



Theory of mind disturbances in borderline personality disorder: A meta-analysis



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ABSTRACT

Impairments of theory of mind (ToM) are widely accepted underlying factors of disturbed relatedness in borderline personality disorder (BPD). The aim of this meta-analysis was to assess the weighted mean effect sizes of ToM performances in BPD compared to healthy controls (HC), and to investigate the effect of demographic variables and comorbidities on the variability of effect sizes across the studies. Seventeen studies involving 585 BPD patients and 501 HC were selected after literature search. Effect sizes for overall ToM, mental state decoding and reasoning, cognitive and affective ToM, and for task types were calculated. BPD patients significantly underperformed HC in overall ToM, mental state reasoning, and cognitive ToM, but had no deficits in mental state decoding. Affective ToM performance was largely task dependent in BPD. Comorbid anxiety disorders had a positive moderating effect on overall and affective ToM in BPD. Our results support the notion that BPD patients' have specific ToM impairments. Further research is necessary to evaluate the role of confounding factors, especially those of clinical comorbidities, neurocognitive functions, and adverse childhood life events. Complex ToM tasks with high contextual demands seem to be the most appropriate tests to assess ToM in patients with BPD.

1. Introduction

Borderline personality disorder (BPD) is a phenomenologically heterogeneous disorder characterized by affective, cognitive, behavioral, and interpersonal (i.e. disturbed relatedness) symptom areas

(APA, 2013). It is widely accepted that BPD patients' unstable relational style is of central importance (Gunderson, 2007), and other symptoms, such as impulsivity, self-harm, anger or emotional instability are consequences of, or triggered by the social, interpersonal context (Hepp et al., 2017; Brodsky et al., 2006; Kehrner and Linehan, 1996). Clinical

Abbreviations: ATT, advanced ToM test; BPD, borderline personality disorder; CAMS, cartoon-based assessment of mentalizing skills; EAT, expression attribution test; FER, facial emotional recognition; FBPST, false-belief picture sequencing task; FPT, faux pas task; HC, healthy controls; JAT, joke-appreciation task; MA, meta-analysis; MASC, movie for the assessment of social cognition; MDD, major depressive disorder; MDE, major depressive episode; MET, multifaceted empathy test; MSAT, mental state attribution tasks; NTT, non-verbal ToM tasks; RMET, reading the mind in the eyes test; TASIT, the awareness of social inference test; ToM, theory of mind

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research paid increasing attention to BPD patients' social dysfunctions during the past decades, and a growing body of data indicates that BPD patients have social cognitive deficits (Daros et al., 2013; reviewed by Roepke et al., 2013; Herpentz and Bertsch, 2014.). Theory of mind (ToM), (or mentalizing) is one of the essential components of social cognition. ToM is the ability to attribute mental states (i.e. beliefs, desires) to self and others, and to understand and predict their behaviors, intentions, and wishes (Baron-Cohen, 1995).

Hence, ToM is a multidimensional construct involving several dimensions. Sabbagh (2004) identified two processes of ToM: (1) detecting and discriminating cues in the immediate social environment, i.e. the ability to *decode* the mental states of others; and (2) making inferences about those cues, i.e. the ability to *reason* about the mental states of others. An additional distinction can be made between components of ToM: one component is involved in understanding others' intentions and beliefs (*cognitive* or 'cold' ToM), whereas the other one processes other people's feelings and emotions (*affective*, or 'hot' ToM). The findings of the functional brain imaging studies sustain the separate neurological underpinnings of ToM decoding and reasoning, as well as those of cognitive and affective ToM (Shamay-Tsoory et al., 2006; Sabbagh 2004). During the past years, increasing attention has been paid to the disassociations of processes and components of ToM in specific clinical populations. Several studies found intact or enhanced mental state decoding abilities together with a dissociation between decoding and reasoning abilities in BPD samples (Preissler et al., 2010; Baez et al., 2015; Zabizadeh et al., 2017). Harari et al. (2010) found a dissociation between cognitive and affective ToM in patients with BPD, but this dissociation was not replicated in later studies (Baez et al., 2015; Petersen et al., 2016). Recently, two studies using different ToM tasks in the same sample reported a decoupling of mental state decoding and reasoning abilities, as well as that of affective and cognitive ToM in BPD (Baez et al., 2015; Zabizadeh et al., 2017).

Clinical studies report common comorbidities in the BPD populations: e.g. 41–83% for major depressive disorder (MDD), 10–20% for bipolarity, 64–66% for substance misuse, 46–56% for post-traumatic stress disorder (PTSD), 23–47% for social phobia, 16–25% for obsessive-compulsive disorder, 31–48% for panic disorder, and 29–53% for any eating disorder (Lieb et al., 2004; Zanarini et al., 1998). Among these, MDD and PTSD have been found to negatively influence ToM performance in BPD patients (e.g. Unoka et al., 2015; Zabizadeh et al. 2017; Nazarov et al., 2014).

Until now, several studies have investigated ToM in BPD, but the results were controversial. Discrepant findings on ToM deficits in BPD might be caused by the low sample sizes, the variability of the ToM processes and components assessed, as well as the heterogeneity of the clinical samples mainly due to the co-morbidities. To resolve controversies, we conducted a quantitative meta-analysis (MA) of the existing data on ToM in BPD. So far, two meta-analyses of social cognition in BPD have been published. Daros et al. (2013) reviewed and meta-analyzed data on facial emotion recognition in BPD – involving 10 primary studies, while Richmann and Unoka (2015) aggregated and meta-analyzed ToM results of 5 studies. However, the latter publication comprised only studies using the Reading the Mind in the Eyes Test (RMET, Baron-Cohen et al., 2001) to assess ToM in BPD.

We outlined the following meta-analysis questions: Can overall ToM deficits be detected in BPD patients compared to healthy control subjects in a large, pooled sample derived from several studies? If so, how can we characterize BPD patients' ToM deficits within the various dimensions and subcomponents of ToM? Do demographic and clinical variables have an impact on ToM capacities of BPD patients? Does task type have an impact on the ToM results? Are there tasks particularly sensitive to assess BPD patients' ToM abnormalities?

2. Methods

2.1. Literature search and study selection

PRISMA guideline (Moher et al., 2009) was followed when conducting this MA. In agreement with other meta-analyses on ToM deficits in psychiatric disorders (recently reviewed by Cotter et al., 2018), electronic, peer-reviewed databases including PubMed, Scopus, PsychINFO, and Web of Science (from January 1990 to November 2017) were searched using keywords {"Theory of mind" OR "mentalizing" OR "social cognition"}, AND {"borderline personality disorder"}. The reference list of papers examined for eligibility criteria, as well as that of reviews on social cognition in BPD, were also reviewed for additional publications.

The initial search strategy yielded 697 studies. After filtering duplicates, 445 studies were screened for eligibility criteria. Studies were selected if they (i) investigated ToM performances of patients with BPD fulfilling DSM-IV criteria confirmed by the Structured Clinical Interview for DSM-IV Axis II Personality Disorders (SCID-II, First et al., 1997) (ii) included healthy comparison groups, (iii) used well-established, valid, and widely used ToM tests, and (iv) presented appropriate data to determine effect sizes and variances. All identified publications were reviewed and data were extracted by two authors (N.N. and M.S.) independently. Inconsistencies of study selection and data extraction were discussed. A discrepancy of data extraction appeared with regard to one publication (5%); nonetheless, it was resolvable: after discussion, there was a 100% agreement on data extraction.

Reasons for exclusion were: participants with no or with not sufficiently established diagnosis of BPD ($n = 4$), no healthy comparison group ($n = 4$), no eligible ToM tasks ($n = 3$), overlapping sample ($n = 1$), mixed clinical sample ($n = 2$). We did not include studies with adolescent samples ($n = 4$), because ToM skills are known to be developing during that age (Sharp et al., 2013; Blackmore 2012); therefore, adding adolescent samples to the MA with adults would have substantially increased the heterogeneity. Regarding the commonly co-occurring psychiatric comorbidities in BPD, samples with typical psychiatric comorbidities (e.g. MDD, PTSD, eating disorders, anxiety disorders, and other personality disorders) were not excluded from the meta-analysis. Fig. 1 presents the flowchart of the study selection process. We also contacted authors for unreported data and missing information.

Seventeen studies involving 585 patients with BPD, as well as 501 healthy controls (HC) passed the inclusion criteria (Table 1). There was no significant between-group difference for age ($d = -0.06$, $CI = -0.18$ to 0.06 , $z = -0.97$, $p = 0.33$). The percentage of males was higher in the HC groups (11.99%) than in the BPD groups (9.2%), and there was a significant difference for gender between BPD and HC across the studies ($RR = 1.18$, 95% $CI = 1.04$ to 1.35 , $z = 2.49$, $p < 0.05$). Therefore, gender was added as a moderator to the analysis.

2.2. ToM measures

The most frequently applied ToM task was the Reading the Mind in the Eyes Test (RMET, Baron-Cohen et al., 2001) that measures the ability of *mental state decoding* ($N = 8$). In RMET, a series of photos presenting only the eye region is shown, and participants are instructed to pick one from four words presented simultaneously with the eyes to best describe the emotional state of the person in the photo. However, partially based on neuroimaging studies, where RMET has been found to be related to amygdala activation (e.g. Russel et al., 2009), it is widely used as a measure of affective ToM as well.

Other tasks assessed the *mental state reasoning* abilities: Faux Pas Task (FPT, Stone et al., 1998) was used in 5 studies; in 2 other studies, ToM was measured with Happé's Advanced theory of mind test (ATT, Happé, 1994). In addition, several ToM cartoons, the Multifaceted Empathy Test (MET), the cognitive empathy subtest of which is

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