



Lower self-positivity and its association with self-esteem in women with borderline personality disorder

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ABSTRACT

Self-esteem, the global attitude towards one's self, is low in persons with borderline personality disorder (BPD). This may be partially due to the ways these persons protect or enhance the self. A case in point is self-positivity, the association of positive rather than negative events, experiences, and objects with the self. Self-esteem and self-positivity may result from either conscious or non-conscious processes. We examined whether low self-esteem is related to low self-positivity in BPD, and whether their covariation is contingent upon conscious processing.

We assessed explicit self-esteem via self-report (Rosenberg Self-Esteem Scale) and implicit self-esteem via the Initial Preference Task in women with BPD and healthy control women. We assessed self-positivity in a self-referential processing task, in which participants rated the valence of positive, neutral, and negative nouns, and later recalled them. We manipulated referential context via supraliminal or subliminal priming of self-reference, other-reference, or no reference. Explicit and implicit self-esteem were lower in the BPD group than in the healthy control group. Participants with BPD rated self-referential words less positively, when primes were presented supraliminally. Less positive and slower ratings of positive self-referential words were associated with lower explicit, but not implicit, self-esteem in the BPD group.

1. Introduction

Identity disturbances are one of the core symptom domains of borderline personality disorder (BPD), comprising an unstable self-concept and high self-criticism (see dimensional model of DSM-5; American Psychiatric Association, 2013). Self-esteem, a global attitude or feeling towards one's self (Rosenberg, 1979; Sedikides & Gregg, 2003), is also very low in persons with BPD (Bungert et al., 2015; Lynum, Wilberg, & Karerud, 2008; Roepke et al., 2011). Albeit clinically relevant, studies on mechanisms underlying low self-esteem in

BPD are sparse (for a review, see Winter, Bohus, & Lis, 2017). Social psychological research has established that people engage in self-enhancing or self-protective processing of self-relevant information, which is in the service of self-esteem (Sedikides & Gregg, 2008; Sedikides, Gaertner, & Cai, 2015; Sedikides, Green, Saunders, Skowronski, & Zengel, 2016). Recent empirical evidence provided first hints that such processing may take a different form in persons with BPD compared to healthy control participants (HC; Auerbach et al., 2016; Winter et al., 2015). In particular, self-positivity, defined as positive evaluation of self-related objects, events, experiences or traits,

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may differ in these two groups. We focused on self-positivity in an effort to improve understanding of mechanisms associated with low self-esteem among persons with BPD.

1.1. Self-esteem in BPD

Most relevant studies have assessed self-esteem in BPD with self-report questionnaires, such as the Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). These measurement approaches are based on the construct of explicit self-esteem being defined as global or trait-like feelings of self-worth. Persons with BPD report markedly low explicit self-esteem in comparison with HC (Bungert et al., 2015; Lynum et al., 2008; Roepke et al., 2011), and also in comparison with persons with other mental disorders such as major depression (Abela, Payne, & Moussaly, 2003) or social phobia (Rusch et al., 2007).

Self-report questionnaires capture the conscious appraisal of one's self. As such, they risk missing self-feelings or self-attitudes of which participants are unaware. Moreover, the responses to such questionnaires are contingent on participants' willingness to share their actual self-views. These shortcomings have partially motivated the development of the construct of 'implicit self-esteem,' which captures non-conscious appraisals of one's self, thus limiting the influence of self-presentational concerns. Nevertheless, it is unclear how different implicit self-esteem is from explicit self-esteem. Some researchers define implicit self-esteem as closely related to explicit self-esteem, assuming that both are based on the same knowledge system (Fazio & Towles-Schwen, 1999; Hetts, Sakuma, & Pelham, 1999), whereas other researchers regard explicit and implicit self-esteem as distinct constructs (Greenwald & Banaji, 1995; Izuma, Kennedy, Fitzjohn, Sedikides, & Shibata, 2018). The latter researchers suggest that explicit self-esteem results from a controlled or deliberate appraisal of the self, whereas implicit self-esteem results from an automatic, effortless, nonverbal, and affective processing style (Greenwald & Banaji, 1995; Izuma et al., 2018).

The literature on implicit self-esteem in BPD is scarce. One study used the Implicit Association Test (IAT; Greenwald & Farnham, 2000) to measure implicit self-esteem. The IAT assesses the strength of associative bonds (i.e., speed of categorization) between self ("I") and positive (e.g., "good") or negative (e.g., "bad") stimuli versus another person (e.g., "other") and said stimuli. The study revealed no BPD-HC differences in the strength of implicit associations between the self and positive information, and between the self and negative information (Hedrick & Berlin, 2012; Vater et al., 2013). Another study (Vater, Schroder-Abe, Schutz, Lammers, & Roepke, 2010) used the Initials Preference Task (IPT; Kitayama & Rarasaewa, 1997; Nuttin, 1985). Here, participants are asked to rate the extent to which they like alphabet letters. Higher implicit self-esteem is indicated by a participant's higher liking for her or his name initials compared to liking of these initials by other participants. Participants with BPD evinced a small but significant preference for their initials. However, this study did not include a control group, and so it could not address the question of whether this preference is less pronounced among participants with BPD compared to HC.

In summary, explicit self-esteem measures reveal low self-esteem among BPD patients relative to control participants, but evidence for lower implicit self-esteem in BPD patients is equivocal. This may be surprising, as social psychological research indicates a small but significant positive association between explicit and implicit self-esteem (Buhrmester, Blanton, & Swann, 2011; Krizan & Suls, 2008). Thus, BPD studies ought to use measures of both types of self-esteem in order to clarify whether low self-esteem in BPD reflects primarily conscious or also non-conscious processing. This clarification could inform the design of psychosocial interventions.

1.2. Self-positivity

Self-positivity refers to the preferential association of positive rather than negative information with the self (Herbert, Herbert, Ethofer, & Pauli, 2011; Watson, Ditschel, Obonsawin, & Jentsch, 2007; Weis & Herbert, 2017) and to the evaluation of information, events, objects or persons related to the self as more positive (Gregg, Mahadevan, & Sedikides, 2017; Shi, Sedikides, Cai, Liu, & Yang, 2017). Stronger self-positivity has been associated with higher self-esteem in healthy participants, suggesting that self-positivity is in the service of protecting or enhancing self-esteem (Tao, Zhang, Li, & Geng, 2012; Zhang, Guan, Qi, & Yang, 2013). Self-positivity has frequently been studied with self-referential encoding tasks that ask healthy participants to indicate whether certain features describe them. Participants endorse more positive than negative personality traits as self-descriptive, make decisions more quickly for self-related positive than for self-related negative items (Shi et al., 2017; Watson et al., 2007; Weis & Herbert, 2017), and when these items are presented with reference to the self (Auerbach et al., 2016; Herbert et al., 2011; Kwan et al., 2007; Moran, Macrae, Heatherton, Wyland, & Kelley, 2006; Watson et al., 2007). In a recent study by Winter et al. (2015), participants judged the valence of positive, neutral, and negative nouns presented in reference to the self (e.g., 'my joy', 'my house'), in reference to a same-gender acquaintance (e.g., 'Maria's joy', 'Maria's house'), or without an explicit reference (e.g., 'the joy', 'the house'). Persons with BPD rated self-related positive and neutral nouns less favorably than HC, suggesting lower self-positivity in BPD. This interpretation was supported by the finding that the BPD and HC did not differ in the 'same-gender acquaintance' condition. Likewise, Auerbach et al. (2016) reported a lack of self-positivity, and even the presence of self-negativity, in BPD: In a self-referential encoding task, adolescents with BPD rated negative (rather than positive) items faster and more often as self-descriptive when compared with HC. This study, however, did not include a no-reference or other-reference control condition.

The just-described literature has focused on conscious processing of self-referential frames. However, research on healthy participants points to self-positivity even when self-reference primes are invisible (Tao et al., 2012). In other domains of functioning, such as emotion recognition, controlled processing of information is impaired in BPD (Dinsdale & Crespi, 2013; Fenske et al., 2015; Hagenhoff et al., 2013), suggesting that conscious self-referential processing may also be impaired.

1.3. Overview

We examined whether lower self-esteem and self-positivity are characteristics of patients diagnosed with BPD. We also examined if changes in self-esteem and self-positivity in BPD depend on explicit and implicit measures, and if the effect of self-reference depends on whether the relevant self-related prime is consciously accessible. We hypothesized that BPD patients would manifest lower self-esteem (explicit and implicit) and reduced self-positivity when reference to the self is presented supraliminally facilitating conscious processing of self- and emotional information. We were tentative as to whether this pattern would emerge when self-referential cues are presented subliminally, which invites non-conscious processing of self-related information. Findings from the BPD literature document the potency of conscious processing (Dinsdale & Crespi, 2013; Fenske et al., 2015; Hagenhoff et al., 2013; Lowyck et al., 2016), implying that changes in self-esteem and self-positivity occur when patients are aware of the self-reference. In addition, we expected that self-positivity would be associated with self-esteem in both BPD and HC.

2. Method

2.1. Participants

All participants were German women. Thirty eight were diagnosed with BPD and 31 served as HC. The two groups were matched in age and education. Participants received information on study procedures and gave written informed consent. The study, approved by the Research Ethics Board II of University of Heidelberg, was conducted according to the Declaration of Helsinki.

Exclusion criteria were age over 55 years, traumatic brain injuries, lifetime diagnosis of schizophrenia or bipolar I disorder, mental or developmental disorders, substance dependency during the last year, and substance abuse in the last two months. BPD patients had to meet DSM-IV criteria and be either without any psychotropic medication or on stable psychotropic medication. HC had no lifetime mental illness and no psychotropic medication.

Trained diagnosticians made clinical diagnoses using the Structured Clinical Interview for DSM-IV Axis I Disorders (SKID-I; Wittchen, Wunderlich, & Gruschwitz, 1997) and the BPD section of the International Personality Disorder Examination (IPDE; Lorranger, 1999). We assessed symptom severity with the Borderline Symptom List short version (BSL-23; Bohus et al., 2009; in this study, Cronbach's $\alpha = 0.97$), and level of depressive mood with the Beck Depression Inventory II (BDI-II; Beck, Steer, & Brown, 1996; Hautzinger, Keller, & Kühner, 2006; in this study, Cronbach's $\alpha = 0.97$).

We excluded one HC due to recent drug abuse and seven BPD patients due to technical problems ($n = 3$), premature task discontinuation ($n = 2$), lack of study commitment (i.e., no questionnaires submitted; $n = 1$), and atypically slow reactions times (i.e., 3 SD below the mean; $n = 1$). Thus, the final sample consisted of 30 participants in the HC group and 31 in the BPD group. We summarize in Table 1 the sample's demographic and psychopathological characteristics. Sixteen (51.6%) BPD patients were free of psychotropic medication. Of the remaining, 11 (35.5%) took selective serotonin reuptake inhibitors, six (19.4%) neuroleptics, four (12.9%) serotonin-norepinephrine reuptake inhibitors, two (6.5%) noradrenalin-dopamine reuptake inhibitors, one (3.2%) antiepileptics, and one (3.2%) methylphenidate.

2.2. Measures and experimental task

Explicit self-esteem. We measured explicit self-esteem with the 10-item Rosenberg Self-Esteem Scale (RSES; Rosenberg, 1965). Scores vary between 0 and 30, with higher scores indicating greater self-esteem. Sample items are: "I feel that I'm a person of worth, at least on an equal basis with others" and "I certainly feel useless at times (reverse-scored)". In this study, the RSES demonstrated excellent internal consistency (Cronbach's $\alpha = 0.96$).

Implicit self-esteem. We measured implicit self-esteem with the well-established Initials-Preference Task (Cai et al., 2011; Kitayama & Rarasaawa, 1997; Nuttin, 1985, 1987). Participants learned that they would take part in a study on individual preferences and then rated the degree to which they liked each of the 26 letters of the alphabet ($1 = \text{not at all}$, $9 = \text{very much}$). We presented letters in white on a black computer screen and in randomized order. We calculated the initials-preference by (1) standardizing each participant's ratings via Z-transformation to control for individual rating biases, (2) averaging for each letter of the alphabet the z-transformed scores across those participants for which the single letter was not an initial, and (3) correcting the ratings of the initial-letters of the single participants by subtracting the mean rating score of the corresponding letter to control for overall letter preference (De Raedt, Schacht, Franck, & De Houwer, 2006; Vatter et al., 2010).

Self-referential processing task. We measured self-positivity with a self-referential processing task used by Winter et al. (2015; Fig. 1). Participants rated the valence of positive and negative nouns as well as

Table 1

Demographic and clinical variables in healthy control participants (HC) and participants with borderline personality disorder (BPD) patients.

	HC (n = 30)		BPD (n = 31)		Statistics	
	M	SD (±)	M	SD (±)	t	p
Age – years	30.27	9.00	31.10	8.16	0.38	.707
Years of education, n (%)					$\chi^2_2 = .608$.738
< 9 years	0	(0)	0	(0)		
9 years	1	(3.33)	1	(3.23)		
10 years	7	(23.33)	10	(32.25)		
13 years	22	(73.33)	20	(64.52)		
BDI-II – total score	3.62 ^a	4.07	30.93 ^b	12.36	11.30	< .001
BSL-23 – mean score	0.12 ^a	0.21	1.85	0.78	11.87	< .001
RSES	25.80	4.65	10.23	5.50	11.93	< .001
IPT	0.97 ^a	0.53	0.54	0.88	2.35	.023
Comorbidities, n (%)						
major depressive disorder			15	(48.39)		
Dysthymia			2	(6.45)		
posttraumatic stress disorder			11	(35.48)		
social phobia			5	(16.13)		
specific phobia			3	(9.68)		
panic disorder			2	(6.45)		
with/without agoraphobia						
agoraphobia			1	(3.23)		
bulimia nervosa			8	(25.81)		
binge eating disorder			2	(6.45)		
atypical anorexia nervosa			1	(3.23)		
obsessive compulsive disorder			2	(6.45)		
somatiform pain disorder			1	(3.23)		
unspecific somatoform disorder			1	(3.23)		

Note: BPD = borderline personality disorder; BSL-23 = Borderline Symptom List-23; BDI-II = Beck Depression Inventory; HC = healthy control participants; IPT = Initial Preference Test; RSES = Rosenberg Self-Esteem Scale; t-Test performed at a significance level of $p < .05$.

^a $n = -1$.

^b $n = -2$.

emotionally neutral nouns. The presentation of each noun was preceded by a prime that manipulated the referential context, namely the reference to the self, the reference to a same-gender acquaintance, or no explicit reference. Beyond these experimental manipulations of valence and referential context, we varied the degree to which the referential context could be consciously or non-consciously processed through supraliminal or subliminal prime presentations, respectively ('prime duration').

To manipulate the emotional valence of the words we used as stimuli 360 nouns referring to concrete objects, concepts, and experiences (e.g., houses, character, happiness, misery). We selected the nouns from a word data base (Herbert et al., 2011), providing ratings of arousal and valence, to form 3 stimulus classes: 120 positive and 120 negative nouns with high positive or negative valence and high arousal ratings, and 120 neutral nouns with low arousal ratings. For each of the three valence conditions, we split nouns into subsets with 20 nouns each (20 trials per condition). These subsets were comparable in regards to word length, valence, and arousal. They were also balanced across participants and the experimental conditions 'referential context' and 'prime duration'.

Further, we manipulated referential context as either (1) a first-person singular pronoun for self-reference (e.g., "my"), (2) an acquaintance name in genitive case (e.g., "Maria's") for other-reference,

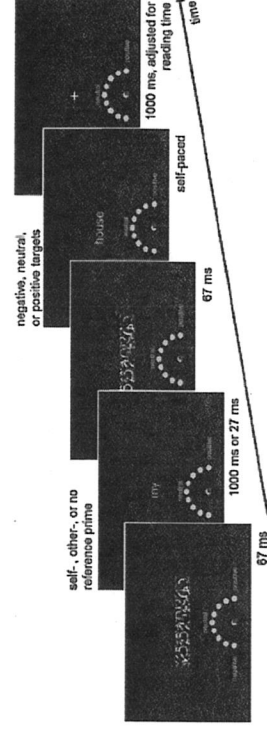


Fig. 1. Trial timing and conditions of the self-referential processing task.

or (3) a definitive article ("the") as control (or "no reference") condition without reference to any person. We determined the acquaintance's name by asking participants to name a female acquaintance that they neither liked nor disliked. Participants indicated the person's approximate age and rated the chosen person regarding their type of relationship and closeness (Unidimensional Relationship Closeness Scale; Dibble, Levine, & Park, 2012). Age and closeness ratings did not differ between BPD patients and HC ($p = .122/p = .194$).

We manipulated the degree to which the referential context could be consciously or non-consciously processed by varying prime duration, namely, whether the reference prime preceding the noun that we presented supraliminally (1000 ms prime duration) or subliminally (27 ms prime duration). In both conditions, primes were masked forward and backwards using a mask consisting of letter parts presented for 67 ms. We chose presentation times for prime and mask in accordance with literature on semantic priming (Drahe & Greenwald, 1998; Greenwald, Drahe, & Abrams, 1996) and subliminal priming in BPD (Cullen et al., 2011; Sieswerda, Arntz, Mertens, & Vertommen, 2007).

To summarize, all participants rated 360 nouns presented in 10 blocks of 36 trials. We varied prime duration between blocks to allow participants to adapt to presentation duration, whereas we varied valence and referential context within each block and presented them in pseudorandom order. In each trial, participants rated the valence of the noun on a 9-point-scale ($-4 = \text{very negative}$, $4 = \text{very positive}$). After each block, we asked participants to recall all nouns they remembered from the previous block. Accordingly, the dependent variables were valence ratings (scores), reaction times, and percent of nouns correctly recalled. We presented all stimuli on a 15 inch computer screen, in white letters on a black background, centered on the computer monitor using Presentation[®] (nbs.neurobs.com).

Control task. Following ratings and recall, participants completed a visibility check to rule out conscious prime perception in the subliminal condition. In 36 trials, participants saw either the prime words or anagrams of these words for 27 ms forward and backward masked (67 ms). Participants were instructed to indicate whether the letters formed a meaningful word (yes/no) and, if so, report which word they thought they saw. We defined visibility as the number of correct yes/no-answers above chance. We determined chance level via a binomial test at $\alpha = 0.05$ resulting in 24 (of 36) correct answers.

2.3. Statistical analysis

We compared BPD patients and HC on RSES and IPT scores via independent sample *t*-tests. We analyzed average valence ratings, average reaction times (RT) trimmed by 20%, and recall performance of the self-referential processing with repeated-measure Analyses of Variance (rm-ANOVA) with 'Group' (BPD, HC) as between-subjects factor, and prime duration (supraliminal, subliminal), valence (negative, neutral, positive), and referential context (self-reference, other-reference, no reference/article) as within-subjects factors. We conducted post-hoc comparisons with ANOVA subdesigns or *t*-tests,

Bonferroni-corrected for multiple comparisons. Additionally, we compared nouns correctly recalled between groups with the Mann-Whitney-U-Test before ANOVA to assure comparable overall performance before calculating recall performance per condition as percent of all recalled words (to control for individual differences in recall abilities; Winter et al., 2015). To test for changes in self-positivity contingent upon explicit or implicit self-esteem in BPD, we calculated Pearson's correlation coefficients. Finally, we conducted all analyses with IBM SPSS Statistics 24 (IBM, USA) at a statistical significance level of $\alpha = 0.05$.

3. Results

3.1. Self-esteem

Explicit self-esteem. RSES scores were lower in the BPD than in the HC group, $t(59) = 11.93$, $p < .001$, $d = 3.06$ (Table 1).

Implicit self-esteem. Both HC and BPD showed a preference for their initials; for HC $t(28) = 9.86$, $p < .001$, $d = 1.83$; for BPD, $t(30) = 3.39$, $p = .002$, $d = 0.61$. This preference, however, was smaller in the BPD than the HC group, $t(50.73) = 2.30$, $p = .026$, $d = 0.62$. Note that, for the IPT analysis, we excluded data of one further HC participant due to invariant neutral responding.

Covariation between explicit and implicit self-esteem. RSES and IPT measures were uncorrelated in both the BPD and HC group (all $p > .865$).

3.2. Self-referential processing task

Valence ratings. Differences in valence ratings between groups were influenced by duration of prime and referential context. Group x Prime Duration x Referential Context interaction $F(2,118) = 10.45$, $p < .001$, $\eta_p^2 = 0.15$ (Fig. 2). We broke down the interaction by calculating separate rm-ANOVA subdesigns for the supraliminal and subliminal prime condition (2x3x3-rmANOVA Group x Referential Context x Valence). Group differences were observed when the referential context was presented supraliminally (Group x Referential Context interaction $F(2,118) = 11.65$, $p < .001$, $\eta_p^2 = 0.17$), but not when it was presented subliminally (Group x Referential Context interaction $F(2,118) = 0.06$, $p = .939$, $\eta_p^2 < 0.01$). In the supraliminal case, BPD patients rated nouns less positively compared to HC when nouns referred to themselves or had no reference, but not when they referred to others (self-reference $p < .001$, $d = 1.46$; no reference $p < .001$, $d = 1.26$; other-reference $p = .417$, $d = 0.21$). Differences between groups were larger for the self-reference condition relative to the no self-reference condition (2×2 rm-ANOVA for supraliminal presentation including the self-reference and no-reference condition, $F(1,59) = 12.81$, $p = .001$, $\eta_p^2 = 0.18$).

Differences in valence ratings between groups were also influenced by the nouns' valence and the referential context, Group x Valence x Referential Context interaction $F(4, 236) = 2.49$, $p = .044$, $\eta_p^2 = 0.04$. We conducted analyses of subdesigns (2x2x3-rmANOVA Group x Prime

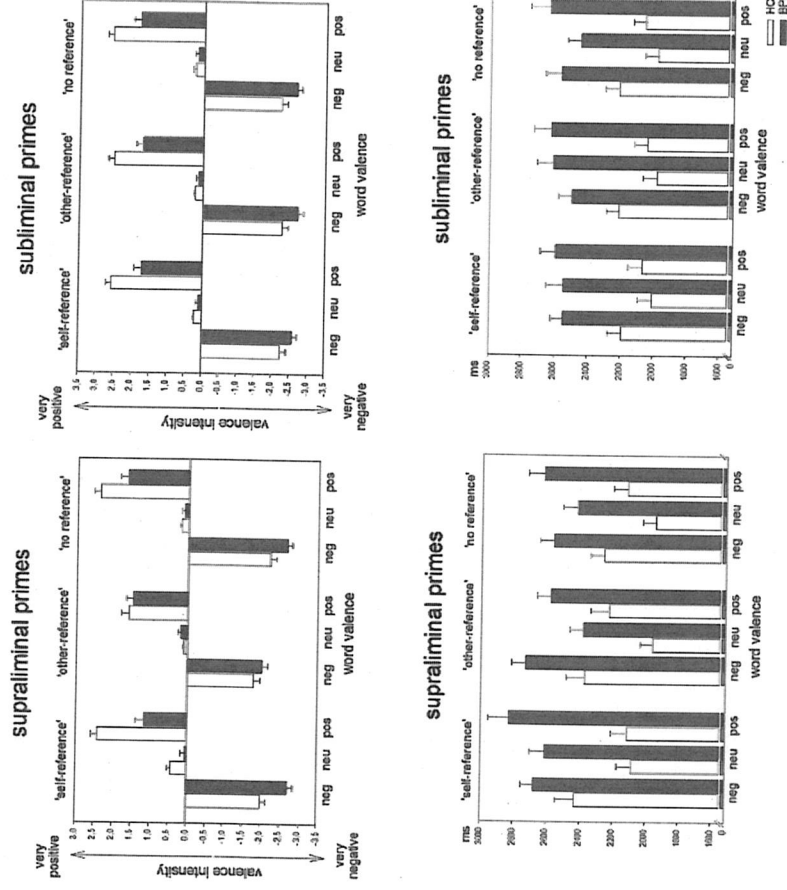


Fig. 2. Word ratings and reaction times of the self-referential processing task. BPD = borderline personality disorder; HC = healthy control participants; neg = negative; neu = neutral; pos = positive.

Duration x Referential Context) separately for negative, neutral and positive nouns. BPD patients rated negative nouns more negatively than HC, independently of the referential context (Group x Referential Context interaction $F(2,118) = 1.77, p = .175, \eta_p^2 = 0.03$; Group main effect $F(1,59) = 4.24, p = .044, \eta_p^2 = 0.07$). In contrast, BPD patients rated neutral nouns less positively compared with HC groups, but only when these referred to the self (Group x Referential Context interaction $F(2,118) = 4.49, p = .013, \eta_p^2 = 0.07$; BPD vs. HC: self-reference: $p = .030, d = 0.57$, no-reference $p = .936, d = 0.19$, other-reference: $p = .455, d = 0.02$; Group main effect $F(1,59) = 1.65, p = .203, \eta_p^2 = 0.03$). BPD patients rated positive words less positively than HC (Group main effect $F(1,59) = 12.29, p = .001, \eta_p^2 = 0.17$). This difference between groups was particularly strong for positive words with self-reference compared to positive words without reference (positive words: Group x Referential Context interaction $F(2,118) = 7.76, p = .001, \eta_p^2 = 0.12$; 2×2 ANOVA subdesigns contrasting self-/other-reference $F(1, 59) = 11.17, p = .001, \eta_p^2 = 0.16$; self-/no-reference $F(1, 59) = 5.94, p = .018, \eta_p^2 = 0.09$; other-/no reference $F(1, 59) = 4.04, p = .049, \eta_p^2 = 0.06$).

For further statistical details, see Appendix, Tables A1 and A.2. Note that, due to data complexity, we restricted a detailed results description of the self-referential processing task to effects related to differences between groups (i.e., main and interaction effects with the factor group). Also, we do not describe details of lower order effects, if their

interpretability is limited due to a higher-order interaction effect.

Reaction times. Prime duration as well as word valence and referential context influenced the strength of differences in reaction times between groups, Group x Prime Duration x Valence x Referential Context interaction $F(4, 236) = 4.43, p = .002, \eta_p^2 = 0.07$ (Fig. 2). The referential context and the words' valence influenced RTs in BPD and HC participants only differentially in the supraliminal condition (ANOVA subdesigns: supraliminal presentation condition: $2 \times 3 \times 3$ -rmANOVA Group x Referential Context x Valence $F(4, 236) = 4.15, p = .003, \eta_p^2 = 0.07$; subliminal presentation condition $F(4, 236) = 1.57, p = .184, \eta_p^2 = 0.03$). Herein, the referential context influenced RT differences between groups only for positive nouns, but not for negative and neutral ones (2×3 -rmANOVA for supraliminal conditions, Group x Referential Context: for positive, $F(2, 118) = 5.46, p = .005, \eta_p^2 = 0.09$; for negative, $F(2, 118) = 0.92, p = .401, \eta_p^2 = 0.02$; for neutral, $F(2, 118) = 1.00, p = .370, \eta_p^2 = 0.02$). BPD patients rated positive nouns more slowly when they referred to themselves compared to others ($p = .037, d = 0.42$) and when having no reference ($p = .002, d = 0.31$). In contrast, in the HC, RT did not differ significantly between the referential contexts (all $p \geq .492$). For further statistical details, see Appendix, Table A1 and A2.

Recall. BPD patients did not differ from HC in overall recall (HC $M = 78.40 \pm 18.83$ SD; BPD $M = 71.84 \pm 3.67$ SD; $U = 365.50, Z = -1.44, p = .15, r = -0.18$). Groups differed at trend level

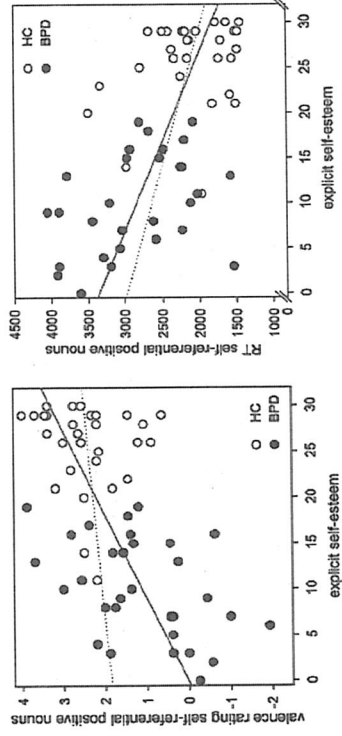


Fig. 3. Correlations between self-esteem and self-positivity. Among participants with borderline personality disorder (BPD), there are significant correlations between explicit self-esteem (measured with the Rosenberg Self-Esteem Scale) and valence ratings, and between explicit self-esteem reaction times (RT), for rating positive nouns with self-reference. These correlations were not significant among healthy control participants (HC).

depending on the recalled words' valence, $F(2,118) = 2.57, p = .081$, $\eta_p^2 = 0.04$. Although the BPD group recalled positive and negative nouns better than neutral nouns (positive nouns: $p < .001, d = 0.77$; negative nouns: $p = .032, d = 0.48$), the HC group recalled positive nouns better than neutral and negative nouns (both $ps = .002, d = 0.61$ and $d = 0.81$). For further statistical details, see Appendix, Table A1 and A.2.

3.3. Covariation between self-esteem and self-positivity in BPD

In the BPD group, participants lower in explicit self-esteem (RSES score) evaluated positive words during the self-referential processing task as less positive and also responded slower, when the words were preceded by a supraliminal reference to the self (ratings $r = .438, p = .014$; RTs $r = -.404, p = .024$; Fig. 3). We found no comparable relations with implicit self-esteem (IPT scores). To control for the possibility that these covariations were not specific to the evaluation and reaction times towards positive nouns, we additionally calculated the corresponding correlations for both neutral and negative nouns. No significant effects emerged.

3.4. Subliminal prime visibility check

For all participants, word visibility ratings for subliminally presented words did not exceed chance level, with 24 out of 36 words correctly classified (Range = 11–23, $M = 18.26, SD = \pm 1.93$). The BPD and HC groups did not differ significantly, $t(59) = 0.15, p = .88$.

4. Discussion

We examined self-esteem and self-positivity as indicators of self-enhancement and self-protection in BPD patients and HC, as well as their covariation. Going beyond previous research, our findings emphasize the importance of evaluative processes in self-referential processing in BPD, particularly when the self-referential context is amenable to conscious processing. In this case, low self-esteem was associated with reduced self-positivity, especially for positive information, in BPD, suggesting that a cognitive modification may be one avenue of intervention to improve self-esteem in BPD patients.

4.1. Explicit and implicit self-esteem

We built upon previous research distinguishing explicit from implicit self-esteem, namely, using a self-report questionnaire and the initials-preference task. In line with the literature (Bungert et al., 2015;

Lynum et al., 2008; Roepke et al., 2011), our results showed lower explicit self-esteem in participants with BPD as compared to HC. Also, our findings suggest reduced implicit self-esteem in BPD, as assessed by the IPT. Although BPD patients preferred their initials over other letters of the alphabet, in line with a previous study (Vater et al., 2010), their preference was smaller compared to HC. Nevertheless, effect sizes suggest that between-group differences were more pronounced for explicit ($d = 3.1$) than for implicit ($d = 0.6$) self-esteem.

Explicit and implicit self-esteem measures were uncorrelated in both groups. This may be due to the two types of self-esteem reflecting distinct processing styles (Greenwald & Banaji, 1995; Izuma et al., 2018), to explicit self-esteem having been unduly influenced by self-presentational concerns (Greenwald & Farnham, 2000), or to low statistical power (Buhrmester et al., 2011). The third explanation is rendered likely by the fact that, when we collapsed across groups, the relation between the two types of self-esteem became positive, albeit marginal ($r = 0.202, p = .086$).

Contrary to our findings, studies assessing implicit self-esteem with the IAT in BPD report no significant differences between BPD and HC groups (Hedrick & Berlin, 2012; Vater et al., 2013). It would be premature to draw conclusions, as this literature is scarce. Nevertheless, it is possible that different measures capture differences facets of implicit self-esteem. Buhrmester et al. (2011), for example, speculated that the IAT may tap on implicit affect towards the self, whereas the IPT may tap on implicit egotism. It is also possible that task-setting properties are responsible for the discrepancy in the results. IAT emphasizes speed, whereas IPT does not; as such, IAT may involve less reflective processes than the IPT.

4.2. Self-positivity

We also examined whether persons with BPD exhibit lower self-positivity. We used a self-referential processing task in which participants rated the valence of negative, neutral, and positive words with reference to the self, reference to another person, or no reference. BPD participants rated positive self-referent nouns both slower and less positively than HC. These findings align with previous results on reduced self-positivity in BPD (Auerbach et al., 2016; Winter et al., 2015). More importantly, this effect was not observed when the nouns referred to another person. Thus, our findings point to the importance of self-reference for judgmental changes among BPD patients. Our findings also rule out the possibility that merely a generalized and non-specific negativity bias characterizes information processing in BPD. However, similar evaluation and reaction time patterns – although attenuated in strength – were present in the condition that provided no referential

context (see also Winter et al., 2015), restricting the specificity of changes to self-referential processing. People may use own criteria, and thus implicit self-reference, to evaluate emotionally connoted information, if no explicitly deviating reference is provided (Herbert, Junghofer, & Kissler, 2008), as per cognitive appraisal theories (Scherer, 2001).

We focused on whether persons with BPD show lower self-positivity only when the reference to the self is available for conscious processing. Indeed, and as in previous studies, BPD patients manifested lower self-positivity during the self-referential processing task when the reference information was presented supraliminally (Auerbach et al., 2016; Winter et al., 2015). This was not the case when reference information was presented subliminally. However, results from the subliminal presentation condition might be interpreted with caution, given that the reference manipulation influenced the obtained measures neither in the BPD nor in the HC group. Hence, it is possible that the subliminal manipulative processes, nevertheless, did influence the positive appraisal of information related to the self in BPD. Regarding the discussion of sub-vs. supraliminal stimulus presentation and unconscious vs. conscious processing effects in BPD, Donges, Dukalski, and Suslow (2016) examined affective priming in BPD and also found no differential BPD specific effects in the processing of self-relevant affective information during very early, non-unconscious stages of processing. Similarly, further research points to changes in BPD—particularly in controlled, attention demanding processes (Dinsdale & Crespi, 2013; Fenske et al., 2015; Hagenhoff et al., 2013; Lowyck et al., 2016).

Based on previous work of our group (Winter et al., 2015), we expected and found lower self-positivity in BPD to depend on the (positive) valence of information. Our findings align with those of previous studies that highlighted the relevance of changes in the processing of positive information in BPD in additional domains of functioning, such as the assessment of facial expressions or social participation (De Panfilis, Riva, Preti, Cabrino, & Marchesi, 2015; Domsalla et al., 2014; Gutz, Renneberg, Roepke, & Niedeggen, 2015; Reichenberger et al., 2017; Thome et al., 2016).

4.3. Self-esteem and self-positivity

Only less positive and slower ratings of positive self-related nouns were associated with lower explicit self-esteem in BPD in the case of supraliminally presented self-reference. This novel finding may define a leverage point for cognitive therapies focusing on low self-esteem in BPD. Nevertheless, longitudinal studies are needed to document the notion that lower self-positivity (in terms of less positive evaluation of consciously processed, self-related information) constitutes a mechanism through which low explicit self-esteem is maintained in BPD. Of note, we do not conclude that the reported association is specific to BPD. Rather, the lack of such an association in HC may be due to restricted variance in RSES score. Given theories suggesting that BPD may be an extreme variant of normal personality (Widiger & Trull, 2007), the two groups may occupy different places on a continuum, without necessarily diverging substantially (i.e., qualitatively) in terms of underlying cognitive processes. Future research should include clinical groups and health groups with low self-esteem in examining across time the covariance between explicit self-esteem and self-positivity.

Speed and ratings of positive self-related nouns were uncorrelated with implicit self-esteem. Lack of a correlation may be due to a variety of reasons. For example, the stimuli presented during the self-referential processing task cover a wide array of contents, whereas the IPT is

far more restricted relying solely on the initials of a participant's name. There is another reason. In our experimental task, self-reference is explicitly formed by the supraliminal presentation of the prime. However, in the IPT, the association between a letter and a participant's name exists outside one's awareness of this relation. Thus, the self-referential processing task may encourage more reflective processing, which is characteristic of explicit (rather than implicit) self-esteem.

4.4. Limitations

Our study has limitations. Data pertained to a female sample, limiting generalizability to males with BPD. Moreover, a high percentage of participants with BPD had a current major depressive episode, a mental condition known to influence self-referential processing (Wisco, 2009). Exploratory post-hoc analyses did not reveal significant correlations of depressive symptom severity with self-positivity. Yet, we cannot rule out the influence of comorbidities, something that needs to be addressed in future research employing larger samples.

Additionally, the subliminal presentation condition needs to be interpreted with caution, given that we found an effect of this experimental manipulation neither in BPD patients nor in HC. We chose the prime presentation duration in line with previous research on semantic priming (Draine & Greenwald, 1998; Greenwald et al., 1996) and subliminal priming in BPD (Cullen et al., 2011; Sieswerda et al., 2007). Visibility check data reinforce the notion that primes were not visible to participants in the subliminal condition. However, reaction times in the self-referential processing task were comparatively long (Auerbach et al., 2016; Tao et al., 2012), suggesting a rather reflective processing of stimuli that might have masked effects of implicit priming. Thus, to address more conclusively the effectiveness of the subliminal condition, further research is needed that would combine behavioral measures with neurophysiological methods, such as event-related potentials, and that would involve experimental manipulation of task features, such as a parametrical variation of prime durations and both speed as well as accuracy instructions (Herbert et al., 2011).

5. Conclusions

BPD patients are characterized by low self-esteem and low self-positivity when consciously evaluating information with reference to the self. We found that self-positivity was indeed correlated positively with participants' level of self-esteem. This finding may have practical implications. A modification of self-views resulting from reflective evaluations of oneself and objects associated with the self may improve low self-esteem in BPD, and in consequence result in other beneficial mental health outcomes. However, our study does not allow causal inferences. Longitudinal research will do well to address whether biased self-referential processing contributes to the maintenance of low self-esteem in BPD and whether strengthening self-positivity improves not only self-esteem but also general mental health outcomes in BPD. Our findings suggest that psychotherapeutic approaches should not be restricted to modifying the processing of negative self-referential information, but rather extend to modifying how people evaluate particularly positive events, traits, or experiences related to their self.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.brat.2018.07.008>.

Appendix

Appendix Table A.1
Rating Scores in the Word Valence Judgment Task and Performance in the Memory Tasks in Healthy Control Participants (HC) and Participants with Borderline Personality Disorder (BPD).

	HC (n = 30)						BPD (n = 31)					
	no reference		self-reference		other-reference		no reference		self-reference		other-reference	
	M	SD (±)	M	SD (±)	M	SD (±)	M	SD (±)	M	SD (±)	M	SD (±)
Valence ratings - evaluations												
- supraliminal trials												
negative nouns	-2.21	0.95	-1.98	0.89	-1.79	0.93	-2.65	0.84	-2.70	0.83	-2.01	0.90
neutral nouns	0.19	0.32	0.43	0.54	0.11	0.20	0.11	0.47	0.05	0.65	0.18	0.53
positive nouns	2.39	0.83	2.41	0.85	1.58	1.07	1.64	1.12	1.14	1.38	1.47	1.06
- subliminal trials												
negative nouns	-2.23	0.98	-2.25	0.93	-2.29	0.92	-2.68	0.78	-2.57	0.84	-2.73	0.88
neutral nouns	0.23	0.32	0.21	0.28	0.20	0.26	0.16	0.47	0.09	0.41	0.11	0.40
positive nouns	2.58	0.85	2.58	0.86	2.52	0.89	1.80	1.14	1.72	1.23	1.69	1.05
Valence ratings - RTs												
- supraliminal trials												
negative nouns	2254.66	475.10	2430.21	611.34	2374.84	607.17	2564.59	453.83	2680.41	411.65	2730.27	459.54
neutral nouns	1943.92	438.25	2089.32	463.50	1961.79	410.87	2421.34	510.63	2609.53	524.89	2382.31	447.32
positive nouns	2120.84	464.56	2111.51	546.41	2227.05	589.26	2625.53	544.28	2831.50	690.71	2579.76	456.35
- subliminal trials												
negative nouns	2216.11	463.05	2193.27	447.12	2213.17	412.70	2565.38	533.98	2546.93	417.06	2495.03	466.93
neutral nouns	1978.93	428.06	2006.79	455.28	1981.16	461.91	2450.87	464.88	2546.49	564.61	2611.50	551.62
positive nouns	2057.52	422.61	2067.31	458.68	2039.06	433.06	2636.08	662.85	2594.20	519.60	2626.20	569.08
Free recall - % correct^a												
- supraliminal trials												
negative nouns	4.40	2.02	5.45	2.29	4.92	2.76	4.96	2.21	5.69	2.70	5.50	2.03
neutral nouns	4.63	2.02	4.76	1.93	4.89	2.02	4.32	2.54	4.91	2.15	4.13	2.10
positive nouns	5.11	2.05	6.14	2.65	5.76	2.50	4.99	2.84	5.43	2.81	5.84	3.23
- subliminal trials												
negative nouns	5.61	2.41	5.22	2.09	5.29	2.08	5.69	2.52	6.32	2.72	6.13	2.72
neutral nouns	5.87	2.00	6.03	2.92	5.20	2.53	5.59	2.35	5.79	2.59	4.59	2.31
positive nouns	6.78	2.75	7.30	2.36	6.64	3.04	6.53	3.39	7.42	3.32	6.19	2.24

AM = arithmetic mean; SD = standard deviation; ^a of all correctly recalled nouns.Appendix Table A.2
Effects of Group, Prime Duration, Valence, and Reference on Ratings, Reaction Times and Recall Performance in the Self-Referential Processing Task.

Main Effects and Interactions	Ratings				Reaction Times				Recall Performance						
	F	DF1	DF2	p	η_p^2	F	DF1	DF2	p	η_p^2	F	DF1	DF2	p	η_p^2
Group	37.87	1	59	< .001	.39	18.39	1	59	< .001	.24	—	—	—	—	—
Prime Duration	2.56	1	59	.115	.41	6.52	1	59	.013	.10	50.95	1	59	< .001	.46
Referential Context	0.17	2	118	.845	< .01	8.35	2	118	< .001	.12	3.48	2	118	.034	.06
Valence	445.49	2	118	< .001	.88	12.21	2	118	< .001	.17	13.76	2	118	< .001	.19
Group x Prime Duration	< 0.01	1	59	.949	< .01	0.88	1	59	.353	.02	0.07	1	59	.796	< .01
Group x Referential Context	9.16	2	118	< .001	.13	0.96	2	118	.385	.02	0.10	2	118	.904	< .01
Group x Valence	2.59	2	118	.079	.04	4.92	2	118	.009	.08	2.57	2	118	.081	.04
Prime Duration x Referential Context	0.57	2	118	.567	.01	6.36	2	118	.002	.10	2.05	2	118	.133	.03
Prime Duration x Valence	27.70	2	118	< .001	.32	17.83	2	118	< .001	.23	2.15	2	118	.121	.04
Referential Context x Valence	13.71	4	236	< .001	.19	3.82	4	236	.239	.02	0.78	4	236	.539	.01
Group x Prime Duration x Referential Context	10.45	2	118	< .001	.15	2.03	2	118	.135	.03	0.36	2	118	.697	< .01
Referential Context x Valence	0.64	2	118	.532	.01	0.46	2	118	.633	< .01	0.09	2	118	.918	< .01
Group x Prime Duration x Valence	2.49	4	236	.044	.04	1.71	4	236	.149	.03	0.29	4	236	.885	< .01

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Appendix Table A.2 (continued)

Main Effects and Interactions	Ratings			Reaction Times			Recall Performance								
	F	DF1	DF2	p	η_p^2	F	DF1	DF2	p	η_p^2					
Group x Referential Context x Valence															
Prime Duration x Referential Context x Valence	12.60	4	236	< .001	.18	3.48	4	236	.009	.06	0.54	4	236	.706	< .01
Group x Prime Duration x Referential Context x Valence	1.57	4	236	.184	.03	4.43	4	236	.002	.07	0.43	4	236	.787	< .01

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