Familiarity, empathy and comprehension of metaphors in patients with borderline personality disorder

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ABSTRACT

Research on figurative language has a long tradition in psychiatry, as it is employed in psychotherapy and its (mis)comprehension plays a substantial role in differential diagnostics of schizophrenic spectrum disorders. Although often associated with empathy and mentalization, it has never been addressed in borderline personality disorder (BPD). Therefore, this study investigated metaphor comprehension and its relationship to cognitive and affective empathy in 20 patients with BPD and 20 matched healthy controls who completed a metaphor task comprising conventional metaphors (CM), novel metaphors (NM), meaningless stimuli (MS), and a rating scale of familiarity, a factor known to influence performance. For cognitive and affective empathy, the interpersonal reactivity index was applied. At first patients with BPD seemed to have significantly more problems in comprehending CM, but not NM or MS, and were less familiar with CM. When familiarity with the stimulus was controlled, this difference disappeared. As for empathy, only fantasy was positively related to familiar CM beyond borderline symptoms. Results indicate that the comprehension of novel metaphorical meaning is preserved in patients with BPD.

1. Introduction

Language constitutes the core of psychopathological diagnostics (Crow, 2010; DeLisi, 2001; Kasanin, 1949). While in everyday communication it is usually shaped by maxims to convey a message as clearly as possible (Grice, 1975), there is a specific phenomenon where ambiguity is constitutive: figurative language. The miscomprehension of figurative language in particular has been used in differential diagnosis since the very beginning of psychiatry (Bleuler, 1911; Kanner, 1946; Kircher et al., 2007; Mitchell and Crow, 2005; Wegrocki, 1940; Wernicke, 1890). In line with this, a deficit in understanding nonliteral, figurative language has traditionally been ascribed to schizophrenia and autism (Blaufarb, 1962; Bleuler, 1911; Gorham, 1956; Kanner, 1946). A prime example of figurative language is metaphor. As a figure of speech, metaphors originate in the transfer of the semantic field of one object to another (Glucksberg, 2003). While evidence for impairments in metaphor comprehension is good for both autism spectrum disorders (Kalandadze et al., 2018; Melogno et al., 2019) and schizophrenia (Rossetti et al., 2018; Schmierer and Rapp, 2009), a suggested specificity requires knowledge about impairments in other psychiatric conditions as well (Andreasen, 1977).

This holds further interest, as diagnoses like borderline personality disorder (BPD) also experience psychotic symptoms (D'Agostino et al., 2019; Thompson et al., 2019) and report similar cognitive biases as psychotic patients (Puri et al., 2018). Unfortunately, research beyond autism and schizophrenia is limited, in turn limiting knowledge about miscomprehension as a transdiagnostic feature that can be applied to BPD as well. To date, BPD has been characterized by an unstable sense of self, emotional instability, and interpersonal hypersensitivity, as well as patterns of unstable relationships (Gunderson et al., 2018). Although the diagnostic and therapeutic process of BPD depends heavily on language (Killick et al., 2016; Linehan, 1993; Stott et al., 2015), there remains a lack of studies on figurative language in BPD. Preliminary results suggest, however, that nonliteral language may constitute an obstacle for adults with subclinical borderline symptoms. Kieckhaefer et al. (2019) applied a video-based irony paradigm in healthy adults and investigated the relationship between irony detection and subclinical autistic, schizotypal, and borderline traits. In their study, borderline symptoms were significantly negatively associated with irony detection.

A glance at the clinical context reveals a wide spectrum of different opinions and attitudes toward the comprehension of and work with

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metaphor in BPD. On the one hand, metaphor is considered a therapeutic tool often encouraged in dialectical behavioral therapy (DBT; Linehan, 1993, pp. 209–212), where it is used as a strategy to help patients to understand concepts of their psychopathology. Metaphors empower individuals to apply their knowledge of a concrete and familiar issue to enhance their understanding of a less-known subject (Gibbs, 1994; Lakoff and Johnson, 2013). They help to mitigate the extremes of a statement by expressing it indirectly (Giora, 2002) and lessen reactance and feelings of control toward the therapist (Linehan, 1993, p. 209). On the other hand, in mentalization-based treatment (MBT; Allen and Fonagy, 2006), it has been argued that metaphors should be applied cautiously, especially in the beginning of therapy. This assumption is based on the idea that perspective taking might be more challenging for patients with BPD (Fonagy and Bateman, 2005). Figurative expressions require the listener to go beyond the literal as well: it is the hidden meaning that needs to be decoded (Searle, 1975). That is why the (mis)comprehension of pragmatic language has often been associated with constructs like theory of mind (ToM; Premack and Woodruff, 1978) and mentalization (Frith and Frith, 2003) as an ability to infer a speaker's intention that is not directly expressed in words (Champagne-Lavau and Charest, 2015; Champagne-Lavau and Stip, 2010; Happe, 1995; Mo et al., 2008; Sperber and Wilson, 2002, 1986), even though it is still unclear if deficits in ToM explain pragmatic competence alone (Bosco et al., 2018) or only pertain to specific types, such as irony (Happe, 1995; Langdon et al., 2002). In MBT the use of figurative language is claimed to be restricted to a context in which the patient has already built up stable inner representations (Bateman and Fonagy, 2016, p. 208; Fonagy and Bateman, 2005, pp. 199–201). Without mentalizing skills, figurative language might confuse rather than clarify. Conversely, once stable self-representations have been established in the first step, metaphors can serve to further improve mentalization skills when applied within the patient's area of competence in the next step (Allen and Fonagy, 2006). However, although research on social cognition in BPD and impairments in mentalizing tasks has grown within the last decades (Németh et al., 2018; Roepke et al., 2012), research on figurative language has not.

The original definition of metaphor has received more fine-grained specifications (Holyoak and Stamenković, 2018; Slack, 1980). For example, in their career of metaphor hypothesis, Bowdle and Gentner (2005) differentiate conventional and novel metaphors. Due to repeated exposure, conventional metaphors are understood almost literally, while novel metaphors still require a matching of implied and stated semantic fields (Slack, 1980). Novel metaphors are considered more complex in comprehension (Bowdle and Gentner, 2005; Gibbs, 1994; Giora, 2002), are processed more slowly (Damerall and Kellogg, 2016; Glucksberg, 2003), are supposed to require distinct cognitive processes (Bowdle and Gentner, 2005) and are associated with different hemispheric foci in the brain (Jung-Beeman, 2005; Rapp et al., 2012). The distinction is reflected in psychopathologies as well. Children with autism exhibit problems specifically with conventional metaphors (Mashal and Kasirer, 2011). For schizophrenia, studies are inconsistent. While Zeev-Wolf et al. (2014) demonstrated that patients outperformed healthy controls in judging novel metaphors, Rapp et al. (2018) reported that they underperformed. But even though the specific impact of conventionality in psychiatric disorders is unclear, these results highlight the need to distinguish both types in empirical studies.

So far, neither metaphor comprehension nor its relation to mentalizing has been empirically investigated in patients with BPD. For this reason, the aim of the study was to compare metaphor comprehension in patients with BPD and healthy controls. Based on preliminary evidence in nonliteral language (Kieckhaefer et al., 2019) and language-based social cognition paradigms in BPD (Baez et al., 2015), we hypothesized that patients with BPD would experience problems in metaphor comprehension compared to healthy adults. We applied a

metaphor task that includes conventional and novel metaphors, as well as meaningless stimuli (Rapp et al., 2018). In addition, the task offers the option to differentially investigate unfamiliar stimuli, as conventional metaphors of a specific language need not be familiar to every individual (Rapp, 2019; Rapp and Wild, 2011). In doing so, we tried to distinguish a deficit in pragmatic competence from a lack of familiarity. Due to conflicting evidence regarding other disorders (Mashal and Kasirer, 2011; Rapp et al., 2018; Zeev-Wolf et al., 2014), our hypothesis on the influence of familiarity and novelty remained exploratory. However, we expected metaphor comprehension to be associated with mentalizing abilities as assessed via self-ratings of cognitive and affective empathy scales.

2. Methods

2.1. Participants

Twenty patients with BPD were recruited at the Department of Psychiatry and Psychotherapy, University of Tuebingen, Germany. Patients met DSM-IV criteria for BPD according to the Structured Clinical Interview for DSM-IV II (SCID II; Fydrich et al., 1997). Possible comorbidities were assessed via SCID I (Wittchen et al., 1997). General exclusion criteria were acute or anamnestic substance abuse or dependence, bipolar disorder, psychotic disorders, severe episodes of major depression and neurological diseases. Inclusion criteria were a normal or corrected to normal vision, age between 18 and 55 years, native German speakers and diagnosed BPD in patients. All patients were under inpatient treatment with DBT. A group of twenty healthy controls (HC) was matched for age, verbal intelligence according to the multiple-choice vocabulary test (MWT; Lehrl et al., 1995), gender, educational level and handedness according to the Edinburgh inventory (Oldfield, 1971). The study protocol was approved by the ethics committee of the Medical Faculty of the University of Tuebingen and carried out according to the Declaration of Helsinki. All participants provided written informed consent and received a monetary compensation.

2.2. Measures

We used a German metaphor comprehension test previously applied on patients with schizophrenia (Rapp et al., 2018). In brief, the test contains novel metaphors (NM, e.g. "a tender sting"), conventional metaphors (CM, e.g. "break a heart") and meaningless statements (MS, e.g. "sport of citrons"). First, participants indicate whether they are familiar or unfamiliar with the stated phrasing. In the next step, one given interpretation must be matched to the stimulus, containing either a correct metaphoric meaning, a literal meaning, an unrelated meaning as a distractor or the statement "this phrase does not make sense", which represents the correct choice for MS. Each stimulus type comprises 13 items and every correct identified interpretation counts as one point. A full version of the test is provided within the supplementary material.

Additionally, participants completed the short version of the Borderline Symptom List (BSL-23; Bohus et al., 2009) and the Interpersonal Reactivity Index (IRI; Davis, 1983) as German short version (Paulus, 2009). The IRI is a self-report instrument with two cognitive (perspective taking, fantasy) and two affective subscales (empathic concern, personal distress). Being part of a more extensive research project, both groups further completed measures not all of which reported here. Table 1 depicts demographics and self-report measures.

2.3. Statistical analysis

Since some variables failed to meet criteria for normality of distribution on a Shapiro-Wilk test ($p < .05$), we performed nonparametric tests in these cases. First, we compared the performance on each stimulus type between HC and BPD applying a Mann-Whitney-U test,

Table 1

Mean values, standard deviations, frequencies and *p*-values for healthy controls (HC) and patients with BPD in demographics and self-rating questionnaires.

	BPD (*n* = 20) Value	HC (*n* = 20) Value	*p*
age	28.25 (9.16)	28.45 (7.83)	.60[b]
male/female	5/15	12/8	.31[c]
handedness (right/left)	17/3	19/1	.29[c]
educational level (median/IQR)	4 (1)	5 (1)	.15[b]
verbal intelligence	29.40 (4.58)	31.00 (3.40)	.24[b]
BSL-23[a]	2.27 (1.08)	0.33 (0.50)	< .001[b]
IRI			
personal distress	16.00 (3.13)	10.90 (2.77)	< .001[d]
empathetic concern	15.90 (2.97)	14.60 (2.12)	.13[d]
perspective taking	13.95 (3.05)	15.60 (2.78)	.08[d]
fantasy	14.40 (3.65)	12.25 (3.32)	.06[d]

[a] BSL-23 = borderline symptom list 23, IRI = interpersonal reactivity index
[b] Mann-Whitney-U test
[c] Pearson's chi-squared test
[d] t-test

with the number of correct identified stimuli as dependent variable. In the next step, we tested if both groups differed on their familiarity with the stimulus types. Finally, we compared performance on only those items that had previously been rated as familiar. Considering the small sample size the exact method for calculating p-values was chosen. As for the within-group analyses of performance and familiarity, Wilcoxon signed-rank tests, Friedman test and Dunn-Bonferroni post hoc tests were carried out. Due to the exploratory character of the study alpha was set at .05 (two tailed) and Holm-Bonferroni corrections for multiple comparisons were applied. Data were analyzed using SPSS 24 (IBM Corp., Armonk, NY, USA).

3. Results

Groups did not differ significantly in age (*Z* = -.53, *p* = .60), gender (*Z* = 1.03, *p* = .31), verbal intelligence (*Z* = -1.19, *p* = .24), educational level (*Z* = -1.68, *p* = .15) and handedness (*Z* = 1.11, *p* = .29). BPD patients experienced significantly more borderline symptoms (*Z* = -4.59, *p* < .001) and personal distress (*t* (38) = -5.46, *p* < .001).

First, we tested group differences between patients and HC in the accuracy of detecting different stimuli types, irrespective of the individual familiarity with the stimulus (see Fig. 1). According to the Mann-Whitney-U test, accuracy did not differ between groups on NM and MS (NM: *Z* = -.63, *p* = .55, corrected *p* = .90; MS: *Z* = -.79, *p* = .45, corrected *p* = .90). However, patients with BPD showed a significant lower amount of correct identified CM (*Z* = -2.69, *p* = .013, corrected *p* = .039).

Next, we tested if familiarity with the stimulus type differed between patients and HC (see Fig. 2). According to the Mann-Whitney-U test, patients with BPD indicated to be less familiar with most of the CM than HC (*Z* = -3.44, *p* = .001, corrected *p* = .003). However, both groups did not differ in their familiarity with other stimulus types (NM: *Z* = -.48, *p* = .64, corrected *p* = 1; MS: *Z* = -1.10, *p* = .58, corrected *p* = 1).

Finally, we compared only those metaphors between patients and HC, that were familiar to them (see Fig. 3). As dependent variable we chose the proportion of familiar stimuli that were correctly answered. In each condition, we divided the number of correctly identified stimuli that had been specified as familiar by the number of familiar stimuli. In MS and for three NM in the group of BPD this would have led to a division by zero. Therefore, we only considered NM and CM and excluded data of those three patients for NM. According to Mann-Whitney-U test, no differences between groups on the proportion of correct identified metaphors on any stimulus type could be found (NM: *Z* = -.39, *p* = .76, corrected *p* = 1; CM: *Z* = -1.43, *p* = .60, corrected

p = .1).

As regards the within-group analysis in the group of patients, Friedman test showed a statistically significant difference in accuracy rates depending on the type of stimulus irrespective of their familiarity (*χ*2(2) = 14.69, *p* = .001). Dunn-Bonferroni post hoc test were carried out with significant differences between CM and NM (*z* = -3.64, *p* = .001), but not between MS and CM (*z* = 1.82, *p* = .21) or NM (*z* = 1.82, *p* = .21; CM *median* = 12, IQR = 2; NM *median* = 9.5, IQR = 6; MS *median* = 11, IQR = 1). These results highlight that NM were harder to interpret than CM in patients with BPD. Next, for the number of familiar stimuli, Friedman test showed statistically significant differences depending on stimulus type (*χ*2(2) = 38.68, *p* < .001), with post hoc Dunn-Bonferroni test indicating that all comparisons were statistically significant (MS vs. NM: *z* = 2.69, *p* = .02; MS vs. CM: *z* = 6.09, *p* < .001; CM vs. NM: *z* = -3.40, *p* = .002; CM *median* = 10, IQR = 1; NM *median* = 3, IQR = 2.75; MS *median* = 0, IQR = 0). Thus, patients were most familiar with CM, followed by NM, but showed no familiarity with MS. In the last step, we analyzed the proportion of familiar stimuli that were correctly answered. In contrast to initially lower performance on NM compared to CM, taking the familiarity into account resulted in equal performance on both stimulus types indicated by an exact Wilcoxon signed-rank (*z* = -1.58, *p* = .156; CM *median* = 1, IQR = 0; NM *median* = 1, IQR = .20). In HC, the pattern of significance was the same: accuracy rates significantly depended on the type of stimulus irrespective of their familiarity (*χ*2(2) = 19.61, *p* < .001). Dunn-Bonferroni post hoc test showed significant differences between CM and NM (*z* = -4.02, *p* < .001), but not between MS and CM (*z* = -1.66, *p* = .29) or NM (*z* = 2.37, *p* = .05; CM *median* = 12, IQR = 2; NM *median* = 9.5, IQR = 6; MS *median* = 11, IQR = 2; see Fig. 1). The number of familiar stimuli significantly depended on stimulus type (*χ*2(2) = 40.00, *p* < .001), with post hoc Dunn-Bonferroni test showing that all comparisons were differing statistically significant (MS vs. NM: *z* = 3.16, *p* = .005; MS vs. CM: *z* = 6.33, *p* < .001; CM vs. NM: *z* = -3.16, *p* = .005; CM *median* = 12, IQR = 2; NM *median* = 2, IQR = 2.75; MS *median* = 0, IQR = 0). Finally, Wilcoxon signed-rank test showed no difference in CM and NM when the proportion of familiar stimuli that had been answered correctly was analyzed (*z* = -2.03, *p* = .06; CM *median* = 1, IQR = 0; NM *median* = 1, IQR = .09).

To test for the association between borderline symptoms, empathy and metaphor comprehension, Pearson correlation coefficients were estimated for IRI scales and performance on as well as familiarity with NM, CM and MS. Due to ceiling effects and low variability within each group, only correlation coefficients across all participants are reported. High borderline symptoms were significantly associated with empathetic concern (*r* = .43, *p* = .006), personal distress (*r* = .66, *p* < .001) and fantasy (*r* = .40, *p* = .01), as well as low performance on the number of correct CM (*r* = -.59, *p* < .001), the number of familiar CM (*r* = -.59, *p* < .001) and the proportion of correct identified CM that had been rated as familiar (*r* = -.34, *p* = .03). There was no link between any scores of NM and reported BPD psychopathology (all *p* > .05). Next, the association between empathy, performance and familiarity was examined. Across all participants, the number of correct identified NM, CM and MS was not associated with any of the IRI scales (all *p* > .05). However, familiarity with CM was lower in individuals reporting high empathetic concern (*r* = -.47, *p* = .002) and personal distress (*r* = -.47, *p* = .002). Further, the proportion of correct identified CM that had been rated as familiar correlated significantly positive with fantasy (*r* = .34, *p* = .032). These results gave rise to the question whether empathy scales generated a surplus variance over borderline symptoms. Thus, correlations were reanalyzed, controlling for BSL-scores. In partial correlation analysis, the relationship between personal distress, empathetic concern and number of selected familiar CM was no longer evident, suggesting that the relationship between affective empathy and familiarity was mainly driven by borderline symptoms. In contrast, performance on CM was significantly higher in
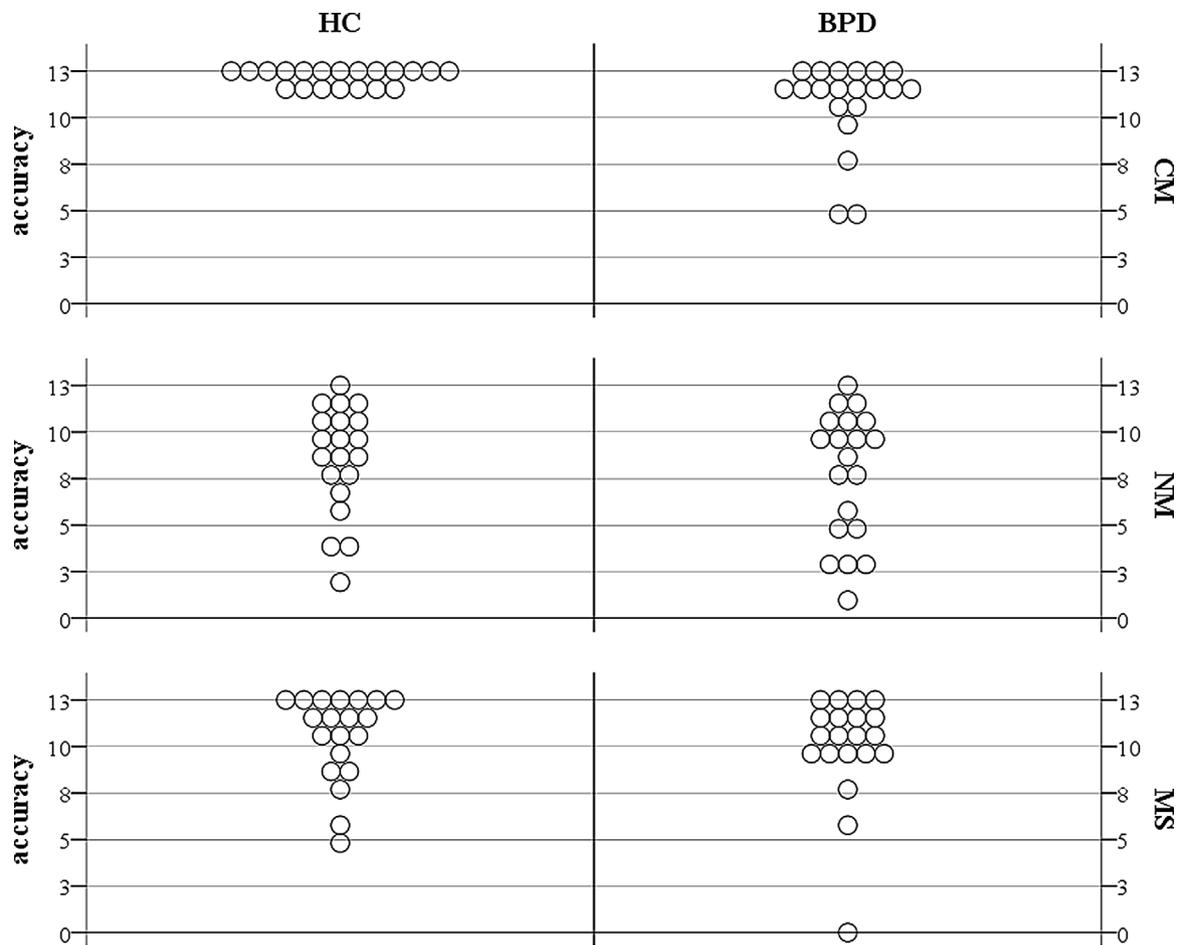
Fig. 1. Number of correct stimuli in the multiple choice metaphor test in healthy controls (HC) and patients (BPD) depending on stimulus type. A value of 13 would indicate perfect performance in any subject. Mann-Whitney-U test resulted in significant differences between HC and BPD in the accuracy of the detection of conventional metaphors. In both groups, Friedman tests showed significant lower performance in novel compared to conventional metaphors.

individuals scoring high on fantasy both in accuracy of all ($r = .54, p < .001$) and only familiar stimuli ($r = .55, p = .001$) when the effect of borderline symptoms was controlled for.

4. Discussion

To best of our knowledge, this was the first study to empirically investigate the comprehension of metaphors in patients with BPD. We applied a metaphor comprehension test (Rapp et al., 2018) that differentiates between NM, CM, and MS and takes the familiarity of each stimulus into account. The results indicated no impairment in the comprehension of novel metaphorical meanings in patients with BPD. Despite high performance on comprehending CM, patients with BPD initially appeared to perform worse than healthy individuals. However, this putative impairment could be explained by lower familiarity: Upon analyzing only those stimuli that had been indicated as known, this difference disappeared.

It is a well-known effect that unfamiliar and novel metaphors are harder to interpret and more complex (Bowdle and Gentner, 2005; Damerall and Kellogg, 2016; Giora, 1997). Accordingly, in both samples performance on NM was lower than on CM. However, familiarity is not equivalent to the conventionality of a metaphor (Blasko and Connine, 1993). Although a conventional stimulus should be familiar to most people, this need not be true of any particular individual – making its interpretation more difficult. This effect might explain the lower performance on CM when familiarity had not been taken into account: Being less familiar, the stimulus might have shown greater difficulty for BPD than for HC without reflecting an inability to understand CM per

se. This is of importance, as equal performance on NM indicates that patients with BPD were not limited in their ability to interpret new metaphorical meanings in the first place.

Nonetheless, although both groups were matched in terms of verbal intelligence and educational level, patients reported to be less familiar with CM. In general, familiarity should reflect perceived experience with the stimulus. But when people are asked to evaluate a phrase for abstract qualities, they sometimes apply other sources than the one in question. In the case of figurative language, participants often use processing fluency to evaluate familiarity (Thibodeau et al., 2018; Thibodeau and Durgin, 2011). One can thus ask whether the low familiarity ratings in BPD might reflect a problem with validity rather than lack of knowledge. One potential confounder may be patients' level of confidence. Several studies have shown that patients with BPD are less confident in their decisions in emotional tasks (Kaletsch et al., 2014; Niedtfeld, 2017; Thome et al., 2016). Notably, stimuli with low confidence were mostly ambiguous (Kaletsch et al., 2014; Niedtfeld, 2017), which constitutes nonliteral language by definition. Thus, the categorical assessment of familiarity applied here might have inclined patients to indicate a phrasing they were uncertain of as nonfamiliar. In general, categorical classifications of familiarity seem oversimple and insufficiently representative of such a complex concept. Research specifically addressing this aspect indicates that metaphor familiarity may represent a dimensional phenomenon (Blasko and Connine, 1993; Lai et al., 2015). But while a continuous operationalization might decrease the potential confounding between familiarity and comprehension, it would not solve the problem of validity. This is of particular relevance in BPD, as Fonagy and
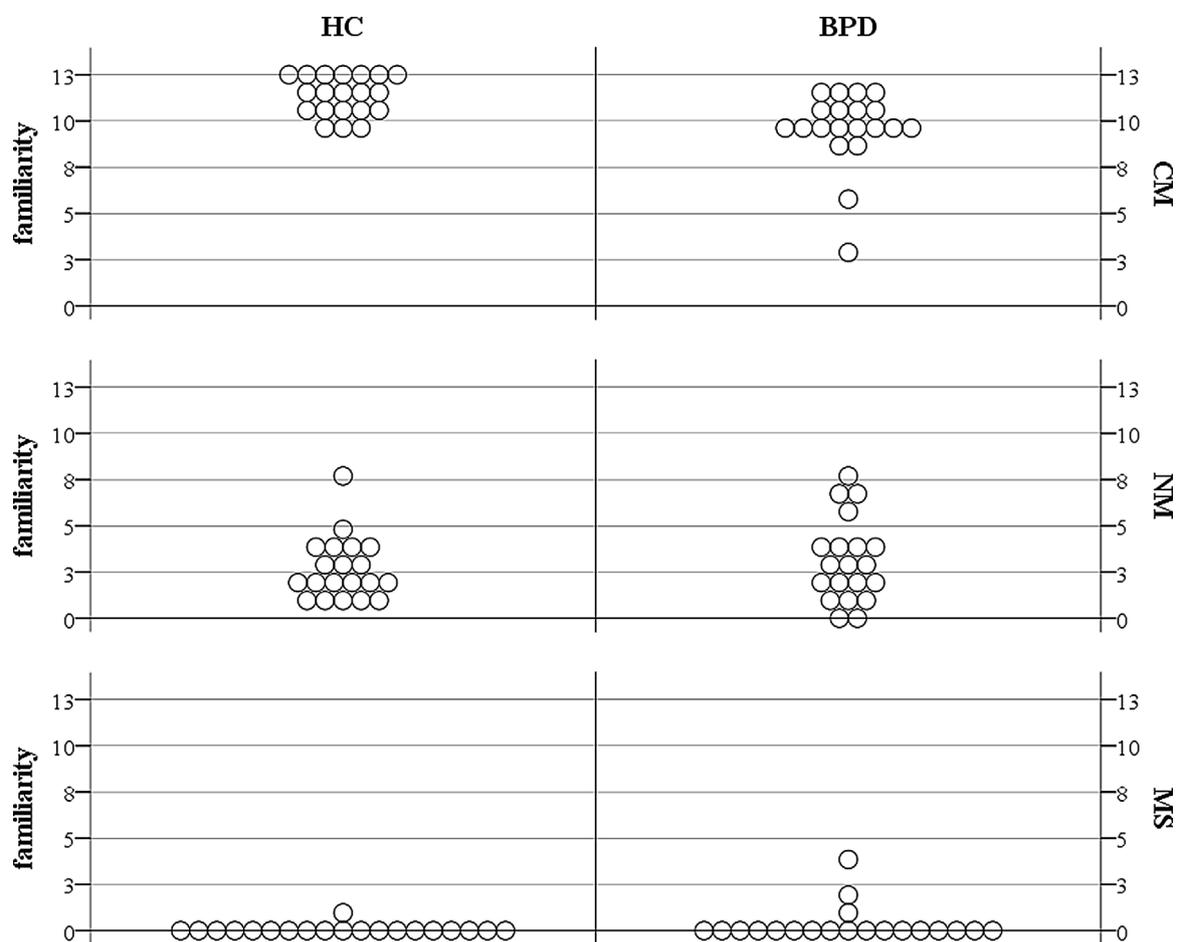
Fig. 2. Familiarity with stimulus types in healthy controls (HC) and patients (BPD). Mann-Whitney-U test resulted in significant differences between HC and BPD in the familiarity with conventional metaphors. Within-group analyses indicated that conventional metaphors were most familiar to both groups, followed by novel metaphors and meaningless stimuli.

Bateman (2016) suggest that beside low mentalizing (thinking about others' thoughts), low metacognition (thinking about own thoughts) shapes the pathology as well. Likewise, estimating familiarity constitutes a metacognitive process, as it requires thinking about own exposure to a stimulus. Future studies should include continuous confidence ratings as well as adequate quantifications such as signal-detection models (Fleming and Lau, 2014) to gain further insight into the relationship between metacognition and figurative language in BPD.

This study aimed to address the relationship between metaphor comprehension, borderline symptoms, and empathy. As for NM, performance and familiarity was associated neither with borderline symptoms nor empathy scales. This is consistent with the view that understanding new metaphorical expressions requires such processes as categorization and analogy (Holyoak and Stamenkovíc, 2018) rather than explicit mentalizing strategies (Langdon et al., 2002; Norbury, 2005). In CM, higher BPD psychopathology was related to lower performance and lesser familiarity. This association was even evident in CM that had been corrected for familiarity. However, due to almost ceiling performance, variability was substantially limited, and this result should be considered with caution. Regarding empathy, personal distress and empathetic concern, both subsumed as affective empathy, were closely linked with borderline symptoms. This has been shown multiple times (Guttman and Laporte, 2000; Jeung and Herpertz, 2014; New et al., 2012) and is in line with a rather affect-oriented way of understanding mental states in BPD (Gunderson et al., 2018), but it raised the question of whether empathy explains a substantial proportion of the performance on CM beyond borderline

symptoms. Reanalysis of the results suggests the latter to be the case. While empathetic concern and personal distress were associated at first with the familiarity with CM, this relationship disappeared when the effect of borderline symptoms was controlled. However, it has been suggested that the role of affective empathy is greater in emotional metaphors (Holyoak and Stamenkovíc, 2018). Emotional metaphors differ in their cognitive demands and brain language lateralization (Mirous and Beeman, 2012) and have been repeatedly demonstrated to activate the amygdala (Bohrn et al., 2012; Citron and Goldberg, 2014; Rapp, 2019). Patients with BPD experience heightened sensitivity to emotional stimuli (Herpertz et al., 2014; Németh et al., 2018), which is accompanied with heightened fMRI activity in the amygdala (Domes et al., 2009; Donegan et al., 2003; Hazlett et al., 2012; Mier et al., 2013; Minzenberg et al., 2006; Schulze et al., 2016). Both findings imply that an affect-oriented approach to mentalization might interfere more with emotional metaphors. The current test was not explicitly developed for emotional metaphors, although some stimuli expressed emotional content (see supplementary material). Future studies should examine the role of emotions in metaphors and their relationship with affective empathy in BPD, including material controlling for valence and arousal (Citron et al., 2020, Citron et al., 2019).

Although our pilot study was in no way designed to provide authoritative data on the discriminative power of metaphor comprehension, two conclusions with clinical relevance may nonetheless be justified. First, our finding is compatible with the widespread clinical impression that metaphor and proverb comprehension is more impaired in schizophrenia and autism than in other frequent disorders (Rapp and Wild, 2011). Second, as with healthy subjects (Damerall and
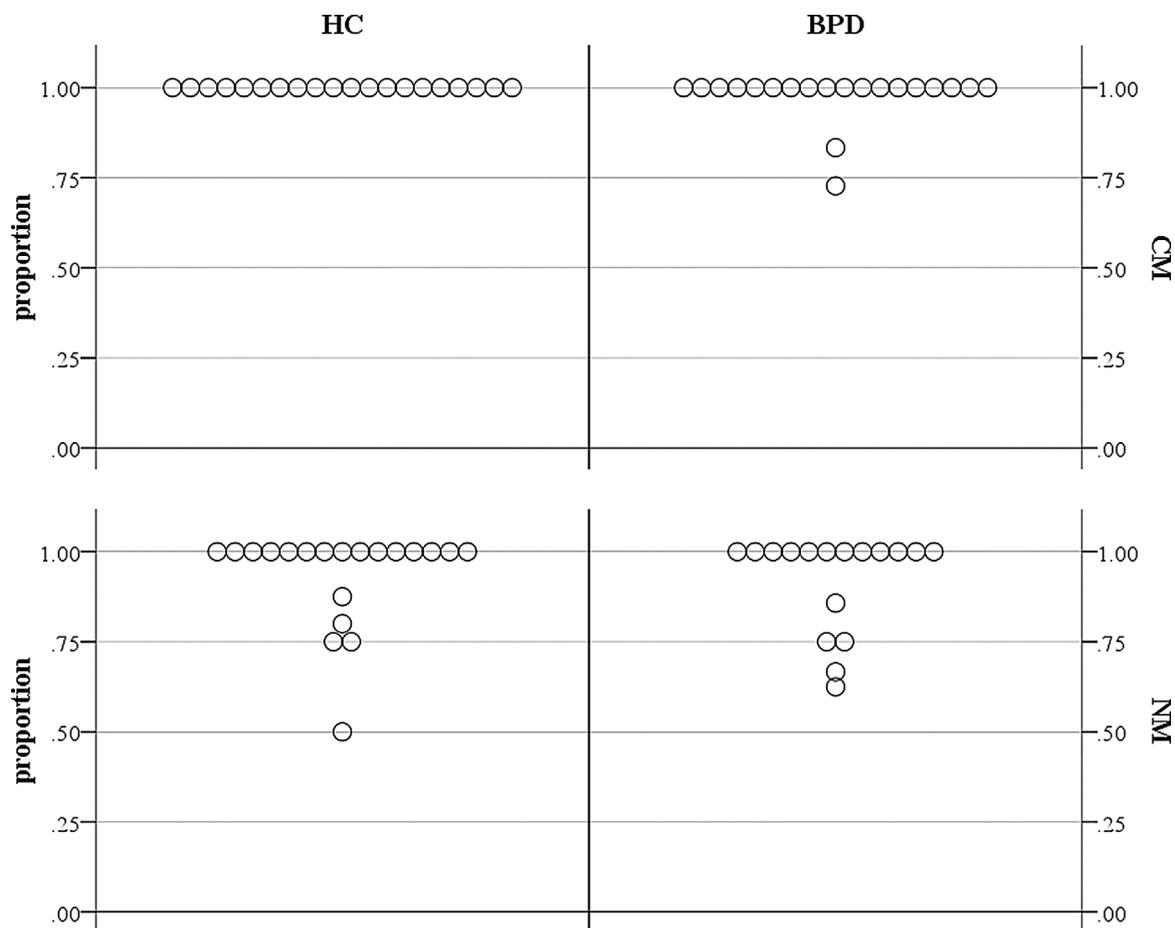
Fig. 3. Proportion of familiar metaphors that were correctly answered in healthy controls (HC) and patients (BPD) depending on metaphor type. In contrast to results on the accuracy irrespective of famililiarity, Mann-Whitney-U and Wilcoxon signed-rank test resulted no significant differences between HC and BPD, as well as NM and CM.

Kellogg, 2016), it makes a difference for the comprehension process (and its success) whether an individual is familiar with a figurative expression. To use unfamiliar and not decomposable proverbs or metaphors for clinical evaluation is often not recommended in bedside clinical practice. Our finding that familiarity is a relevant factor in performance further strengthens this clinical advice and points to the importance of familiarity with the stimuli used for testing (Blasko and Connine, 1993; Damerall and Kellogg, 2016).

We are aware of several limitations. First, as shown in a review by Jeung and Herpertz (2014), several studies highlight the relevance of complex paradigm when trying to detect slight nuances in which BPD patients differ to controls while attributing intentions. Impairments were mostly dominant in tests with ecologically valid material such as the Movie for the Assessment of Social Cognition (MASC; Sharp et al., 2011; Somma et al., 2019; Vaskinn et al., 2015). The current study, however, comprised only written metaphors without context. In future studies, for both mentalization and metaphors, more enriched paradigms than self-report questionnaires might be more appropriate for BPD. Second, in the applied paradigm, CM consisted of idiomatic expressions, which are in many respects different from metaphors. As a subset of fixed expressions, the meaning of an idiom is not derived purely via semantic composition (Glucksberg, 2008). Instead, by virtue of an arbitrary combination of signifier and signified, idioms are subject to a learning process similar to that of regular vocabulary and rely more on semantic memory (Cacciari, 2014; Glucksberg, 2008). In this context, it seems noteworthy that fantasy appeared to be the only scale linked to performance on CM but not NM once the effect of borderline symptoms and even familiarity was controlled. Closer examination of

the scale clarifies its connection to conventional figurative language: Fantasy measures a specific form of cognitive empathy, the tendency to identify with characters in books and movies (Davis, 1983), whereby it is at least partly confounded with fondness for (Nomura and Akai, 2012) and exposure to (Mar et al., 2006) fiction, probably pertaining to those individuals confronted with a wide range of figurative expressions. Thus, it might be a more appropriate matching variable than the mere level of education when it comes to conventionalized, idiomatic expressions.

In this study we applied a metaphor comprehension task. However, our findings cannot be generalized to all forms of figurative language. Other types, such as irony, might differ in cognitive demands (Beck and Weber, 2016; Gibbs, 1994; Happe, 1995; Rapp, 2019) and required brain structures (Rapp et al., 2012). In line with this, our results differ from those of studies on social cognition in BPD (Roepke et al., 2012) as well as preliminary findings in irony, showing that subclinical borderline symptoms in nonclinical adults are associated with lower performance on an irony detection task (Kieckhaefer et al., 2019). Metaphors, in contrast to irony, might not cause confusion in BPD, as they might rely less on mentalizing capacities (Happe, 1995) - leading directly back to the scientific debate as to whether mentalizing abilities are even directly linked to or at the base of all pragmatic competence (Bosco et al., 2018). Future studies should include different forms of figurative language within one experimental setting. Irony in particular appears a strong candidate for investigating the role of mentalizing in clinical groups of BPD.

Apart from other forms of figurative language, we do not believe that our results necessarily generalize to all forms of metaphors.

Especially in therapy, metaphorical content is often embedded in pathology-related narratives, not just attributive metaphors used in the current paradigm (e.g., "a tender sting"). Meaning is made metaphorically in various sensory domains: through language, but also bodily in dance therapy (Koch et al., 2012) and visually in art therapy (Koch, 2017; Schwind et al., 2019). To examine metaphorical thinking, future research in BPD may apply experimental setups beyond language to directly compare different domains. Shedding a light on the question of a domain-general vs. domain-specific ability for metaphorical thinking could help identify potential markers for therapeutic outcome and individually determine the most beneficial therapeutic strategy.

As the high scores on verbal intelligence indicate, our sample has an overall high educational standard, having been recruited in a German university city. Epidemiologically, this may seem less often the case for borderline patients (Torgersen et al., 2001; Ullrich and Coid, 2009). At the same time, all patients stayed in a DBT ward, a therapy explicitly encouraging metaphors and analogies (Linehan, 1993). It can be assumed that the current sample exhibited a higher exposure to a sophisticated lexicon and was embedded in a clinical context where figurative language could already be implicitly practiced, leading to higher performance and familiarity. Being more exposed to figurative speech and perhaps even fiction, the therapeutic setting may also explain the relationship between borderline symptoms and the fantasy scale in the current sample, which has not been shown in other studies (Dziobek et al., 2011; Jeung and Herpertz, 2014; New et al., 2012), although some evidence on this issue has been presented (Guttman and Laporte, 2000). It would be reasonable if future studies include BPD patients with a broader variety of IQ levels and no previous experience in DBT, while controlling for exposure to fiction.

To summarize, this study provides an experimental assessment of a task that therapies like DBT for patients with BPD have made use of for many years: the comprehension of metaphorical meaning. Our results demonstrated a solid understanding of metaphors in patients, especially for new metaphorical content. An apparent reduced understanding of CM could be explained by lower familiarity with these phrasings. Once only known metaphors were compared, the difference between the groups disappeared. While clinical impressions and instructions provide heterogeneous hypotheses on the comprehension of metaphors in BPD, with DBT explicitly encouraging and MBT suggesting caution, our findings constitute evidence for the applicability of metaphors in patients with BPD, so long as the linguistic knowledge of the patient is taken into account. As the patients and HC performed equally well on NM, pragmatic competence itself seems to be preserved. Although the lack of familiarity might lead to confusion in the patient when applying figurative language in differential diagnostics and therapeutic interventions, this confusion should be easily resolved by guiding explanations.

CRediT authorship contribution statement

Anne Felsenheimer: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft, Visualization. **Carolin Kieckhaefer:** Conceptualization, Investigation, Writing - review & editing, Software. **Alexander Michael Rapp:** Conceptualization, Resources, Writing - original draft, Supervision, Project administration.

Declaration of Competing Interest

None.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.psychres.2020.113152.

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