al., 2010; Brüne, 2016).

However, the group differences were less strong as expected, and the overall statistical model became significant only when subjective depressiveness was co-varied out. We nevertheless thought that considering depressiveness might not only be statistically justified in view of vast differences between groups in subjective ratings, but also from a theoretical point of view. In particular, previous research has shown that individuals with mental disorders tend to choose partners – like non-clinical people – based on similarity in psychological traits. That is, nonrandom mating effects can not only be found in the general population, but also in clinical samples (reviewed in Mathews and Reus, 2001; Nordsletten et al., 2016), which includes similarities for antisocial personality traits and conduct disorder (Galbaud du Fort et al., 2002). Evidence for assortative mating in BPD is limited, by comparison, though it seems to contribute a small amount of variance to the heritability of the disorder (Distel et al., 2009). Aside from assortative mating, research has shown that nonrandom mating may also involve dissimilarities of traits. For example, Marmorstein et al. (2004) reported that depressed women may tend to choose men with antisocial personality traits as partners, which may affect the risk for offspring of developing psychopathological conditions such as depression and conduct disorder (Marmorstein et al., 2004). This is compatible with psychodynamic considerations suggesting that women who were maltreated as children are at increased risk of revictimization in abusive relationships (Bockers and Knaevelsrud, 2011).

In line with these observations, the present study revealed multiple correlative associations of subjective depressiveness with mating behavior both in the hypothetical scenarios and actual sociosexuality. That is, depressiveness correlated inversely with expectations of Parental Investment from a hypothetical partner in the ‘Predictably Safe’

condition, and with one's willingness to have sexual intercourse with the hypothetical mate in the riskier scenarios. Moreover, depressiveness correlated with early adversity or trauma and with invalidating parenting experiences, as well as with the number of actual short-term sexual relationships. In addition, we found in a series of linear regression analyses that depressiveness was the single-best predictor of the "Timing of First Sexual Intercourse" in the "Predictably Unsafe" and the "Unpredictably safe/risky" scenarios. This may underscore the idea proposed elsewhere (Brüne, 2016) that subjective depressiveness in BPD could be a driving force of a "fast" LH strategy and hence, increase risk-taking behavior (at least in terms of psychosexuality), rather than being defensive and an indicator of risk-aversion. However, regression analyses clearly showed that depressiveness had no direct effect on young women's actual number of short-term sexual partners. Rather, depressiveness had some impact on the timing or willingness to have sex, which, in turn, predicted one's indiscriminative (and therefore potentially riskier) sexual behavior. A more crucial factor in this regard is the experience of early adversity, as the severity of traumatization significantly predicted both subjective depressiveness and the number of partners with which young women had sex only once.

Contrary to expectations, no effect of physical maturation (i.e. menarche) on mate preferences in the hypothetical scenarios or any measure of adversity or depressiveness was found. This is inconsistent with Ellis et al.'s (2011) and Belsky's (2012) predictions according to which adverse early environmental stress may accelerate physical maturation and sexual activity. One simple explanation of this disparity could be that our study was statistically under-powered in this regard. In addition, the speed of sexual maturation is multifactorial with substantial impact of genetic and epigenetic factors not examined in this study (Day et al., 2016; Susman & Dorn, 2009).

In any event, to our knowledge our study is among the first to describe possible associations of early developmental conditions and interpersonal strategies concerning mating

and psychosexuality in BPD. Our findings, at least in part, support Belsky et al.'s (1991) evolutionary model of socialization, as well as recent reports on associations between LH strategies and psychopathology (Hurst and Kavanagh, in press).

The study has several weaknesses. First, we constrained our analyses to female participants, because previous work has shown that findings concerning physical maturation and mating behavior based on LHT approaches are more robust in females. Thus, our results are not generalizable for males. Second, we restricted the age range to people in their late teens or twenties, which does not allow drawing conclusions for other age ranges. Third, the findings exclusively rely on self-report measures, where errors and distortions of one's memories cannot be ruled out. Fourth, the study did not include actual measures of stress-related changes of physiology such as cortisol, body-mass index, blood pressure etc. which may reflect an individual's "allostatic load" as a measure of an individual's accumulated biological burden (McEwen, 1998; Seeman, McEwen, Rowe, Singer, 2001). Fifth, the lack of a clinical control group precludes the conclusion that these findings are specific to BPD. In fact, similar results may be found in conditions that also seem to be compatible with fast LH strategies such as attention deficit/hyperactivity disorder (ADHD), bipolar disorder or substance abuse (Del Giudice, 2015).

5. Conclusions

In summary, the present study lends further support to the idea that the BPD phenotype is compatible with a "fast" LH strategy (Brüne, 2014, 2016). Although premature at this stage, future psychotherapeutic treatment strategies may utilize these insights to reflect upon the relationship between early experiences and adult life history strategies that may be a source of harm and distress. Specifically, since many with BPD experience difficulties in maintaining intimate relationships, reflecting upon one's mating strategies in psychotherapy may help

individuals to adopt “slower” LH strategies. This may eventually be more rewarding, if the therapeutic process succeeds to change patients’ perception of the social world as a safer and more trustworthy place than their early experiences suggest.

6. References

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Table 1. Summary of demographic data and sexual development and behavior in BPD and Controls

Variable	BPD Group <i>N</i> = 60	Control Group <i>N</i> = 45	Statistical significance
Mean age at time of survey	23.85 (3.70)	23.40 (3.26)	n.s.
Single (no relationship)	10	3	n.s.
Single, dating	14	12	n.s.
Unmarried with romantic partner	32	25	n.s.
Unmarried with multiple partners	1	0	
Married	2	3	
Divorced	1	0	
First pubertal hair	12.04 (1.45)	11.94 (1.67)	n.s.
Menarche	12.91 (1.37)	12.88 (1.44)	n.s.
Recognition of breast dev.	12.40 (1.55)	11.76 (1.78)	n.s.
First sexual intercourse	15.79 (2.27)	16.19 (1.91)	n.s.
Number of sexual affairs (“one-night stands”)	7.0 (13.52)	1.18 (1.62)	p = 0.003
Number of sexual partners in the past year	4.55 (9.0)	1.35 (1.48)	p = 0.01

Numbers in parentheses represent standard deviations

Table 2. Comparison of subjective depressiveness, childhood trauma, and recalled parenting between patients with BPD and controls

Variable	BPD Group <i>N</i> = 60	Control Group <i>N</i> = 45
Depressiveness (BDI)**	32.55 ± 9.84	2.58 ± 2.52
CTQ Emotional abuse**	16.5 ± 6.3	6.3 ± 1.8
CTQ physical abuse**	10.7 ± 6.0	5.2 ± 0.7
CTQ sexual abuse**	9.4 ± 6.4	5.2 ± 1.2
CTQ emotional neglect**	16.5 ± 6.2	6.8 ± 2.4
CTQ physical neglect**	10.9 ± 5.2	5.4 ± 1.0
FEE paternal rejection**	14.4 ± 7.2	9.0 ± 1.9
FEE maternal rejection**	16.0 ± 7.2	9.1 ± 2.8
FEE paternal warmth**	15.8 ± 7.1	24.2 ± 6.0
FEE maternal warmth**	17.4 ± 7.4	26.2 ± 6.3
FEE paternal overprotection**	15.6 ± 5.3	11.4 ± 3.1
FEE maternal overprotection**	17.3 ± 5.7	13.2 ± 4.2

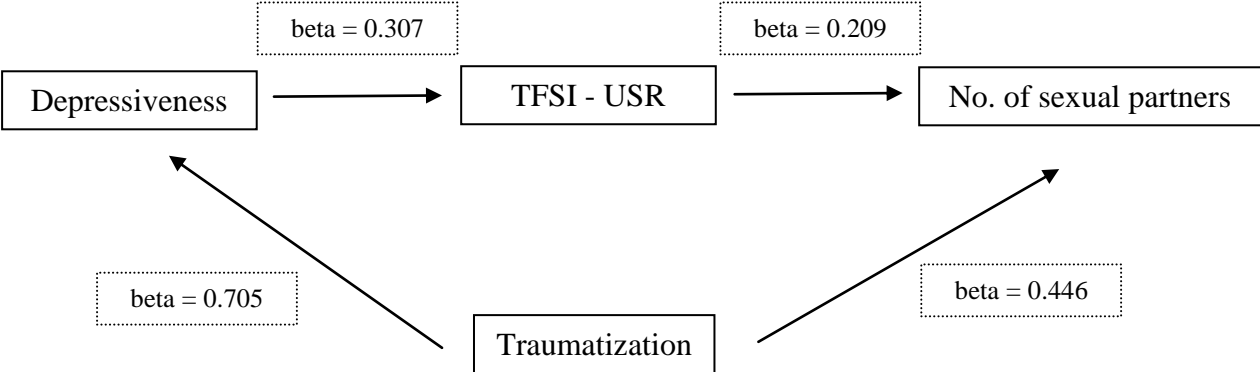
Difference significant at ** $p < .001$

Table 3. Mean scorings for the BMQ factors in the three Ecological Conditions for group data pooled (larger values indicating “slower” mating strategies)

	Predictably	Unpredictably	Predictably
	Risky	Safe-Risky	Safe
	<u>M</u>	<u>M</u>	<u>M</u>
<u>Subscale</u>	<u>(SD)</u>	<u>(SD)</u>	<u>(SD)</u>
Economic Resources	23.81 (7.10)	23.46 (5.95)	25.49 (6.02)
Parental Investment	15.55 (7.55)	18.20 (7.99)	21.74 (6.88)
Cues to Commitment	24.29 (4.30)	25.23 (3.43)	26.25 (2.83)
Alpha Qualities	14.71 (2.71)	14.60 (2.27)	15.82 (2.71)
Timing of First Sexual Intercourse	9.92 (2.61)	10.35 (2.47)	11.36 (2.66)
Physical Resources and Intelligence	15.54 (2.58)	15.74 (2.26)	16.67 (2.16)
Mating Strategy	13.24 (3.60)	13.94 (3.10)	15.61 (2.92)

M = mean; SD = standard deviation

Figure 1. Summary and overview of regression analyses to predict sexual behavior



Legend: TFSI-USR: Timing of First Sexual Intercourse in the unpredictably safe/risky scenario

Table 4

	PI-PR	PI-SR	PI-PS	FI-PR	FI-SR	FI-PS	Depr	EmAb	PhAb	SexAb	EmN	PhN	pRP	mRP	pEW	mEW	pCO	mCO	Me	1stS
PI-PR																				
PI-SR	.524**																			
PI-PS	.120	.441**																		
FI-PR	.401**	.236*	.039																	
FI-SR	.247*	.432**	.209*	.450**																
FI-PS	-.020	.250*	.345**	.338**	.530**															
Depr	-.152	-.087	-.209*	-.253**	-.261**	-.186														
EmAb	-.093	-.054	-.167	-.222*	-.219*	-.119	.720**													
PhAb	.001	-.016	-.104	-.237*	-.180	-.112	.529**	.745**												
SexAb	.026	.075	.034	-.058	-.162	-.048	.455**	.524**	.526**											
EmN	-.010	-.058	-.196*	-.152	-.205*	-.108	.589**	.880**	.693**	.550**										
PhN	-.039	-.041	-.186	-.145	-.198*	-.138	.639**	.788**	.718**	.438**	.847**									
pRP	-.059	-.110	-.133	-.127	-.169	-.056	.459**	.843**	.565**	.419**	.621**	.555**								
mRP	.080	-.079	-.164	-.212*	-.198*	-.229*	.534**	.768**	.768**	.393**	.761**	.723**	.606**							
pEW	.078	.152	.217*	.087	.261*	.127	-.520**	-.706**	-.608**	-.407**	-.704**	-.699**	-.636**	-.571**						
mEW	.047	.166	.242*	.110	.222*	.100	-.516**	-.636**	-.550**	-.295**	-.708**	-.724**	-.415**	-.659**	.683**					
pOC	-.124	.034	-.051	-.121	-.033	.016	.419**	.459**	.369**	.362**	.410**	.449**	.452**	.346**	-.252*	-.288*				
mOC	.055	.028	-.196*	-.100	-.079	-.106	.460**	.545**	.434**	.269**	.468**	.418**	.380**	.507**	-.327**	-.325**	.690**			
Me	-.116	.147	.060	-.108	-.003	.086	-.064	-.018	-.096	-.112	-.023	.003	-.086	-.055	-.003	-.071	-.008	-.171		

1stS	.180	.115	.053	.075	.105	.126	-.133	-.024	.050	-.044	-.040	-.049	.025	-.011	.031	-.040	-.023	-.085	.118	
nSP	-.225*	-.323**	-.082	-.308**	-.340**	-.205*	.411**	.411**	.403**	.223*	.422**	.421**	.286**	.333**	-.354**	-.370**	.221*	.110	.005	-.377**

Table legend: PI-PR: Parental Investment in the Predictably Risky condition; PI-SR: Parental Investment in the Unpredictably Safe-Risky condition; PI-PS: Parental Investment in the Predictably Safe condition; FI-PR: First Sexual Intercourse in the Predictably Risky condition; FI-SR: First Sexual Intercourse in the Unpredictably Safe-Risky condition; FI-PS: First Sexual Intercourse in the Predictably Safe condition; Depr: Depressiveness; EmAb: Emotional Abuse; PhAb: Physical Abuse; SexAb: Sexual Abuse; EmN: Emotional Neglect; PhN: Physical Neglect; pRP: paternal Rejection and Punishment; mRP: maternal Rejection and Punishment; pEW: paternal Emotional Warmth; mEW: maternal Emotional Warmth; pOC: paternal Control and Overprotection; mOC: maternal Control and Overprotection; Me: Menarche; 1stS: Age at first actual Sexual Intercourse; nSP: number of Sexual Partners (one-night stands).

* correlations significant at $p < 0.05$; ** correlations significant at $p < 0.001$.

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