Delay discounting of protected sex and compulsive sexual behavior in women with borderline personality disorder

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ABSTRACT

Background and aims: Borderline personality disorder (BPD) is a complex mental health condition characterized by emotional dysregulation, impulsivity, and unstable interpersonal relationships. Some individuals with BPD regularly engage in sexual risk behavior such as unprotected sex and are at higher risk of contracting sexually transmitted infections. This study investigates discounting of condom- or dental dam-protected sex in women with BPD compared with a control group. *Methods:* Data were collected from 40 women diagnosed with BPD and 40 healthy controls with an average age of 27.28 years (SD = 6.14) using the Sexual Delay Discounting Task (SDT), the *Borderline Symptom List-23* (BSL-23), and the *Compulsive Sexual Behavior Disorder Scale-19* (CSBD-19). *Results:* Women with BPD were less likely to use an immediately available condom or dental dam and more likely to discount safer sex than controls. Partner desirability and the perceived STI risk influenced the participants' likelihood of having protected sex. Women with BPD showed more symptoms of compulsive sexual behavior (CSB) than controls. However, sexual delay discounting was not significantly correlated with borderline symptoms or CSB in the BPD group. *Discussion and conclusions:* These findings contribute to our understanding of sexual impulsivity in women with BPD and highlight the omission and delayed availability of safety measures as important contributors to sexual risk behavior and STI risk in women. Impulsive sexual behavior, as well as the accompanying sexual health concerns, should receive special attention in the treatment of women with BPD.

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INTRODUCTION

Borderline personality disorder (BPD) is defined by impulsive behavior, unstable relationships with others, and difficulties with emotion regulation and self-image (American Psychiatric Association, 2022). Sexuality and sexual risk-taking behaviors are important aspects of the clinical picture in individuals with BPD. Women with BPD in particular report dissatisfaction with sexual relationships, concerning high-risk sexual behavior or relationship difficulties (Hurlbert, Apt, & White, 1992) and experience these at higher rates than healthy and clinical controls (Daley, Burge, & Hammen, 2000; Miano, Grosselli, Roepke, & Dziobek, 2017; Navarro-Gómez, Frías, & Palma, 2017).

BPD is frequently associated with sexual impulsivity – commonly defined by the age of first sexual contact, promiscuity, and a higher frequency of casual relationships (Bégin et al., 2021; Sansone, Barnes, Muennich, & Wiederman, 2008; Thompson et al., 2019). Adverse outcomes of sexual impulsivity include a higher risk for sexually transmitted infections (STI) and unwanted pregnancy due to unprotected sex (Sansone et al., 2008). Patients with BPD more often engage in risky sexual behaviors and are at higher risk for contracting STIs (Chen et al., 2019; Harned, Pantalone, Ward-Ciesielski, Lynch, & Linehan, 2011; Sansone & Sansone, 2011; Tull, Gratz, & Weiss, 2011). Women with BPD also score lower on sexual safety and health measures than healthy controls (Thompson et al., 2019).

Impaired sexual delay discounting could provide one possible explanation for sexual risk behavior in women with BPD, as it is commonly linked to impulsivity (Howe & Finn, 2020; Levitt, Sanchez-Roige, Palmer, & MacKillop, 2020; Ludwig et al., 2015). Delay discounting refers to the value of a future outcome decreasing as the delay to its occurrence increases (Odum, 2011). It is frequently assessed with monetary discounting tasks, where the subject is offered an immediate small sum of money or an increasingly larger amount at defined time delays. Impulsive behavior is associated with a higher degree of delay discounting as in choosing the immediate reward more frequently (Levitt et al., 2020).

Few studies exist examining delay discounting in BPD patients as a measure of impulsivity. Barker et al. (2015) and Krause-Utz et al. (2016) measured monetary delay discounting in individuals with BPD and found a higher rate of monetary discounting compared to controls.

Delay discounting in a sexual context has yet to be examined in women with BPD. The current study investigates the role of sexual delay discounting in sexual risk behavior among women with BPD. To that end, we administered the Sexual Delay Discounting Task (SDT; Johnson & Bruner, 2012), to assess the discounting of protected sex in a sample of women with BPD and healthy controls.

This task has previously been used in samples of college students, recreational drug users, and individuals with cocaine- or opioid dependence to examine the effect of delay on discounting of condom-protected sex (Berry, Bruner, Herrmann, Johnson, & Johnson, 2022; Collado, Johnson, Loya, Johnson, & Yi, 2017; Herrman et al., 2014; Johnson et al., 2012, 2013, 2015; Lemley, Jarmolowicz, Parkhurst, & Celio, 2018). Disorders linked to impulsivity and other problem behaviors were associated with a greater degree of sexual delay discounting (Herrmann, Hand, Johnson, Badger, & Heil, 2014; Johnson & Bruner, 2012, 2016; Negash, Sheppard, Lambert, & Fincham, 2016). Furthermore, self-reported measures of impulsivity and risky sexual behavior correlated with a higher degree of discounting (Collado et al., 2017; Herrmann et al., 2014; Lemley et al., 2018; Sweeney et al., 2020). Delay to condom availability consistently shows greater discounting of protected sex in these study populations, suggesting the SDT to be a useful research tool to identify impulsive or sexual risk behavior (Gebru et al., 2022; Leeman, Rowland, Gebru, & Potenza, 2019).

In a scenario where a condom is immediately available, protected sex dramatically reduces the risk of contracting a STI or unwanted pregnancy while still providing the immediate reward, i.e., sexual intercourse. In a scenario where protection is not immediately available, the reward is delayed, whereas unprotected sex offers an immediate reward and delayed "punishment", e.g., risk of STI or unwanted pregnancy.

Like sexual impulsivity, compulsive sexual behavior (CSB) may be associated with borderline personality disorder. CSB involves a lack of control over sexual behavior that has become central to one's life, leading to distress and negative consequences and potentially to Compulsive Sexual Behavior Disorder (CSBD; ICD-11, World Health Organization, 2022). CSBD is conceptualized as an Impulse Control Disorder and individuals with BPD also commonly exhibit difficulties in regulating impulsive behavior (Fuss et al., 2024). Research on associations between CSB and BPD has produced inhomogeneous results so far, with some data showing relations of borderline symptoms with CSB (Elmquist, Shorey, Anderson, & Stuart, 2016; Fuss, Briken, Stein, & Lochner, 2019; Jardin et al., 2017), while others did not find a strong relationship (Lloyd, Raymond, Miner, & Coleman, 2007). BPD may be associated with CSB as they share features like greater sexual preoccupation, a greater number of sexual partners, emotional dysregulation, and attachment anxiety (Kowalewska, Gola, Kraus, & Lew-Starowicz, 2020; Lew-Starowicz, Lewczuk, Nowakowska, Kraus, & Gola, 2020; Sansone et al., 2011a, 2011b).

This study examined how sexual delay discounting and condom-use preference in women with BPD might differ from healthy controls. Additionally, the relationship between sexual delay discounting and borderline symptoms, especially self-harm, were assessed. Due to the symptom overlap of CSBD and BPD, we were also interested in the extent to which CSB was related to BPD or to sexual delay discounting.

METHODS

Participants

Female patients with borderline personality disorder (BPD) were recruited from inpatient and outpatient treatment for BPD in the Department of Psychiatry at the University Medical Center Hamburg-Eppendorf.

Women with BPD were included in the study if they were 1) between 18 and 45 years of age and 2) met the criteria for a BPD according to DSM-5, rated by experienced clinicians. The cut-off age of 45 was chosen to control for changes in sexual desire due to menopausal symptoms. During the recruitment process, several patients turned down participation based on the study's focus on sexuality and sexual behavior. Out of 44 interested individuals, four

were excluded: one aged 50, two for non-attendance, and one who discontinued the task because she felt she could not deliver reliable data.

A sample of 40 was considered adequate for statistical power. Consequently, 40 control subjects were recruited through social media, newsletters, and flyers. For the control group, women were invited to participate if they were 1) between 18 and 45 years of age, 2) reported no illicit drug or substance abuse and 3) did not meet the DSM-5 criteria for a borderline personality disorder. Control participants were matched in age to the BPD group and assessed for substance use disorder to minimize potential confounding factors. The absence of a possible BPD diagnosis was ensured by clinical evaluation according to DSM-5 criteria. Out of 42 invited subjects, two were excluded: one for non-attendance and the other due to concerns about discrimination related to the SDT.

Measures

Participants were interviewed in person to confirm the BPD diagnosis according to DSM-5 and assess psychiatric comorbidities via *MINI-Dips* Open Access interviews (Margraf & Cwik, 2017). The set of questionnaires was then completed via the survey tool *Qualtrics*. The instruments employed for this study included a demographic questionnaire, the *Borderline Symptom List-23* (*BSL-23*; Bohus et al., 2009), and the *Compulsive Sexual Behavior Disorder Scale-19* (*CSBD-19*; Böthe et al., 2020). The BSL-23 consists of 23 statements and 11 supplemental items for assessing behavior. It can be rated on a five-point Likert scale from 0 (not at all) to 4 (very strong). It includes statements about the ability to concentrate or feel present, rapid mood changes, feeling vulnerable or lonely, and desire to self-harm in the past week.

The CSBD-19 is a self-report instrument consisting of 19 items, each rated on a Likert scale ranging from 1 (totally disagree) to 4 (totally agree). The items cover various domains related to compulsive sexual behavior, including loss of control, preoccupation with sexual thoughts and behaviors, negative consequences, and distress.

Sexual Delay Discounting Task. To assess sexual delay discounting, participants completed Johnson & Bruner's (2012) SDT. The task was modified into an online version. This allowed the participants to complete the task in privacy, which we found to be particularly helpful for women with BPD in reducing anticipated shame. The task presented participants with 30 photographs of a variety of individuals with diverse appearances. In line with the original model, the task offered to choose between women and men, excluding people of other genders. Participants were asked to select photographs of people with whom they would like to have sex with, assuming they were not currently in a committed relationship and that sex carried no risk of pregnancy.

Subsequently, the selected portraits were to be assigned to four different conditions: Select the person 1) you would most want to have sex with, 2) you would least want to have sex with, 3) that would most likely have a sexually

transmitted infection, 4) that would least likely have a sexually transmitted infection.

A person could be selected for more than one of the conditions, but not within the same pair.

For each of the selected partners, participants rated their likelihood of having unprotected sex immediately vs. using an immediately available condom or dental dam on a visual analog scale (VAS) from 0 to 100%. Second, they rated their likelihood of having unprotected sex immediately vs. waiting different delays (1 h, 3 h, 6 h, 1 day, 1 week, 1 month, 3 months) for protection. An example of both VAS-trials is shown in Fig. 1.

Statistical analysis

Sexual delay discounting task. Typical delay discounting tasks like monetary tasks offer an immediate, small reward and increasingly larger amounts at later delays. The amount of the immediate reward is adjusted to the point of indifference, where the participant switches the preference to the later reward. The indifference points represent the value of the delayed outcome and characteristically decrease as the delay to the larger, later reward increases, creating a hyperbolically declining discounting function (Odum, 2011).

In the SDT, the immediate reward consists of having immediate, but unprotected sex, whereas the larger, later amount is represented by condom- or dental-dam-protected sex.

Consequently, the VAS scales of the SDT were equated with the indifference points of the discounting function. The VAS likelihood was a dependent variable signifying the value of protected sex. Our independent variables were the delays (1 h, 3 h, etc.) to availability of protection.

Each participant's data consisted of four different sets of indifference points for the four different partner conditions. Participants with a zero percent likelihood to use protection when it is immediately available (zero-delay) were excluded from the analyses of that particular condition for not providing a sensible measure to assess delay discounting.

Orderliness of data was assessed with an algorithm developed by Johnson and Bickel (2008): If an indifference point surpassed the preceding point by more than 0.2, the data were flagged as nonsystematic and the participant was excluded from analysis of that partner condition – resulting in varying n per condition. In addition, systematic data were analyzed with nonlinear regression using the hyperbolic discounting function $V = A/(1+kD)^s$ (Myerson & Green, 1995). For the utilized equation, V was equated with the respective likelihood, A with the maximum likelihood value of 1.00, and D with the delay to the availability of a condom or dental dam. The mean likelihood values of the BPD and the control group were fit to the model, producing the two free parameters k and s. The parameter k indicates the rate of decrease in value, while s is a nonlinear scaling parameter modulating the form of the hyperbola (Green, Fry, & Myerson, 1994). The root mean square error (RMSE) was calculated to test how well the data fit the hyperbolic discounting function.
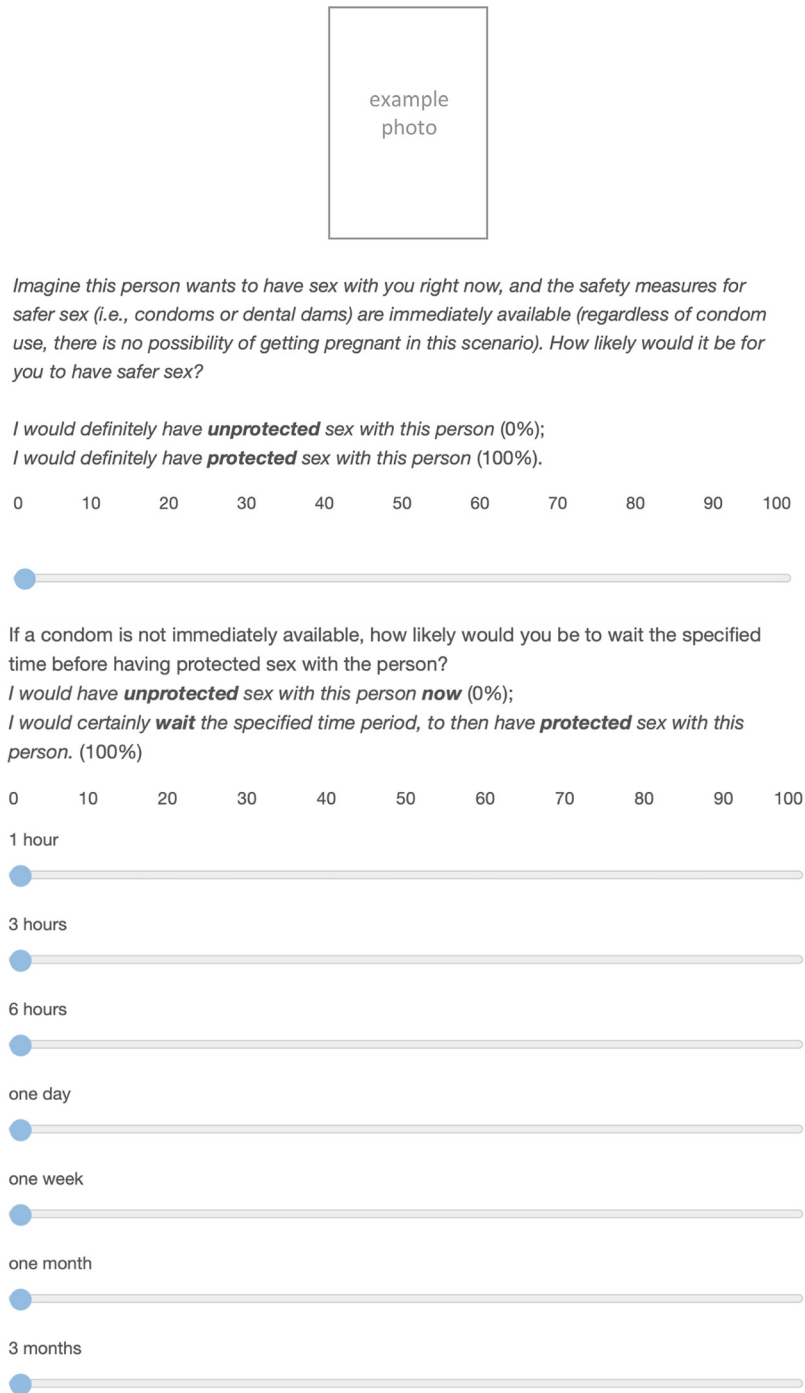
Imagine this person wants to have sex with you right now, and the safety measures for safer sex (i.e., condoms or dental dams) are immediately available (regardless of condom use, there is no possibility of getting pregnant in this scenario). How likely would it be for you to have safer sex?

*I would definitely have **unprotected** sex with this person (0%);*
*I would definitely have **protected** sex with this person (100%).*

0   10   20   30   40   50   60   70   80   90   100

If a condom is not immediately available, how likely would you be to wait the specified time before having protected sex with the person?
*I would have **unprotected** sex with this person **now** (0%);*
*I would certainly **wait** the specified time period, to then have **protected** sex with this person. (100%)*

0   10   20   30   40   50   60   70   80   90   100

1 hour

3 hours

6 hours

one day

one week

one month

3 months

*Fig. 1.* Example of VAS for the different delay trials

The areas under the curve (AUC) of the discounting functions were calculated to analyze the rate of discounting, using the method described by Myerson (2001).

A higher AUC value indicates a higher likelihood of condom or dental dam use, whereas a lower AUC value indicates a willingness to discount protected sex. Indifference points and delays in hours were normalized, ranging from 0 to 1.00, resulting in AUC values expressed on the same scale.

In order to control for the relative likelihood of using a condom when one is immediately available (zero-delay), the AUC was also computed by dividing the VAS value of any delay hour by the VAS value of the zero-delay time trial. If any standardized likelihood value would exceed 1.00, i.e., when a non-zero-delay trial surpassed the value of the zero-delay trial, it was assigned the value 1.00 for the AUC values being expressed as a proportion of the maximum.

Twenty-nine out of 310 discounting functions were found to be nonsystematic and were consequently excluded from analyses. The RMSE of the best-fit hyperboloid function was <0.1 for all partner conditions, indicating a close fit to the hyperboloid discounting model.
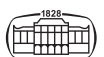
Comparison between groups and the four partner conditions. The level of significance was set at 0.05. Cohen's *d* was used to calculate the effect size. Cut-offs are set at 0.2 for a small, 0.5 for a medium, and 0.8 for a large effect (Cohen, 2013).

Because the distributions of zero-delay and AUC values were skewed, non-parametric rank tests were utilized for statistical comparison. Mann-Whitney-U-tests were conducted to compare the zero-delay trials and delay discounting data (original and standardized AUCs) of all conditions between BPD patients and controls.

Within-group differences across the four partner conditions were calculated with Wilcoxon signed-rank tests. Respectively, the tests compared the first and second (*"most want sex"* and *"least want sex"*) and third and fourth (*"most likely STI"* and *"least likely STI"*) conditions.

Only AUC, and not *k*, was used for these analyses because its values are limited by the minimum 0 (total discounting) and maximum 1 (absolutely no discounting), setting a scale and permitting a sensible measure of variability.

Associations between discounting data and symptom scales. Non-parametric Spearman's rank correlations were conducted to identify associations between the SDT data (zero-delay and AUC) and the total scores of the BSL-23 and CSBD-19. A purpose-designed subscore with the five items of the BSL-23 concerning self-harm (self-harm thoughts or actions, displaying high risk behavior, or sexual encounters that were regretted later) was also included. The analysis was carried out to examine if discounting of protected sex was related to current symptoms of BPD or CSB. Differences in these scores between the BPD and control group were calculated with Mann-Whitney-U-tests.

Ethics

The study was approved by the local ethics committee of the University Medical Center Hamburg-Eppendorf. All participants provided informed consent. The procedures were carried out in accordance with the Declaration of Helsinki.

RESULTS

Participants in the BPD and control groups did not differ significantly in their sociodemographic characteristics but showed significant differences in other aspects, such as depression (see Table 1 in the appendix). None of the co-morbid diagnoses had an influence on SDT outcomes in any of the four partner conditions. Subsequently, they were not controlled for in the discounting data analyses.

Sexual delay discounting task

The general likelihood of using a condom or dental dam when one is immediately available (zero-delay) was significantly lower in the BPD group for the *"most want sex"*

($p = 0.021$, $d = 0.515$) and *"least likely STI"* conditions ($p < 0.001$, $d = 0.827$) than in the control group.

The *"least want sex"* and *"most likely STI"* conditions did not show a significant difference in preference for condom or dental dam usage between the groups.

In comparison between the two pairs of conditions, women with BPD were more likely to forego the use of immediately available protection in the *"most want sex"* ($p = 0.036$, $d = 0.534$) and *"least likely STI"* ($p = 0.007$, $d = 0.699$) than in the associated other conditions. Women in the control group showed no difference between conditions and overall were highly likely to use immediately available protection in all conditions ($\bar{X}_1 = 0.93$, $\bar{X}_2 = 0.96$, $\bar{X}_3 = 0.94$, $\bar{X}_4 = 0.95$).

The raw discounting data points and the best-fit hyperboloid curve for each group and partner condition are shown in Fig. 2. Figure 3 displays each participant's standardized AUC values and group mean values per partner condition.

Comparison of standardized mean AUC values across all four conditions showed a significant difference in overall discounting of protected sex between women with BPD and controls. The mean values were 0.58 for the BPD vs. 0.77 for the control group ($p = 0.023$; $d = 0.581$).

The BPD patient's standardized likelihood to wait for a condom or dental dam was significantly lower than in the control group in the *"most want sex"* ($p = 0.014$, $d = 0.614$) and *"least likely STI"* ($p = 0.017$, $d = 0.587$) conditions.

Both, the BPD and control group, were more likely to discount protected sex in the *"most want sex"* compared to the *"least want sex"* condition ($p = 0.021$, $d = 0.59$; $p = 0.017$, $d = 0.613$). Additionally, both groups discounted significantly less in the *"most likely STI"* compared to the *"least likely STI"* condition ($p = 0.052$, $d = 0.493$; $p = 0.011$, $d = 0.65$).

Correlations of discounting data and symptom scales

No discernible patterns of significant correlations of the SDT data (zero-delay and AUC) with BSL-23 total scores, self-harm subscores, as well as CSBD-19 scores were found in the subgroups (Table 2 in the appendix).

Women with BPD exhibited significantly higher levels of compulsive sexual behavior compared to the control group ($M_{Rank} = 52.81$ vs. 35.39; $p < 0.001$, $d = 0.74$). Additionally, significant group differences were observed in borderline symptoms ($M_{Rank} = 62.26$ vs. 26.74; $p < 0.001$, $d = 1.93$) and self-harm tendencies ($M_{Rank} = 58.63$ vs. 30.38; $p < 0.001$, $d = 1.33$), with the BPD group displaying a greater number of symptoms in each category than the control group.

Higher levels of compulsive sexual behavior were significantly correlated with a higher borderline symptom load in the entire study sample ($p < 0.001$; $\rho = 0.41$). In subgroup analyses, this association persisted only in the control ($p < 0.01$, $\rho = 0.43$), but not in the BPD group ($p = 0.204$, $\rho = 0.2$).
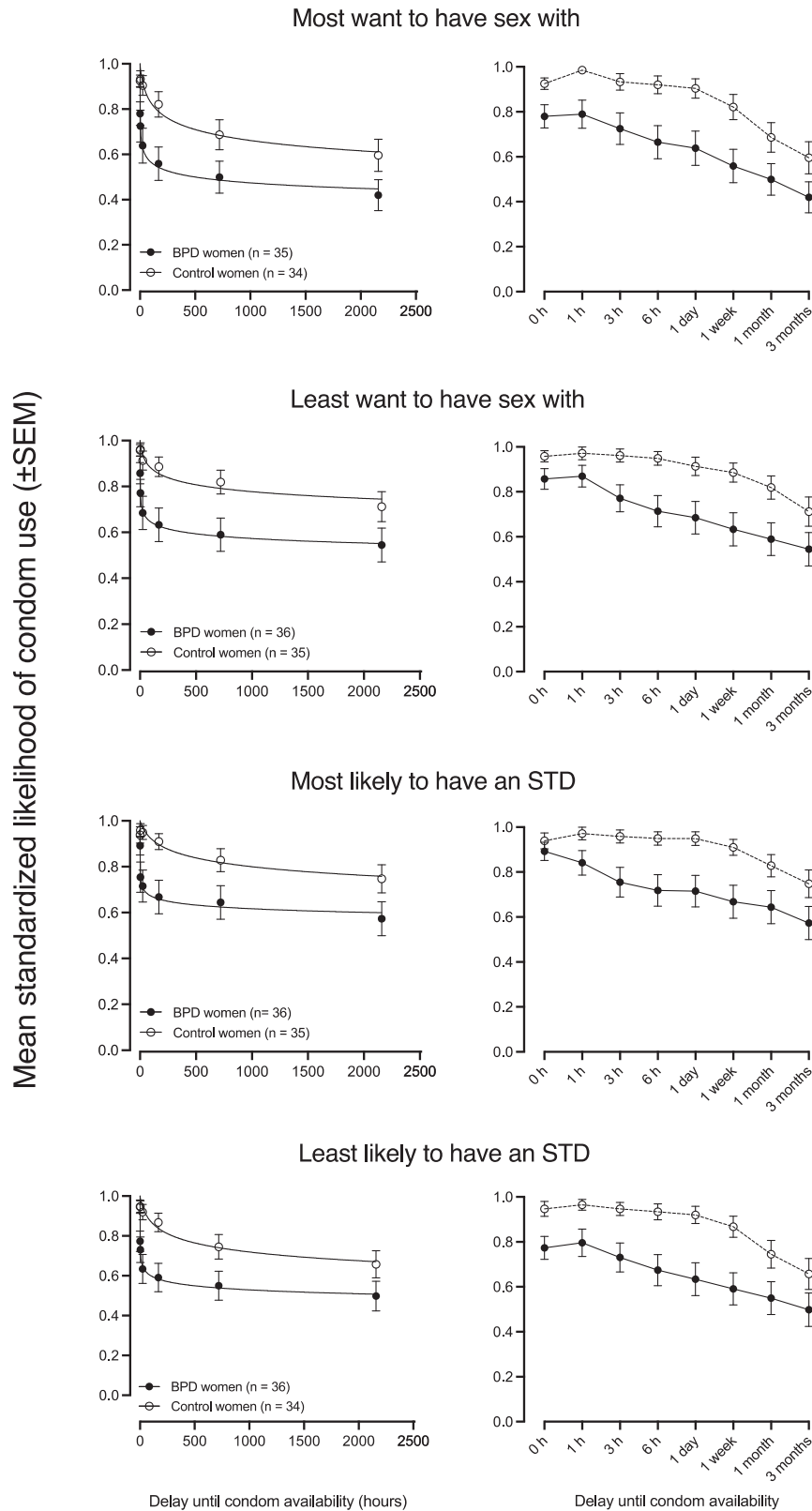
Fig. 2. **Left column**: Best-fit hyperboloid curves of mean standardized likelihood of condom use plotted against delay in hours for each of the partner conditions in the BPD and Control groups. **Right column:** Data from right column plotted against equally spaced delay intervals. The errors bars signify the standard mean error (*SEM*)

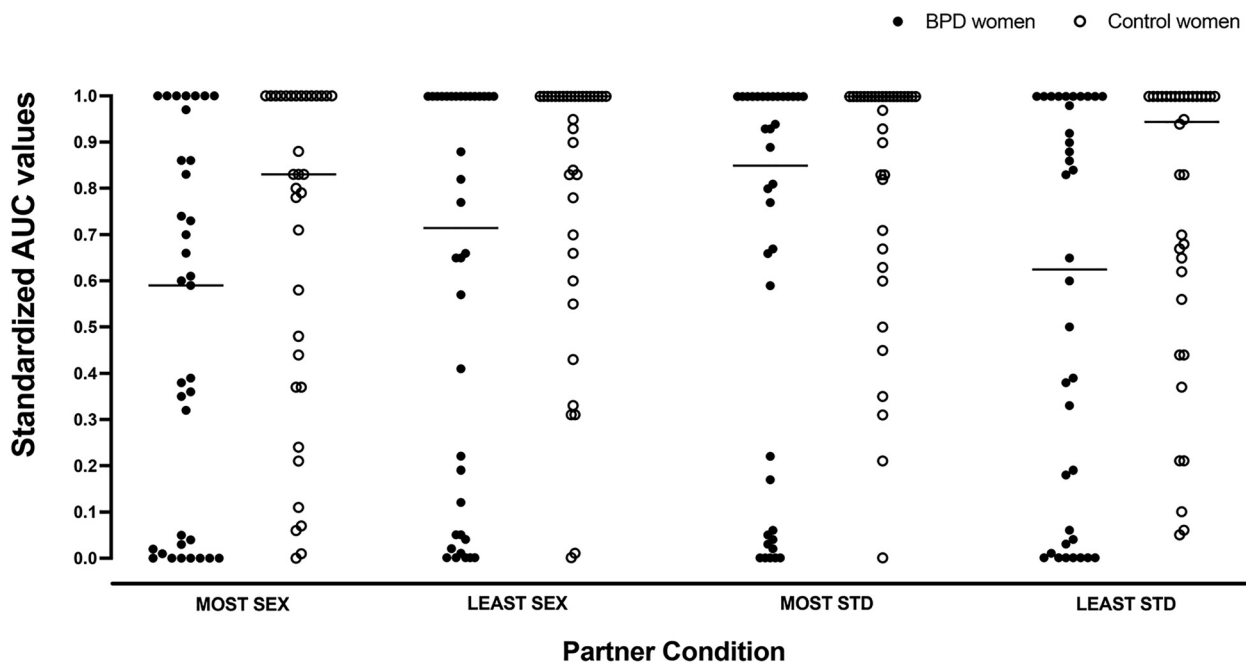*Notes. BPD:* Borderline personality disorder. *STD:* sexually transmitted disease.

Fig. 3. Participant's standardized area under the curve (AUC) values organized by group and partner condition. Horizontal lines signify group mean AUC values for each condition

Notes. BPD: Borderline personality disorder. STD: sexually transmitted disease.

DISCUSSION

The present study demonstrates that women with BPD are more likely to engage in unprotected sex, both in situations with and without delay to a condom or dental dam.

Our main findings include that first, women with BPD were less likely to use an immediately available condom or dental dam and discount safer sex more steeply than controls. Second, partner desirability and the perceived STI risk influenced participants' likelihood of having protected sex. Third, even though women with BPD exhibited more symptoms of compulsive sexual behavior (CSB) than controls, sexual delay discounting was not significantly correlated with CSB or borderline symptomatology in the BPD group.

Women with BPD discounted protected sex significantly more than controls across all four partner conditions. Within the different partner conditions, women with BPD were significantly more likely to wait for a condom or dental dam than the controls in the *"most want sex"* and *"least likely STI"* conditions. The effect sizes were medium to large.

The general likelihood of using protection when it is immediately available was significantly lower for women with BPD in the categories *"most want sex"* and *"least likely STI"*. Women in the control group were overall highly likely to use immediately available protection.

These experimental findings reinforce existing reports on the higher frequency of unprotected sex and increased rates of STIs in women with BPD (Chen et al., 2019; Harned et al., 2011; Sansone & Sansone, 2011; Tull et al., 2011) and opens ways to investigate the underlying mechanisms of this phenomenon further.

Prior research has also shown greater tendencies of general delay discounting as a marker of impulsivity in BPD (Barker et al., 2015; Krause-Utz et al., 2016; Lawrence, Allen, & Chanen, 2010). Our study expands on previous findings by highlighting the association of BPD with domain-specific discounting and impulsive behavior in women with BPD.

Comparing the paired conditions *"most want sex/least want sex"* and *"most likely STI/least likely STI"*, both groups exhibited significant preferences to discount protected sex at a steeper rate when the partner was the most desired one. In contrast, the perceived STI risk only had a small effect on decisions in the BPD group, whereas controls discounted significantly less in the *"most likely STI"* condition. This finding suggests a tendency towards sexual risk behavior or self-harm intention in women with BPD.

Symptoms of CSB were significantly more prevalent in the BPD group compared to the control group. There was also a link between reported borderline symptoms and CSB regardless of group affiliation, suggesting an overlap of symptoms.

The findings coincide with existing data on CSB and BPD features: Elmquist et al. (2016) found a significant association between CSB and borderline symptoms in women undergoing treatment for substance use disorders, even after controlling for alcohol and drug use. In a study of female college students, BPD features were significantly associated with sexual compulsivity and were found to have an indirect effect on increased numbers of sexual partners via sexual compulsivity (Jardin et al., 2017). Future studies could expand on the probable overlap of symptoms with sub analyses in a larger study sample size.

In clinical work with BPD patients, risky sexual behavior is often reported as a form of self-harm with concomitant

feelings of shame and guilt. Our data showing no correlation of BPD severity and self-harm intention with sexual delay discounting indicate that the picture is more complex. A missing correlation between sexual delay discounting and CSB also contradicts the hypothesis that delay discounting is a mere aspect of CSB in BPD.

We conclude that CSB or pronounced borderline symptoms (like self-harm) do not explain our findings that women with BPD are less likely than controls to use available STI protection and discount safer sex. Possible alternative hypotheses could include higher pleasure- or sensation-seeking by omitting a condom, self-punishment, or a wish to please the partner by not using protection. Women with BPD might also be more likely to abstain from use of protection because of self-soothing behavior and feeling more need for immediate sexual connection. Continued research is needed to further examine sexual delay discounting and the underlying motivation in individuals with BPD.

Strengths and limitations

Strengths of the present study include a diverse sample of participants. The control group was matched according to age and sexual orientation. We included lesbian women and the usage of dental dams, which were not previously considered in the SDT. All participants in the BPD group had a preexisting diagnosis of BPD by experienced clinicians, confirmed through standard diagnostic DSM-5 interviews for inclusion in the study. We ensured that participants in the control group did not meet the criteria for a BPD diagnosis through the administration of the same diagnostic interview.

Several limitations of the study should be acknowledged: Dental dam use is not as common (Bailey, Farquhar, Owen, & Whittaker, 2003; Richters, Prestage, Schneider, & Clayton, 2010) and may not be comparable to normal condom use; therefore, women having sex with women (roughly 12% of the sample) may not be as inclined to use them at all (Gutierrez, Tan, Strome, & Pomeranz, 2022).

Another limitation concerns the self-report and hypothetical nature of the SDT. Individuals may be dishonest about condom preference in favor of choosing the more socially acceptable answer. To mitigate this bias, in contrast to the original SDT, we opted to adapt it into an online version so that it could be answered while being alone.

Hypothetical tasks also include the possibility that individuals' choices in the task may not reflect their real-life behavior. However, previous studies utilizing the SDT show that sexual delay discounting correlates with self-reported high-risk sexual behavior (Collado et al., 2017; Johnson & Bruner, 2012), and research concerning monetary delay discounting suggests that hypothetical and real money tasks produce similar results (Johnson & Bickel, 2002; Johnson, Bickel, & Baker, 2007; Madden, Begotka, Raiff, & Kastern, 2003). Furthermore, it should be noted that the data attained by the SDT remain observational; therefore, no causative conclusions can be made.

CONCLUSION

To our knowledge, this is the first study assessing sexual delay discounting in a sample of women with BPD and the first examining associations between sexual delay discounting, borderline symptoms and CSB. Despite the study limitations, our findings contribute to the growing literature on sexual risk behavior in women with BPD and highlight the higher likelihood to engage in unprotected sex, both in situations with and without delay to protective measures.

The tendency for sexual impulsivity and risk behavior, as well as the accompanying sexual health concerns, should receive special consideration in the treatment of women with BPD. The omission of safety measures for protected sex poses a higher risk for sexually transmitted infections and possibly unwanted pregnancy.

The current study indicates that impaired delay discounting is associated with sexual risk behavior in BPD, while no association with BPD symptom severity was found. This finding can improve clinicians' assessment of sexual risk behavior. Future research is warranted to examine the relations between BPD and the discounting of protected sex as well as CSB and to provide further insight into the sexual decision-making of women with BPD.

REFERENCES

American Psychiatric Association (2022). Personality disorders. In *Diagnostic and statistical manual of mental disorders* (5th ed.). *text rev.* https://doi.org/10.1176/appi.books.9780890425787.x18_Personality_Disorders.

Bégin, M., Ensink, K., Bellavance, K., Clarkin, J. F., & Normandin, L. (2021). Risky sexual behavior profiles in youth: Associations with borderline personality features. *Frontiers in Psychology*, *12*, 777046. https://doi.org/10.3389/fpsyg.2021.777046.

Bőthe, B., Potenza, M. N., Griffiths, M. D., Kraus, S. W., Klein, V., Fuss, J., & Demetrovics, Z. (2020). The development of the Compulsive Sexual Behavior Disorder Scale (CSBD-19): An ICD-11 based screening measure across three languages. *Journal of Behavioral Addictions*, *9*(2), 247–258. https://doi.org/10.1556/2006.2020.00034.

Bailey, J. V., Farquhar, C., Owen, C., & Whittaker, D. (2003). Sexual behaviour of lesbians and bisexual women. *Sexually Transmitted Infections*, *79*(2), 147–150. https://doi.org/10.1136/sti.79.2.147.

Barker, V., Romaniuk, L., Cardinal, R. N., Pope, M., Nicol, K., & Hall, J. (2015). Impulsivity in borderline personality disorder. *Psychological Medicine*, *45*(9), 1955–1964. https://doi.org/10.1017/s0033291714003079.

Berry, M. S., Bruner, N. R., Herrmann, E. S., Johnson, P. S., & Johnson, M. W. (2022). Methamphetamine administration dose effects on sexual desire, sexual decision making, and delay discounting. *Experimental and Clinical Psychopharmacology*, *30*(2), 180–193. https://doi.org/10.1037/pha0000398.

Bohus, M., Kleindienst, N., Limberger, M. F., Stieglitz, R. D., Domsalla, M., Chapman, A. L., … Wolf, M. (2009). The short version of the borderline symptom list (BSL-23): Development and initial data on psychometric properties. *Psychopathology*, *42*(1), 32–39. https://doi.org/10.1159/000173701.

Chen, S. F., Lin, C. L., Wang, L. Y., Wang, J. H., Hsu, C. Y., & Shen, Y. C. (2019). Borderline personality disorder is associated with an increased risk of sexually transmitted infections: A nationwide population-based cohort study in Taiwan. *Sexually Transmitted Infections*, *95*(7), 529–533. https://doi.org/10.1136/sextrans-2018-053812.

Cohen, J. (2013). *Statistical power analysis for the behavioral sciences*. Routledge.

Collado, A., Johnson, P. S., Loya, J. M., Johnson, M. W., & Yi, R. (2017). Discounting of condom-protected sex as a measure of high risk for sexually transmitted infection among college students. *Archives of Sexual Behavior*, *46*(7), 2187–2195. https://doi.org/10.1007/s10508-016-0836-x.

Daley, S. E., Burge, D., & Hammen, C. (2000). Borderline personality disorder symptoms as predictors of 4-year romantic relationship dysfunction in young women: Addressing issues of specificity. *Journal of Abnormal Psychology*, *109*(3), 451–460. https://doi.org/10.1037/0021-843x.109.3.451.

Elmquist, J., Shorey, R. C., Anderson, S., & Stuart, G. L. (2016). Are borderline personality symptoms associated with compulsive sexual behaviors among women in treatment for substance use disorders? An exploratory study. *Journal of Clinical Psychology*, *72*(10), 1077–1087. https://doi.org/10.1002/jclp.22310.

Fuss, J., Briken, P., Stein, D. J., & Lochner, C. (2019). Compulsive sexual behavior disorder in obsessive–compulsive disorder: Prevalence and associated comorbidity. *Journal of Behavioral Addictions*, *8*(2), 242–248. https://doi.org/10.1556/2006.8.2019.23.

Fuss, J., Keeley, J. W., Stein, D. J., Rebello, T. J., García, J. Á., Briken, P., … Reed, G. M. (2024). Mental health professionals' use of the ICD-11 classification of impulse control disorders and behavioral addictions: An international field study. *Journal of Behavioral Addictions*. https://doi.org/10.1556/2006.2023.00083.

Gebru, N. M., Kalkat, M., Strickland, J. C., Ansell, M., Leeman, R. F., & Berry, M. S. (2022). Measuring sexual risk-taking: A systematic review of the sexual delay discounting task. *Archives of Sexual Behavior*. https://doi.org/10.1007/s10508-022-02355-y.

Green, L., Fry, A. F., & Myerson, J. (1994). Discounting of delayed rewards: A life-span comparison. *Psychological Science*, *5*, 33–36. https://doi.org/10.1111/j.1467-9280.1994.tb00610.x.

Gutierrez, D., Tan, A., Strome, A., & Pomeranz, M. K. (2022). Dental dams in dermatology: An underutilized barrier method of protection. *International Journal of Women's Dermatology*, *8*(1), e008. https://doi.org/10.1097/jw9.0000000000000008.

Harned, M. S., Pantalone, D. W., Ward-Ciesielski, E. F., Lynch, T. R., & Linehan, M. M. (2011). The prevalence and correlates of sexual risk behaviors and sexually transmitted infections in outpatients with borderline personality disorder. *The Journal of Nervous and Mental Disease*, *199*(11), 832–838. https://doi.org/10.1097/NMD.0b013e318234c02c.

Herrmann, E. S., Hand, D. J., Johnson, M. W., Badger, G. J., & Heil, S. H. (2014). Examining delay discounting of condom-protected sex among opioid-dependent women and non-drug-using control women. *Drug and Alcohol Dependence*, *144*, 53–60. https://doi.org/10.1016/j.drugalcdep.2014.07.026.

Howe, L. K., & Finn, P. R. (2020). The influence of harm avoidance and impulsivity on delay discounting rates. *Personality and Individual Differences*, *152*. https://doi.org/10.1016/j.paid.2019.109564.

Hurlbert, D. F., Apt, C., & White, L. C. (1992). An empirical examination into the sexuality of women with borderline personality disorder. *Journal of Sex & Marital Therapy*, *18*(3), 231–242. https://doi.org/10.1080/00926239208403409.

Jardin, C., Sharp, C., Garey, L., Vanwoerden, S., Crist, N., Elhai, J. D., & Zvolensky, M. J. (2017). Compelled to risk: Does sexual compulsivity explain the connection between borderline personality disorder features and number of sexual partners? *Journal of Personality Disorders*, *31*(6), 738–752. https://doi.org/10.1521/pedi_2017_31_277.

Johnson, M. W., & Bickel, W. K. (2008). An algorithm for identifying nonsystematic delay-discounting data. *Experimental and Clinical Psychopharmacology*, *16*(3), 264–274. https://doi.org/10.1037/1064-1297.16.3.264.

Johnson, M. W., Bickel, W. K., & Baker, F. (2007). Moderate drug use and delay discounting: A comparison of heavy, light, and never smokers. *Experimental and Clinical Psychopharmacology*, *15*(2), 187–194. https://doi.org/10.1037/1064-1297.15.2.187.

Johnson, M. W., & Bruner, N. R. (2012). The sexual discounting task: HIV risk behavior and the discounting of delayed sexual rewards in cocaine dependence. *Drug and Alcohol Dependence*, *123*(1–3), 15–21. https://doi.org/10.1016/j.drugalcdep.2011.09.032.

Johnson, M. W., & Bruner, N. R. (2013). Test-retest reliability and gender differences in the sexual discounting task among cocaine-dependent individuals. *Experimental and Clinical Psychopharmacology*, *21*(4), 277–286. https://doi.org/10.1037/a0033071.

Johnson, M. W., Johnson, P. S., Herrmann, E. S., & Sweeney, M. M. (2015). Delay and probability discounting of sexual and monetary outcomes in individuals with cocaine use disorders and matched controls. *Plos One*, *10*(5), e0128641. https://doi.org/10.1371/journal.pone.0128641.

Johnson, P. S., Sweeney, M. M., Herrmann, E. S., & Johnson, M. W. (2016). Alcohol increases delay and probability discounting of condom-protected sex: A novel vector for alcohol-related HIV

transmission. *Alcoholism, Clinical and Experimental Research*, *40*(6), 1339–1350. https://doi.org/10.1111/acer.13079.

Kowalewska, E., Gola, M., Kraus, S. W., & Lew-Starowicz, M. (2020). Spotlight on compulsive sexual behavior disorder: A systematic review of research on women. *Neuropsychiatric Disease and Treatment*, *16*, 2025–2043. https://doi.org/10.2147/ndt.S221540.

Krause-Utz, A., Cackowski, S., Daffner, S., Sobanski, E., Plichta, M. M., Bohus, M., … Schmahl, C. (2016). Delay discounting and response disinhibition under acute experimental stress in women with borderline personality disorder and adult attention deficit hyperactivity disorder. *Psychological Medicine*, *46*(15), 3137–3149. https://doi.org/10.1017/s0033291716001677.

Lawrence, K. A., Allen, J. S., & Chanen, A. M. (2010). Impulsivity in borderline personality disorder: Reward-based decision-making and its relationship to emotional distress. *Journal of Personality Disorders*, *24*(6), 786–799. https://doi.org/10.1521/pedi.2010.24.6.785.

Leeman, R. F., Rowland, B. H. P., Gebru, N. M., & Potenza, M. N. (2019). Relationships among impulsive, addictive and sexual tendencies and behaviours: A systematic review of experimental and prospective studies in humans. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *374*(1766), 20180129. https://doi.org/10.1098/rstb.2018.0129.

Lemley, S. M., Jarmolowicz, D. P., Parkhurst, D., & Celio, M. A. (2018). The effects of condom availability on college women's sexual discounting. *Archives of Sexual Behavior*, *47*(3), 551–563. https://doi.org/10.1007/s10508-017-1040-3.

Levitt, E., Sanchez-Roige, S., Palmer, A. A., & MacKillop, J. (2020). Steep discounting of future rewards as an impulsivity phenotype: A concise review. *Current Topics in Behavioral Neurosciences*, *47*, 113–138. https://doi.org/10.1007/7854_2020_128.

Lew-Starowicz, M., Lewczuk, K., Nowakowska, I., Kraus, S., & Gola, M. (2020). Compulsive sexual behavior and dysregulation of emotion. *Sexual Medicine Reviews*, *8*(2), 191–205. https://doi.org/10.1016/j.sxmr.2019.10.003.

Lloyd, M., Raymond, N. C., Miner, M. H., & Coleman, E. (2007). Borderline personality traits in individuals with compulsive sexual behavior. *Sexual Addiction and Compulsivity*, *14*(3), 187–206. https://doi.org/10.1080/10720160701480337.

Ludwig, V. U., Nüsser, C., Goschke, T., Wittfoth-Schardt, D., Wiers, C. E., Erk, S., … Walter, H. (2015). Delay discounting without decision-making: Medial prefrontal cortex and amygdala activations reflect immediacy processing and correlate with impulsivity and anxious-depressive traits. *Frontiers in Behavioral Neuroscience*, *9*, 280. https://doi.org/10.3389/fnbeh.2015.00280.

Madden, G. J., Begotka, A. M., Raiff, B. R., & Kastern, L. L. (2003). Delay discounting of real and hypothetical rewards. *Experimental and Clinical Psychopharmacology*, *11*(2), 139–145. https://doi.org/10.1037/1064-1297.11.2.139.

Margraf, J., & Cwik, J. C. (2017). Mini-DIPS Open Access: Diagnostisches Kurzinterview bei psychischen Störungen. Bochum: Forschungs- und Behandlungszentrum für psychische Gesundheit. *Ruhr-Universität Bochum*. https://doi.org/10.13154/rub.102.91.

Miano, A., Grosselli, L., Roepke, S., & Dziobek, I. (2017). Emotional dysregulation in borderline personality disorder and its influence on communication behavior and feelings in romantic relationships. *Behaviour Research and Therapy*, *95*, 148–157. https://doi.org/10.1016/j.brat.2017.06.002.

Myerson, J., Green, L., & Warusawitharana, M. (2001). Area under the curve as a measure of discounting. *Journal of the Experimental Analysis of Behavior*, *76*(2), 235–243. https://doi.org/10.1901/jeab.2001.76-235.

Navarro-Gómez, S., Frías, Á., & Palma, C. (2017). Romantic relationships of people with borderline personality: A narrative review. *Psychopathology*, *50*(3), 175–187. https://doi.org/10.1159/000474950.

Negash, S., Sheppard, N. V., Lambert, N. M., & Fincham, F. D. (2016). Trading later rewards for current pleasure: Pornography consumption and delay discounting. *Journal of Sex Research*, *53*(6), 689–700. https://doi.org/10.1080/00224499.2015.1025123.

Odum, A. L. (2011). Delay discounting: I'm a k, you're a k. *Journal of the Experimental Analysis of Behavior*, *96*(3), 427–439. https://doi.org/10.1901/jeab.2011.96-423.

Richters, J., Prestage, G., Schneider, K., & Clayton, S. (2010). Do women use dental dams? Safer sex practices of lesbians and other women who have sex with women. *Sexual Health*, *7*(2), 165–169. https://doi.org/10.1071/sh09072.

Sansone, R. A., Barnes, J., Muennich, E., & Wiederman, M. W. (2008). Borderline personality symptomatology and sexual impulsivity. *The International Journal of Psychiatry in Medicine*, *38*(1), 53–60. https://doi.org/10.2190/PM.38.1.e.

Sansone, R. A., Chu, J. W., & Wiederman, M. W. (2011). Sexual behaviour and borderline personality disorder among female psychiatric inpatients. *International Journal of Psychiatry in Clinical Practice*, *15*(1), 69–73. https://doi.org/10.3109/13651501.2010.507871.

Sansone, R. A., Lam, C., & Wiederman, M. W. (2011). The relationship between borderline personality disorder and number of sexual partners. *Journal of Personality Disorders*, *25*(6), 782–788. https://doi.org/10.1521/pedi.2011.25.6.782.

Sansone, R. A., & Sansone, L. A. (2011). Sexual behavior in borderline personality: A review. *Innovations in Clinical Neuroscience*, *8*(2), 14–18 Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3071095/pdf/icns_8_2_14.pdf.

Sweeney, M. M., Berry, M. S., Johnson, P. S., Herrmann, E. S., Meredith, S. E., & Johnson, M. W. (2020). Demographic and sexual risk predictors of delay discounting of condom-protected sex. *Psychology & Health*, *35*(3), 366–386. https://doi.org/10.1080/08870446.2019.1631306.

Thompson, K. N., Betts, J., Jovev, M., Nyathi, Y., McDougall, E., & Chanen, A. M. (2019). Sexuality and sexual health among female youth with borderline personality disorder pathology. *Early Intervention in Psychiatry*, *13*(3), 502–508. https://doi.org/10.1111/eip.12510.

Tull, M. T., Gratz, K. L., & Weiss, N. H. (2011). Exploring associations between borderline personality disorder, crack/cocaine dependence, gender, and risky sexual behavior among substance-dependent inpatients. *Personality Disorders*, *2*(3), 209–219. https://doi.org/10.1037/a0021878.

World Health Organization (2022). *ICD-11: International classification of diseases (11th revision)*. https://icd.who.int/.

Appendix

Table 1. Demographics and interview results of women with borderline personality disorder and control women. A significant difference between groups is indicated by a *p* value less than .05, based on *t*-tests for metric variables and chi-square tests for nominal variables

	BPD (*n* = 40)	Control (*n* = 40)	*p* value
Age (years) (mean ± SD)	26.6 (5.8)	28.5 (6.4)	0.17
Relationship status			1.00
In a relationship	18 (45%)	18 (45%)	
Single	20 (50%)	20 (50%)	
Other	2 (5%)	2 (5%)	
Number of sex partners			0.37
0	3 (7.5%)	3 (7.5%)	
1–10	17 (42.5%)	21 (52.5%)	
11–20	12 (30%)	6 (15%)	
21–30	3 (7.5%)	6 (15%)	
30+	5 (12.5%)	3 (7.5%)	
Sexual orientation			0.5
Preferred women	4 (10%)	6 (15%)	
Preferred men	36 (90%)	34 (85%)	
Depressive disorder			<0.01
Never had depressive episode	3 (7.5%)	32 (80%)	
Current depressive episode	23 (57.5%)	1 (2.5%)	
Previous depressive episode	14 (35%)	7 (17.5%)	
Mania			0.07
No symptoms	31 (77.5%)	38 (95%)	
Current	1 (2.5%)		
Previous	8 (20%)	2 (5%)	
Suicidality			<0.01
No symptoms	11 (27.5%)	40 (100%)	
Mild	14 (35%)		
Moderate	7 (17.5%)		
Severe	8 (20%)		
Bipolar disorder			0.12
No symptoms	36 (90%)	40 (100%)	
Current	1 (2.5%)		
Previous	3 (7.5%)		
Panic disorder			<0.01
No symptoms	22 (55%)	38 (95%)	
Current	6 (15%)		
Lifetime	12 (30%)	2 (5%)	
Agoraphobia			<0.01
No symptoms	31 (77.5%)	40 (100%)	
Current	9 (22.5%)		
Social phobia			<0.01
No symptoms	26 (65%)	39 (97.5%)	
Current	14 (35%)	1 (2.5%)	
Obsessive-compulsive disorder			0.09
No symptoms	35 (87.5%)	39 (97.5%)	
Current	5 (12.5%)	1 (2.5%)	
Posttraumatic stress disorder			<0.01
No symptoms	25 (62.5%)	39 (97.5%)	
Current	15 (37.5%)	1 (2.5%)	
Generalized anxiety disorder			<0.01
No symptoms	26 (65%)	40 (100%)	
Current	14 (35%)		
Psychotic disorder			0.31
No symptoms	40 (100%)	39 (97.5%)	
Previous		1 (2.5%)	

(continued)

Table 1. Continued

	BPD (*n* = 40)	Control (*n* = 40)	*p* value
Anorexia nervosa			0.08
No symptoms	37 (92.5%)	40 (100%)	
Current	3 (7.5%)		
Bulimia			<0.01
No symptoms	31 (77.5%)	40 (100%)	
Current	9 (22.5%)		
Binge-eating disorder			0.02
No symptoms	35 (87.5%)	40 (100%)	
Current	5 (12.5%)		
Antisocial personality disorder			
No symptoms	40 (100%)	40 (100%)	
Current			

'Current' is defined as in the past month for all diagnoses, except for generalized anxiety disorder (6 months).

Table 2. Spearman's rank correlations of discounting data and symptom scales

	BPD				Control			
	n	1	2	3	*n*	1	2	3
1. CSBD-19 score	40	—			40	—		
2. BSL-23 score	40	0.2	—		40	0.43**	—	
3. Self-harm subscore	40	0.11	0.83**	—	40	−0.17	0.43**	—
Zero-delay$_{\text{Most want sex}}$	35	−0.48**	−0.17	−0.21	34	0.01	0.04	0.1
Zero-delay$_{\text{Least want sex}}$	36	−0.09	−0.16	−0.16	35	0.02	0.25	0.18
Zero-delay$_{\text{Most likely STI}}$	36	−0.32	−0.17	−0.12	35	0.01	0.43*	0.18
Zero-delay$_{\text{Least likely STI}}$	36	−0.43**	−0.25	−0.26	34	0.16	0.4*	0.17
AUC$_{\text{Most want sex}}$	35	−0.28	−0.26	−0.28	34	−0.06	−0.11	−0.33
AUC$_{\text{Least want sex}}$	36	−0.27	−0.38*	−0.26	35	−0.09	0.18	−0.06
AUC$_{\text{Most likely STD}}$	36	−0.18	−0.35*	−0.21	35	0.04	0.22	−0.12
AUC$_{\text{Least likely STD}}$	36	−0.33	−0.23	−0.24	34	−0.26	0.00	−0.12

Notes. BPD: patients with borderline personality disorder. *Control:* Control group. *AUC:* area under the curve. *STD:* sexually transmitted disease.
* *p* < 0.05. ** *p* < 0.01.