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SOCIAL COGNITION SKILLS IN BORDERLINE
PERSONALITY DISORDER.

Section A: A systematic literature review of social cognition skills in people with a
diagnosis of Borderline Personality Disorder

8,317 words

Section B: Affect labelling and response strategy differences in Borderline
Personality Disorder: A quasi-experimental and economic game approach.

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1. Project summary

Section A reviewed 18 empirical behavioural studies on empathy and mental state inference (MSI) skills in those meeting Borderline Personality Disorder (BPD) criteria. The review was situated within Mentalization theory (MBT), which posits a central link between such skills and complex needs presentation. Firm conclusions about BPD mentalization skills are difficult as deficits, enhanced abilities and no differences compared to non-patients are reported. None of the reviewed papers described studies that stimulated attachment system arousal, as warranted by mentalization theory. Economic game research was highlighted as offering value in assessing self-directed mentalization, an under-researched area.

Section B sought to test MBT and other models claim that empathy and Mental State inference (MSI) skills are differentially degraded in Borderline Personality Disorder (BPD). Twenty-seven people meeting BPD criteria and a matched non-patient group had empathy assessed with the Reading the Mind in the Eyes Task and MSI assessed with a modified economic game task. This was done before and after a novel attachment system intervention. Empathy skills were less accurate in the BPD group. Other findings including game behaviour, fairness ratings and a social cue selective prioritisation in non-patients only are discussed. The theoretical links and suggestions for clinical innovation and research development are provided.

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MAJOR RESEARCH PROJECT

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SECTION A

**A systematic literature review of social cognition skills in
people with a diagnosis of Borderline Personality Disorder.**

7,935 (382)words

Abstract

Aims: this paper reviewed the recent empirical behavioural studies on empathy and mental state inference (MSI) skills in those meeting Borderline Personality Disorder criteria. The review was situated within Mentalization-Based Theory (MBT), which posits a central link between such skills and complex needs presentation.

Method: A systematic review of the literature resulted in 18 studies being appraised. These had not been extensively reviewed in the two earlier reviews. Studies were categorised by task type, based upon which facet of empathy or MSI was being assessed.

Findings: Firm conclusions about BPD mentalization skills are difficult as findings report deficits, enhanced abilities and no differences from non-patients. Task paradigms were not consistent and few basic replications were attempted. None of the reviewed papers described studies that stimulated attachment system arousal, as warranted by mentalization theory. Economic game research was highlighted as offering value in assessing self-directed mentalization, an under-represented research area.

Conclusions: Proposals for future research were presented along with a synthesis of candidate mentalization modules, and influencing factors, in the hope of informing a more coordinated future research programme.

Keywords: systematic, review, empathy, borderline, unstable, mentalization

1. Background: Why is empathy important?

“There is one reason why empathy matters so much: from the start of life, we require others to help us cope with stress. Our brain requires social experience to develop properly: we influence each other’s ability to manage stress in a very real, measureable way.”

Szalavitz and Perry, 2011, p.16.

This review aims to survey the empirical, behavioural research on the social cognitive abilities of those with a diagnosis of Borderline Personality Disorder (BPD). The paper begins by contextualising empathy as one of myriad social cognition skills. The paper then outlines the construct of BPD and explains why researchers, and clinicians, are currently interested in empathy abilities within this population. The main section reviews previous empathy studies with BPD clinical samples. The paper concludes with implications for future research.

1.1. Social cognition and empathy’s dual aspects

Social cognition research asks how humans – as inherently social animals – process and make sense of the milieu. Social cognition is “a type of thought, feeling, or perception that we can only have with respect to another person” (Downey, Zaki, & Mitchell, 2010, p.152). One particular area of social cognition familiar to the layperson and of interest to clinicians and researchers is ‘empathy’. Empathy, from the Greek *empathia*, means “to enter the feelings from the outside, or to be with a person’s feelings, passions or suffering” (Howe, 2012, p.9). This definition focuses on emotion and sensation, synonymous with the everyday usage. Empathy is a fast and

automatic bodily experience linked to affect. Empathy is associated with experiences of emotional contagion i.e. when fear or excitement spreads quickly through a group, without verbal communication. Different terms for empathy exist. Some researchers use *intercorporeality* (Froese, Stanghellini, & Bertelli, 2013) or a *shared representation* (Lis & Bohus, 2013) and the term *affective empathy* is a commonplace distinction in the literature.

There is also another aspect of empathy, not so far discussed. Downey et al. (2010) report “two core mental processes [that are] uniquely person-oriented: mental state inference and empathy” (p.152). Mental state inference (MSI), sometimes known as *cognitive empathy*, refers to the skill of “seeing, imagining and thinking about the situation from another person’s point of view,” (Howe, 2012, p.14). MSI is understood as developing later in infancy than empathy, typically emerging around three to four years of age.

MSI is a more complex, slower process requiring higher levels of brain activation compared to empathy. It is also understood to function less well when the attachment system is activated, for example during care-seeking, affiliation or perceived threat of rejection from a significant other person (Fonagy & Luyten, 2009; Fonagy et al., 1996). MSI is less likely to be used toward out-group members, often giving way to quicker, heuristic stereotyping to inform social appraisal (Downey et al., 2010). An example of encouraging MSI is when a child is asked to, “Think about how your behaviour affects your friend.”

Figure 1 diagrammatically presents both forms of empathy.

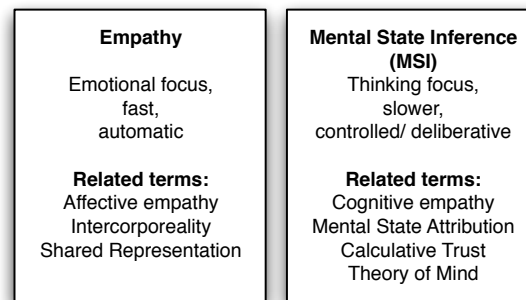


Figure 1: Diagram representing two aspects of empathy

Mental State Attribution (Ripoll, Snyder, Steele, & Siever, 2013), *Calculative Trust* (Braynov, 2013) and *Theory of Mind* (Premack & Woodruff, 1978) all denote constructs highly similar to MSI. Froese et al. (2013) claim that the majority of social cognition is automatic via empathy. They suggest that only those with high-functioning autism predominantly use MSI during interaction.

1.2. Empathy, MSI and Borderline Personality Disorder

In the last fifteen years research has increasingly investigated empathy and MSI in clinical populations. Initially focused on psychotic disorders (Brüne, Abdel-Hamid, Sonntag, Lehmkämpfer, & Langdon, 2009; Brüne & Brüne-Cohrs, 2006; Brüne, 2001), Peter Fonagy, Anthony Bateman and colleagues' work brought empathy and MSI considerations into BPD research.

BPD is “characterised by a pervasive pattern of instability in affect regulation, impulse control, interpersonal relationships and self image” (Lieb, Zanarini, Schmahl, & Linehan, 2004, p.453). Instability is the disorder’s primary theme (see Appendix 1), which is associated with elevated levels of self-harm, suicidal and risky or challenging interpersonal behaviour. Data suggest a correlation between childhood trauma (abuse and/or neglect) and development of BPD (Fossati, Madeddu, & Maffei, 1999; Minzenberg, Poole, & Vinogradov, 2006a). In the UK it has an estimated prevalence of between 0.2 and 1.1% (Coid, Yang, Tyrer, Roberts, & Ullrich, 2006).

BPD is more commonly diagnosed in women (Lieb et al., 2004) however (Becker and Lamb (1994) suggest that gender biases exist in professionals. They found that professionals examining identical case histories tended to allocate men to trauma-related diagnoses yet women were allocated to the BPD category. When considered in light of social and professional stigma around BPD which may result in less supportive care (Aviram, Brodsky, & Stanley, 2006) the BPD concept clearly warrants careful use. More broadly there are serious issues with the use of a DSM-type system to classify human experiences as if it were a disease entity (The British Psychological Society, 2011). These issues fall outside the scope of this project. DSM is used here as all the journals reviewed used these criteria in research, rather than ICD-10 or other phenomenological approaches.

In sum, BPD is a pervasive, problematic and persistent pattern of behaviour associated with a reduced quality of life and interpersonal functioning. It is difficult to treat with psychopharmacology alone (Zanarini, 2009). Structured and collaborative psychotherapy, lasting not less than three months, is the main intervention in UK clinical guidance (National Institute for Health and Clinical Excellence, 2009).

There are several recently established therapeutic models for treating symptoms of BPD including Dialectical Behavioural Therapy (Linehan, 1993), Cognitive Behavioural Therapy (Davidson, 2007), Schema Focused Cognitive Therapy (Young, 1999), Transference Focused Psychotherapy (Kernberg, Yeomans, Clarkin, & Levy, 2008) and Mentalization-Based Therapy (MBT: Bateman & Fonagy 2004, 2006).

The theoretical basis of MBT has particular relevance to this review because it defines mentalization as “the capacity to make sense of others and ourselves

implicitly and explicitly in terms of subjective states [empathy] and mental processes [MSI]” (Fonagy & Bateman, 2008, p.5).

1.3. Mentalization-Based Therapy

Mentalization-Based Therapy (MBT) is an evidence-based intervention (Bateman & Fonagy, 1999, 2009) for people with a diagnosis of BPD. One of MBT’s assumptions is that in BPD difficulties in mentalization result in emotional dysregulation and relational rupture. Therefore therapy “consists of identifying non-mentalizing in the patient’s narrative and working with the patient to address these failures with a view to enhancing this capacity in the patient” (Bateman & Fonagy, 2011, p.275).

The concept of mentalization incorporates both empathy and MSI and also adds self-directed awareness i.e. understanding what one feels and thinks. Mentalization can also be either automatic or controlled and can use external (e.g. facial affect) or internal cues (Allen & Fonagy, 2006). In sum, there are ‘four poles’ of mentalization.

As a four dimensional conceptual construct it is difficult to test empirically for two reasons: First, the four-pole mentalizing matrix (i.e. self-other, thoughts-feelings, automatic-controlled, internal-external cues) makes experimental isolation and testing difficult. Second, mentalization is said to be highly context-dependent and so variable within an individual.

To explain how mentalization emerges, MBT draws on attachment theory. Specifically one’s experiences of early care as, in ‘good enough’ caregiving timely, soothing parental interactions match and then taper an infant or child’s displayed affect. This process is known as marked contingent mirroring (Fonagy & Bateman, 2008). Mirroring is thought to help the infant develop the capacity to recognise and

then to regulate its own feelings and mental states. In time this ability will help the child differentiate their mental states from others. For the child, mirroring contributes to a secure and stable sense of self and appears to protect against disorganised attachment and poor attentional control (Beeghly & Cicchetti, 2008).

When mentalizing skills are not established, significant interpersonal and emotional difficulties perpetuate in adult life. MBT interventions target these 'mentalizing' deficits as the main therapeutic aim. MBT has been found to reduce suicidality, service use, medication use and BPD caseness, when compared to treatment as usual (Bateman & Fonagy, 2008).

Yet other researchers do not agree that developing mentalization is the main aim of effective BPD intervention. Other models, each with growing effectiveness data, propose emotional over-responsivity (Linehan, 1993), negative core beliefs (Davidson, 2007), unresolved and unmet developmental needs (Young, 1999) or the over-reliance on primitive defences (Kernberg et al., 2008) as alternative causal factors in BPD. Clinical anecdotes also suggest enhanced empathy ability in BPD. This creates the so-called 'Borderline Paradox' (Dinsdale & Crespi, 2012; Krohn, 1974) of apparently temporarily heightened empathy, yet persistent difficulties in relationships.

In summary, the existence, or lack, of the theoretically predicted mentalizing deficits have significant implications for the design of treatment and the direction of clinical research. Better understanding of actual mentalizing abilities and/or deficits may inform new, or revised approaches to BPD treatment or more clarification as to which patients with BPD are most likely to benefit. Also, the therapeutic aim of increasing mentalization warrants a sensitive tool to assess change in mentalizing skills during therapy, to measure progress and understand efficacy

The main section of this paper now outlines studies that have sought to assess actual empathy and MSI abilities in those with a BPD diagnosis. MBT has the greatest investment in this area of research, given some of the model's assumptions.

2. Aims and methods

This review aims to evaluate evidence for empathy deficits in those meeting criteria for BPD. It is intended that the review will address this issue in an academic and clinically relevant manner. A literature search was carried out using the terms: (“Borderline Personality Disorder” OR “BPD” OR “Borderline” OR “emotionally unstable”) AND (“empathy” OR “mentalization” OR “social cognition” OR “mind reading”) on BioMed, CINAHL, PsycINFO, SAGE and ScienceDirect databases. The search returned 212 articles. All abstracts were read for possible relevance. The following inclusion criteria were applied:

- i) a clinical population meeting criteria for BPD and a non-patient (NP) comparison group.
- ii) Behavioural or performance data, rather than designs solely reliant on self-report, questionnaire methods. Instability characterises BPD and there are no data to support the reliability or validity of self-report empathy questionnaires with this population (Lis & Bohus, 2013). It is not known how accurately this population rates its own empathy abilities (Dinsdale & Crespi, 2012).
- iii) At least 30 points under Hart’s (1998 see Appendix B) literature scoring rubric, to ensure methodological rigour and theoretical relevance to the research question.

Sixteen studies and two reviews (Dinsdale & Crespi, 2012; Domes, Schulze, & Herpertz, 2009) were found to be of interest.

The current search strategy was confirmed by checking the references of the short-listed papers, ensuring relevant studies were considered. An alert using the

above parameters returned two further papers (Hagenhoff et al., 2013; Schulze, Domes, Köppen, & Herpertz, 2013) before the search ended on 1 November 2013.

Figure 2 presents inclusion/exclusion information as a PRISMA diagram.

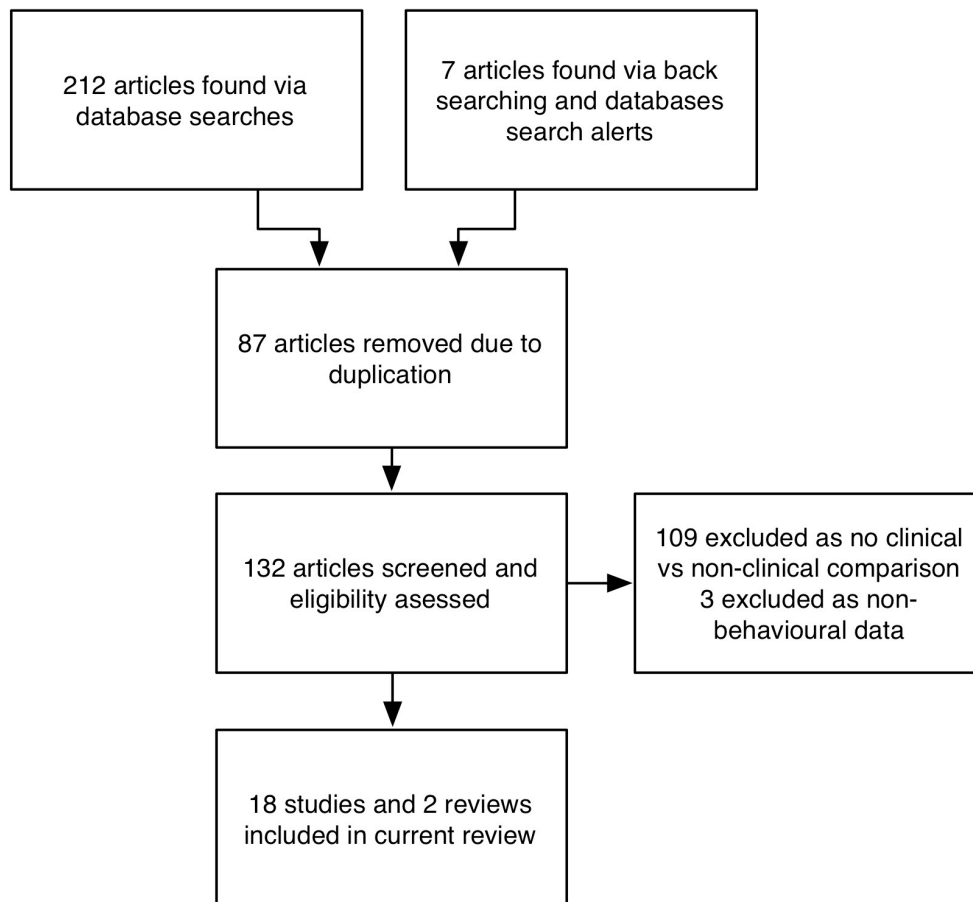


Figure 2: A PRISMA diagram for the current review

3. Findings

This review explains the main methods and findings in the literature. It will also report on five new papers, not previously reviewed (Hagenhoff et al., 2013; King-Casas et al., 2008; Schilling et al., 2012; Schulze et al., 2013; Wischniewski & Brüne, 2012).

3.1. Earlier reviews

Domes et al. (2009) reviewed six contemporaneous studies and found evidence of people with BPD showing “subtle impairments in basic emotion recognition, a negativity or anger bias, and a heightened sensitivity to the detection of negative outcomes” (p.10). However, findings since this review have been mixed. For example, Fertuck, Grinband, and Stanley, (2013, p.195) summarised study findings as showing “individuals with BPD are worse than, equal to, or better than controls at evaluating social cues”. This review was useful in bringing together the first studies in this field, however much work has been done since its publication. It originates from a Dialectical Behavioural Therapy research group that may bias the interpretation of results to confirm with this framework.

A 2012 review by Dinsdale and Crespi included 28 studies related to the Borderline Empathy Paradox (see p.9). The majority of these were experimental designs with clinical groups, though also included questionnaire only designs and some samples drawn from non-clinical ‘BPD trait’ populations (Scott, Levy, Adams, & Stevenson, 2012). It critiqued study designs that lacked interactive stimuli, recommending face-to-face interaction, over looking at photo-images or reading narratives. The reviewer’s believed these were more likely to reveal the BPD group’s enhanced mentalizing skills. They concluded, “a sufficient number of studies [using

interactive stimuli]... showed enhanced empathic skills in BPD” (p.14). Yet acknowledged that empathy and MSI abilities in BPD were “highly variable across studies” (p.14). This review is useful in providing more recent review of studies across a range of designs and methods. However, such breadth results in a less systematic review that, at times, appears to offer sparse justification for its conclusions.

3.2. Current review structure

To assist the reader, the results are arranged in four sub-sections reflecting the main experimental task used. The first assess 'affect detection' studies (i.e. other-focused, affect -based, automatic mentalization based on external cues). These are the basic, perceptual processes underpinning empathy and higher-order MSI. Each subsequent review subsection reflects increasing task complexity. The second subsection contains 'Affect-labelling' studies. 'Theory of mind' tasks relating to weighing and integrating cue information are the third sub-section. These examined controlled, other-focused, cognitive mentalizing, not facial affect (i.e. Mental State Inference tasks).

The final sub-section comprises 'economic game' studies. These games are extensively researched in non-clinical populations in economics and behavioural finance and offer behavioural data for defined social interactions and processes (e.g. sharing resources, trust-based reciprocity and punishing freeloaders). Economic games are typically based around exchange of value (i.e. tokens) - between players which can be considered as useful means to assess responding based on the entire string of affect detection, affect labelling and weighing of other cues, including MSI to inform behaviour.

3.3. Affect detection studies

There were two affect detection studies in Domes and colleague's (2009) review with two further studies published in 2013 (Table 1).

Table 1: Affect detection studies, by publication year

Study N	Main task	Measures	Overall findings
Domes et al. (2008) 25 BPD 25 NP	Emotional transition task: 108 trials of neutral to one of six emotions in gradual steps of intensity. Included a forced choice 'when sure' of affect state. Also included an affect-labelling task.	Beck Depression Inventory (BDI), State- Trait Anxiety Inventory (STAI), Positive and Negative Affect State (PANAS), Borderline Symptom List (BSL) SCID-II	No significant group differences in sensitivity. BPD group lower performance (non-significant) due to less accurate identification of 'Surprise'. BPD group became quicker, with no increase in errors over numerous trials. No difference on affect-labelling task.
Lynch, et al. (2006) 20 BPD 20 NP	Affective empathy paper: Multimorph Facial Affect Recognition task: neutral to emotional face morph in 39 steps. Signal when first detected emotion, able to revise answer. Also tested emotional labelling at 100% intensity.	Hamilton Depression Scale (HAM-D) SCID-II**	BPD group recognised affect earlier than non-patients No significant bias toward any single emotion (fear, anger or happiness) despite differences in the latter two. No group level difference in error rates / impulsivity. Found non-medicated BPD participants were quicker than medicated. No difference on affect labelling task.
Hagenhoff et al. (2013)* 28 BPD 28 NP Age, sex and education matched.	Visual search task: incongruent shape or face in the crowd. Measured accuracy and response times and plotted as a search slope (mathematical model of response time accounting for motor speed) for all accurate responses.	BDI DSS (a German dissociative scale) SCID-II	Both groups saw anger quicker than happy, with no difference between groups. No significant group differences in search slope comparison.
Schulze et al. (2013)* 20 BPD 25 NP Female only. Not age or education matched groups.	Rapid continuous stream task: 216 trials presenting a stream of neutral faces that changed every 117ms. Occasional inclusion of a happy or angry face following a non-face target image (e.g. flowers or mushrooms).	IPDE (German BPD Screen) Zanarini Borderline List (ZAN-BPD) Sub-tests from Wechsler Adult Intelligence Scale (WAIS) BDI BSL	BPD showed greater detection/sensitivity to presence of emotions, including a heightened sensitivity for angry face trials. No differences in error rate.

* studies not included in previous reviews. SCID-II: Structured Clinical Interview for DSM-IV – Axis II personality disorders. BDI, Beck, Steer, and Brown, 2005; BorderlineSL, Bohus et al. 2009; BSL, Franke, 1995; DSS Stiglmayr, Braakmann, Haaf, Stieglitz, and Bohus, 2003; HAM-D, Hamilton, 1960; IPDE, Loranger, Janca, and Sartorius, 1997; PANAS, Watson, Clark, and Tellegen, 1988; SCID-II, First, Spitzer, Gibbon, Williams and Benjamin, 1997; STAI, Spielberger, 2010; WAIS, Wechsler, 2008; ZAN-BPD, Zanarini, 2003.

The primary approach to assess emotional detection skills used photo-manipulation software to create and present photo-images that morph in gradations from neutral to one of six 'prototypical' emotions (Domes et al., 2008; Lynch et al., 2006). Participants are assessed on their ability to first detect affect cues known as 'sensitivity' in the literature. Domes et al. (2008) found no group differences in the minimum affect intensity needed to detect nascent affect. They also found no

differences in labelling of emotions when at 100% intensity. Interestingly, they found the BPD group i) had poorer recognition of surprise and ii) their accuracy increased over numerous trials. This 'learning' effect was not present in the non-patient group.

However Lynch et al. (2006) found earlier detection in the BPD group, with no evidence of impulsivity-related errors (i.e. premature guessing). This is suggestive of enhanced empathy skills at the perceptual level. This study differed from Domes et al's (2008) findings in that participants were able to change their response as more information became available. Lynch et al also tested emotional labelling accuracy at 100% intensity and also found no group differences. These two studies do not agree on affect detection abilities, though neither reported a clear perceptual-level deficit.

Two, more recent, studies examined affect detection using different paradigms. Schulze et al. (2013) presented a chain of neutral affect face pictures to participants for 117 milliseconds. Some chains included a happy or angry affect photo-image following a non-face image (e.g. flowers). The BPD group's detection of angry affect was enhanced, with no group differences for happiness. The authors noted both groups were at ceiling level when detecting happy affect, so differences were difficult to detect.

Hagenhoff and colleagues (2013) used a 'face in the crowd' approach to assess detection. They used 9, or 16, rudimentary line drawings of neutral 'faces', arranged in 3x3 or 4x4 grids. In some trials either a subtly, or starkly, different affect (happy or angry) was included in the grid. Researchers hoped to measure pre-attentive processes in affect recognition (i.e. <5ms). These data suggested no differences between BPD and non-patient groups, though analysis of search times suggested that the BPD group might have used slower, conscious processing when subtle affect was present. It should be noted that none of the group-level response

times were indicative of pre-attentive processing, challenging the ecological validity of the task. Also, 43% of the BPD group was prescribed major tranquilizers (“antipsychotics”), though this was not analysed as a possible co-variate.

In sum, detection studies do not reveal a clear mentalizing deficit. No data indicate reduced affect detection sensitivity in BPD. Yet this is broadly in line with MBT’s prediction as participants had not had their attachment system aroused before the tasks. A number of interesting differences emerged (i.e. quicker learning, sensitivity to anger and difficulties detecting surprise). None of the studies have yet been independently replicated, so caution is needed when extrapolating from these findings.

3.4. Affect labelling studies

Seven studies met the stated inclusion criteria and assessed abilities to accurately label affect in others (see Table 2). Dinsdale and Crespi (2012) and Domes et al. (2009) provide coverage of earlier affect labelling studies - all of which reported affect labelling deficits in BPD groups (Bland, Williams, Scharer, & Manning, 2004; Guitart-Masip et al. 2009; Levine, Marziali, & Hood, 1997; Minzenberg, Poole, & Vinogradov, 2006b; Wagner & Linehan, 1999). However, Wagner and Linehan (1999) found evidence for attenuated, enhanced and no group differences in their paper.

Of the seven studies considered here, two reported enhanced affect labelling (Fertuck et al., 2009; Frick et al., 2012); three found no group performance differences (Dyck et al., 2009; Fertuck et al., 2013; Schilling et al., 2012) and two reported attenuated abilities in BPD (Preißler, Dziobek, Ritter, Heekeren, & Roepke, 2010; Unoka, Fogd, Füzy, & Csukly, 2011). However Preißler et al. (2010) also reported finding no differences in one of the two tasks used.

Table 2: Emotion labelling studies arranged by year of publication

Study N	Main task	Measures	Overall findings
Fertuck et al. (2009) 30 BPD 25 NP	Reading the Mind in the Eyes task (RMET) - attribute mental state based on photo-images of eye regions	SCID I & II BDI Profile of Moods States (POMS)	BPD group showed enhanced ability, even when controlling for depression
Dyck, et al. (2009) 19 BPD (50% also PTSD) 19 NP	Fear Anger Neutral Test (FAN) – Two second presentation before forced-choice between negative or neutral expression	Borderline Symptom List (BorderSL) BDI HAM-D STAI	PTSD highly co-incident with BPD. PTSD symptoms reduce accuracy of affect labelling. FAN – no overall group differences, though some misreading of neutral faces as negative in BPD group
Age & Education matched	Emotional Recognition (ER) task: 40 Facial photo-images with no time constraint, response times collected. Respond using one of five choices.	PANAS International Personality Disorder Examination (IPDE-S) Neuropsychological battery SCID-I	ER - lower performance in both groups. Though no group differences for accuracy, or response time.
Preißler, et al. (2010)	RMET	A German test of fluid intelligence	No group differences in RMET
64 BPD 38 NP Age & IQ matched All female	Movie for the Assessment of Social Cognition (MASC) – a 15 min film with 45 prompt questions about character's emotions, thoughts and intentions in an everyday situation.	German Mini International Neuropsychiatric interview (MINI) BSL Posttraumatic Stress Diagnostic Scale (PDS) SCID-II	MASC: Significant group differences in overall, 'emotion', 'thinking' and 'intention' subscales. When PTSD factored out of BPD group, then no differences from non-patients except on the 'intentions' scale of the MASC. BSL's 'intrusion' scale and PDS's 'experiences of sexual assault by a known assailant' scores negatively predicted MASC scores.
Unoka et al. (2011)	60 Ekman faces: five-second exposure then a response from one of six options. No response time data.	Young Schema Questionnaire (YSQ) Symptom Check List-90 (SCL-90-R) – global severity scale	BPD attenuated performance: Less accurate in labelling disgust, sadness, fear and anger due to over-attributing disgust, and surprise and under-attributing fear. BPD group more accurate in labelling surprise. Finding stands when controlling for medication.
33 BPD inpatients 32 NP Age matched		SCID I & II	
Schilling, et al. (2012)*	RMET with added confidence rating	Mini International Neuropsychiatric Interview (MINI) Multi Choice quiz for IQ estimate	No group differences in accuracy. No specific difficulties in labelling negative, neutral or positive emotions. Higher confidence ratings in BPD group.
31 BPD 27 NP Age & education matched		SCID I & II	
Frick, et al. (2012)	RMET: with five-second exposure then ten-seconds to respond - no simultaneous exposure of images and response options. Response times collected.	Affective Lability Scale BDI SCID I & II	BPD group faster and more accurate than NP, more accurate on negative and positive affect with no differences for neutral affect. Different neural activation correlates between groups. Finding stands after controlling for depression.
21 BPD, medication naive 20 NP Age & education matched All female	fMRI scanning.		

Study N	Main task	Measures	Overall findings
Fertuck, et al. (2013)* 17 BPD 19 NP Unmatched for age and education	Photo-images of faces morphed in 10 gradations on trustworthy-untrustworthy and neutral-fearful spectrum. Ratings on two 5-pt scales on these dimensions. Response times collected.	HAM-D Brown-Goodwin Aggression Scale (BAS) Profile of Mood States (POMS) Rejection Sensitivity Questionnaire (RSQ) SCID-II	No difference in trust discriminability between groups. Though BPD group returned higher untrustworthy ratings - suggestive of non-perceptual explanation. No group differences on fearfulness ratings. BPD group slower in ambiguous trust trials. BPD also slower in all trust ratings compared to fearfulness. Non-patients did not take longer to respond to trust evaluations. Findings stand when controlling age and depression.

* study not included in previous review. NP, non-patient group
ALS, Harvey, Greenberg, and Serper, 1989; BAS, Brown, Goodwin, Ballenger, Goyer, & Major, 1979; BDI, Beck, Steer, and Brown, 2005; BorderlineSL, Bohus et al. 2009; BSL, Franke, 1995; HAM-D, Hamilton, 1960; IPDE, Loranger, Janca, and Sartorius, 1997; MINI, Sheehan et al., 1998; PANAS, Watson, Clark, and Tellegen, 1988; PDS, Foa, 1995; POMS, McNair, Lohr, & Droppelman, 1981; SCID I/II, First, Spitzer, Gibbon, Williams and Benjamin, 1997; RSQ, Ayduk et al., 2008; SCL-90-R, Derogatis, 1977; STAI, Spielberger, 2010; WAIS, Wechsler, 2008; YSQ, Schmidt, Joiner Jr, Young, & Telch, 1995.

In this class of studies, the main method of assessment is the presentation of photographs displaying specific facial affect. Participants then label affect, typically from provided options. Four of the studies reviewed here used the Reading the Mind in the Eyes Task (RMET: Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). This was originally designed for assessment of empathy skills in those meeting criteria for autism. Rather than presenting an entire face, only eye regions are shown to participants in RMET's 36 trials.

Fertuck et al. (2009) used an unmodified RMET and found evidence of enhanced affect labelling skills in the BPD group. Frick et al. (2012) also reported enhanced abilities with a modified RMET task: a five second presentation followed by a delay before answering. The BPD group was both faster and more accurate than non-patients.

Schilling et al. (2012) used an unmodified RMET, but added a confidence rating scale for each item of the RMET. The BPD group was more confident than non-patients, yet there were no significant groups differences in labelling accuracy.

Preißler et al. (2010) used an unmodified RMET in one part of their study and also found no differences between groups.

The RMET's utility is somewhat limited. First each item has a 'correct' answer. This may not reflect the ambiguity of intermediate facial expressions in the way that morphed facial affect images might. Use of four response options also reduces a participant's potentially nuanced appraisal to a single value. Wagner and Linehan (1999) believed that allowing free response and coding answers allowed the BPD group's detailed affect recognition skills to be recorded. They reported enhanced ability in this regard in the BPD group. Finally, some items (e.g. sceptical, interested and fantasizing) do not appear to reflect basic emotions. Arguably they refer to mental states in such case the RMET lacks sufficient contextual information to reliably discern between such states.

Not all studies used RMET, some instead presented whole face photo-images. Dyck et al. (2009) used two tasks. First a Fear Anger Neutral (FAN) task assessed the earlier reported over-labelling of negative emotions in neutral faces amongst BPD groups. Here, a two-second presentation proceeded by a choice between 'negative' or 'neutral' valences. This task falls somewhere between simple detection and full affect labelling. Whilst there was a slight bias (i.e. reading negative affect in neutral faces) in the BPD group, there were no significant overall group differences using the FAN task. The second task used 40 photo-images with no time constraints and a forced choice design. No overall group differences emerged for response times or accuracy.

Unoka, Fogd, Fűzy, and Csukly (2011) published the only recent affect labelling paper to conclusively report attenuated skills in BPD groups. This followed Frick and colleague's (2012) design, modified with entire face photo-images (Eckman

& Friesen, 1976). Unoka and colleagues reported less accurate labelling skills at a significant level in the BPD group, contradicting Frick et al. (2012).

One element of Preißler et al. (2010) also found evidence of attenuated labelling skills in BPD. They used a 15-minute 'Movie for the Assessment of Social Cognition (MASC), a task originally developed for research with 'autistic' populations. During the film, 45 questions are asked about the emotions, thoughts and intentions of the on-screen characters. Significant group differences in MASC score for the 'emotion', 'thinking' and 'intention' subscales were reported. However, half the sample of this study also met criteria for Post-Traumatic Stress Disorder (PTSD). When this was factored out, non-patients and BPD group performance was comparable, except in the 'intentions' scale. Arguably the 'intentions' and 'thoughts' subscales measure MSI, rather than affect labelling. Interestingly the study also reported BPD-related involuntary thoughts negatively correlated with MASC ability. Taken together, there may be evidence pointing to social cognitive impairment related to the burden of suppressing or 'managing' intrusive thoughts. Again, this may suggest a limitation of higher-order social cognitive resources rather than a perceptual issue. This interpretation of the MASC data would converge with Minzenberg et al. (2006b) who reported attenuated labelling accuracy only when two sensory inputs (speech recordings and facial affect) were combined, in 21, 10-second filmed vignettes. Minzenburg found no differences when affect labelling used either only prosody or only photo-images, so the authors posited a cue integration problem in BPD empathy.

The final study in this category has not been previously reviewed. Fertuck et al. (2013) created 144 computer-morphed photo-images of facial affect. Each image was scaled along two dimensions: untrustworthy-trustworthy and neutral-fearful.

Participants rated each expression along five-point rating scales for both dimensions. There were no group differences in ‘trust’ or ‘fearfulness’ sensitivity. Interestingly, BPD groups were less trusting of all ‘untrustworthy’ faces and took longer in ambiguous trust trials. Unlike the non-patient group, they also were differentially slower when assessing trust, compared to fearfulness.

In summary, the seven papers presented here begin to counter the findings of the first affect labelling studies with a BPD population. Although the first five published papers (i.e. those not reviewed here) found evidence for affect labelling deficits, only Unoka et al. (2011), and part of Preißler et al. (2010) support this conclusion. As study paradigms progressed they began finding either no differences between BPD and non-patient groups or, in two cases, (Fertuck et al., 2009; Frick et al., 2012) enhanced affect labelling skills.

One interpretation of these data is that any differences in social cognition and empathy in BPD are related to higher-order cognitive processes, or influencing factors (e.g. motivation, prior learning etc.) rather than a simple skills deficit. This interpretation is tentative as there are no pure replication studies, and relatively small sample sizes. This category, whilst the most developed and tested, may still contain a high level of random noise amongst mixed findings. For example, the RMET is commonly used yet this task does not return unambiguous findings.

There is a clear need for further replication studies. In addition, it would be interesting to provide written vignettes alongside the RMET to see what impact this had on scores for the seemingly MSI items. To explore the ‘cue integration’ hypothesis one might assess the role of working memory during empathy tasks. This may entail digit span recall tasks, or other distractor activities whilst assessing affect. Any further studies would ideally control for PTSD and other intrusive thinking (e.g.

OCD, complex trauma etc.) as these data suggest they may negatively impact on affect labelling skills.

3.5. Mental State Inference tasks

The search revealed three mental state inference (MSI) papers, all of which were previously reviewed (Table 3). The findings in this area are consistent: All three studies found no main effect, or group difference when assessing MSI (Arntz, Bernstein, Oorschot, & Schobre, 2009; Ghiassi, Dimaggio, & Brune, 2010; Harari, Shamay-Tsoory, Ravid, & Levkovitz, 2010). However some post-hoc analyses did reveal some interesting patterns.

Table 3: Mental state inference studies, by year of publication

Study N	Main task	Measures	Overall findings
Arntz, et al. (2009) 16 BPD 16 Cluster C patients 28 NP All women, age and IQ matched	Happé's Theory of Mind task: 16 stories, 8 'mental' and 8 'physical'. 'Mental' stories required inferences about a character's mind and included bluffs, mistakes, persuasion and white lies. 'Physical' stories acted as a comparison task.	Visual mood scales, WAIS: picture sort, matrices, jigsaw and arithmetic. SCID-II	No BPD-NP group differences found. BPD groups outperformed NPs when controlling for IQ.
Ghiassi et al. (2010) 50 BPD 20 NP	Mental State Attribution Tasks (MSAT-Q & MSAT-S, Brune, 2005) – a cartoon sequencing and story task with questions on character's beliefs, intentions, false beliefs, reciprocity and deception.	Parenting style questionnaire (FEE) SCID II	No significant differences between groups
Harari, et al. (2010) 20 BPD 22 NP Age, education and sex matched	Baron-Cohen's (1997) Faux pas task: 20 social stories with questions on story facts (test of story recall) and thoughts of characters	Interpersonal reactive index (IRI: Davis, 1983). Self report questionnaire on 7 domains of cognitive and affective empathy. Revised Diagnostic Interview for Borderlines (R-DIB) (Zanarini et al., 2002)	In the Faux pas task, no main effect for group, though group by faux pas type interaction occurred. BPD higher in affective empathy with non-patients more accurate at spotting the faux pas and explaining why it occurred (MSI) IRI findings not discussed here, due to lack of evidence supporting valid or reliable self-report of empathy or MSI abilities.

Note: FEE, Richter & Eisemann, 2000; IRI, Davis, 1983; R-DIB, Zanarini et al., 2002; SCID II, First, Spitzer, Gibbon, Williams and Benjamin, 1997; Wechsler, 2008.

All three studies involved telling a set story, sometimes with visual aids, and then asking about the thoughts, feelings and motivations of characters. These designs are analogous to the MASC (above) and also derive from 'autism' research programmes. Arntz et al. (2009) included a non-BPD personality disordered group (i.e. 16 people meeting criteria 'anxious' cluster personality disorders). This group outperformed non-patients and those in the BPD group. There was no significant difference between non-patients and BPD, though when IQ was controlled, the BPD group did outperform non-patients using the Theory of Mind task mean item score.

Likewise, Ghiassi et al. (2010) did not detect any differences using two tasks from Mental State Attribution Task (MSAT: Brüne, 2005). Intelligence was uncontrolled, as it was not measured.

Finally, Harari et al. (2010) used a *faux pas* task alongside a self-report empathy and MSI ability rating questionnaire (IRI: Interpersonal reactive index Davis, 1983). However, this review excludes IRI data due to a lack of validity and reliability information with the BPD population. Turning to the *faux pas* data, no main effect for group was found in an analysis of variance. However, post-hoc *t*-tests revealed that the BPD group were less accurate at detecting and explaining the likely cause of a *faux pas* compared to non-patients.

This class of studies used autism-research tasks and found no BPD group deficits in MSI. Cognitive, and controlled mentalization are two end points on the four mentalizing dimensions, and so one might expect to find evidence of the predicted deficits here. Again, there was no attachment arousal in these tasks and also mentalization-theory does not predict a stable, global mentalizing deficit.

Considering some of the methodological limitations, only Arntz et al. (2009) controlled for IQ, which was found to co-vary with MSI abilities. Future studies

would be well served exploring this correlation. Studies would also ideally attempt to introduce some interaction in the design. All these tasks rely on passive stimuli that may not be ecologically valid and do not allow stimulation of affect or attachment systems. Further, the integration of empathy cues during MSI may only be accurately assessed in live, interactive tasks (after Dinsdale & Crespi, 2012).

3.6. Economic game studies

These four studies attempt to behaviourally assess empathy and MSI by linking opponent representations with one's own goals and behaviour (Table 4). Half have been reviewed previously. All feature reciprocal interaction involving the movement of tokens in a number of rounds according to predetermined parameters.

Table 4: Economic game studies, by year of publication

Study N	Main task	Measures	Overall findings
King-Casas et al. (2008)* 55 BPD 55 NP Age, sex, verbal IQ & education matched	A ten round trust game with unseen patient trustees. Also used fMRI scanning during games.	Interpersonal Trust Scale (ITS)	Cooperation deteriorated in the BPD group, following a low payback from the trustee.
Unoka, et al (2009) 25 BPD 25 Major Depression and other PD 25 NP	A five rounds trust game with an unseen 'trustee' and no in-game feedback. Five rounds of a 'risk game': sending tokens to a 'lottery' for random payouts. Participants unaware of performance so asked to predict outcomes for both games. Also rated comfort and excitement for each game.	ZAN-BPD SCL-90 Repeatable Brief Assessment of Neuropsychological Status (RBANS) SCID-I & II	Trust game: BPD made lowest offers, MDD group the highest. NP and MDD increased offers over five rounds. So, BPD relatively less trusting as trust game continued. Tokens offered predicted by ZAN-BPD 'impulsivity' and 'cognitive' subscales. Risk game: No group differences in offers. BPD group predicted worst outcome.
Franzen et al. (2011) 30 BPD 30 NP Age, sex and education matched	18 rounds of trust game against four different 'trustees' being able to see their faces. Trustees varied in fairness of paybacks and neutral or variable affect displays. Also fairness for both self and trustee rated. Emotional recognition test.	SCID I & II A German IQ task DIPS	BPD made lower offers with 'unfair' regardless of facial cues. Non-patient's offers were informed by facial affect displays, rather than objective fairness of opponent behaviour. No differences in assessment of trustee fairness. BPD group's self-rating of fairness was affected by trustees behaviour. Non-patients self-rating for fairness were stable. No affect labelling differences.
Wischniewski and Brüne (2012)* 30 BPD 30 NP Age, sex and IQ matched. BPD group fewer years education	Dictator game: Participants referee a two-player game. Participant was able to punish (for a cost) unfair play.	A German verbal IQ task	No differences in the punishment of players following unfair offers. No opportunistic behaviour, in fact willing to punish at their own loss.

* Studies not previously reviewed.

DIPS, Margraf, 1994; ITS, Rotter, 1967; RBANS, Randolph, Tierney, Mohr, & Chase, 1998; SCID I/II, First, Spitzer, Gibbon, Williams and Benjamin, 1997; SCL-90, Derogatis, 1977; ZAN-BPD, Zanarini, 2003.

The first two economic game studies reported deficits in cooperative behaviour, attributed to a insensitivity to social norms (King-Casas et al., 2008) and less optimistic expectations (Unoka et al., 2009). The third published study added opponent affect cues to the same economic game (Franzen et al., 2011). This modification resulted in the BPD group outperforming non-patients. The final study used a different game, to explore the hypothesis that BPD was associated with a lack of social norm sensitivity (Wischniewski & Brüne, 2012). This most recent study found no behavioural differences between BPD and non-patient groups.

King-Casas et al. (2008) introduced game-theoretic approaches to BPD research, using ‘the trustee game’ (Figure 3).

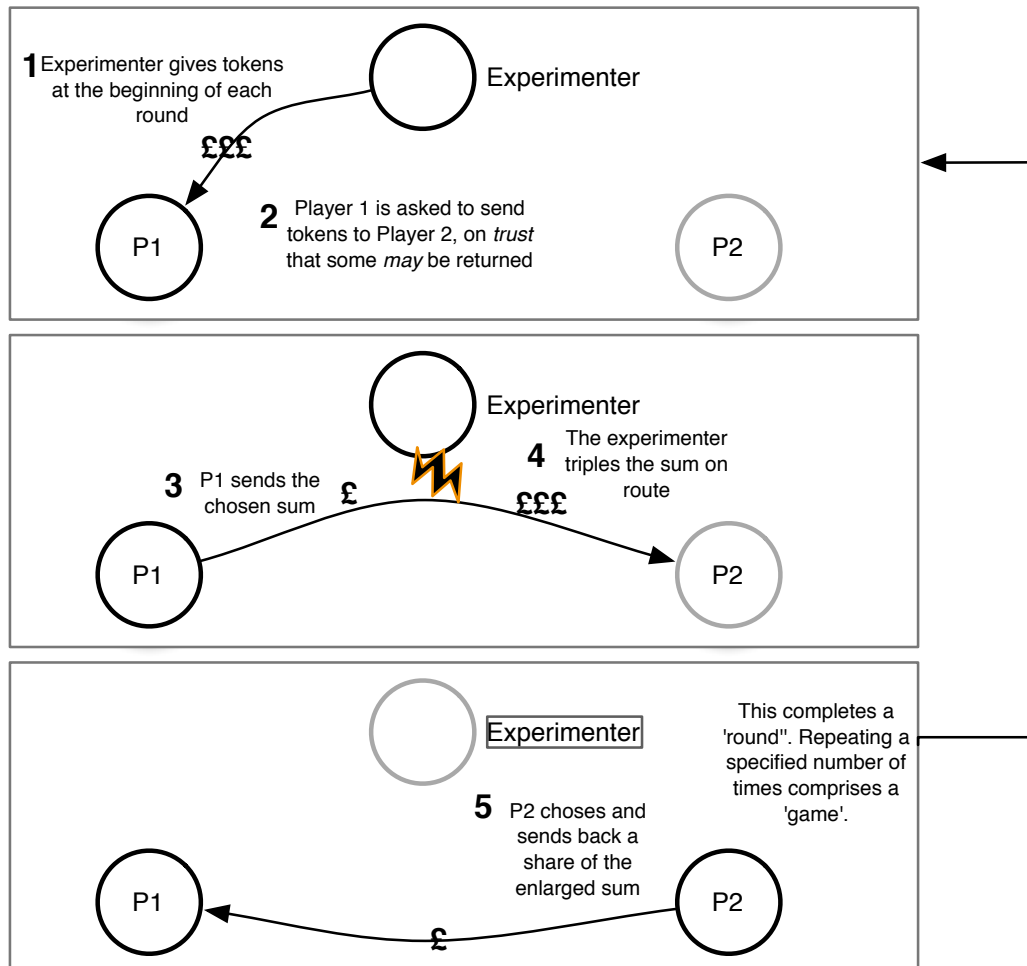


Figure 3: A diagram detailing the steps in a single round of the ‘Trustee game’

The only permitted communication is the token amounts sent between players. In any round of the Trustee game, a low pay back from Participant 2 (P2) causes Participant 1 (P1) a net loss. P1 may ‘retaliate’ in subsequent rounds, sending fewer tokens to the P2. Obviously, the highest overall payoffs are achieved through sustained cooperation. When cooperation breaks down – usually caused by the other player ‘freeloading’- attempts can be made to repair the relationship by sending more tokens (i.e. ‘coaxing’).

King-Casas et al. (2008) compared dyads with BPD participants as trustees, with a wholly non-patient group. They reported “a profound incapacity to maintain cooperation [in BPD] ... norms used in perception of social gestures are pathologically disturbed or missing altogether among individuals with BPD” (p.806). This conclusion was based on data that showed the BPD group was less willing to ‘coax’ cooperation following a small P1 transfer. However, both patient and non-patient trustees transferred fewer tokens as games progressed. The game’s format may inherently lead players to infrequently freeload, which inevitably undermines cooperation.

It is also interesting that the BPD group’s unwillingness to ‘coax’ after freeloading is framed as pathological. It could be argued that the rupture is caused by norm violation (i.e. freeloading) on the part of the non-patient P1, which is then met by a retaliatory response, albeit a rigid one.

Unoka et al. (2009) altered this game in several ways. Participants were always P1 and, radically, no trustee feedback was provided during play. After five rounds participants predicted their final payout. The BPD group made the lowest transfers to the trustee, compared to both non-patient and major depressive disorder group. ‘Interpersonal’ and ‘cognitive’ subscales on a BPD symptom severity scale (ZAN-BPD: Zanarini, 2003) negatively predicted token transfers. Playing this game ‘blind’ with no P2 information begs the question: how interactive was this task? Without such feedback, this became a solo endeavour with little scope for learning or true cooperation.

Participants also played a ‘Risk’ game. They chose how many tokens to risk in numerous rounds of lottery. It was predicted that BPD impulsivity might lead to elevated gambling behaviour. However, no group differences were found in the ‘Risk

game'. Critically, it is not clear whether participants believed they were interacting with other humans in either sub-game.

Franzen et al. (2011) sought to address this last concern and integrate affect labelling skills by presenting facial images of the four 'trustees'. Trustees were actually pre-programmed algorithms, which varied on two dimensions: fairness and use of affective facial signals. Fair trustees returned over one third of the available tokens to P1, whilst unfair trustees returned less than one third. To explore the role of facial affect cues, photo-images of affect were presented in game. These cues were either consistently neutral, or modulated to signal cooperation in that round (i.e. happy faces pay back more). Unlike non-patients, the BPD group made offers closely calibrated to the trustee's fairness, whereas non-patients were influenced by 'false' facial cues, making overly generous offers to 'happy' and 'unfair' trustees. This suggests sophisticated cue integration and well-calibrated responding in the BPD group. Participants were also asked to rate self- and opponent-fairness after each round. In BPD only, self-fairness ratings were determined by trustee behaviour, rather than participant's behaviour. This may be indicative of differences in self-other mentalizing as predicted by MBT.

In the final study, Wischniewski and Brüne (2012) assessed the claim that BPD groups were unable to detect norm violations. Participants watched repeated rounds of the 'dictator game' between two players. The dictator game is a two-player game where P1 sends a sum of tokens to P2 from a provision in each round. P2 cannot refuse or negotiate (i.e. they are 'dictated' to). Participants, as onlookers, were able to punish P1 for unfair sharing, though this cost participants tokens. When participants chose to punish, P1's tokens were redistributed to P2. P1's behaviour

varied in fairness over a number of trials. The researchers chose this game as it focuses on perception of unfairness and altruistic attitudes.

In this study there were no differences in punishment behaviour between groups, though different motivations were suggested, namely, 'angry retaliation' rather than altruism in BPD. Motivation aside, there were clear signs of cue integration, appropriate responding and norm enforcement in the BPD group, so challenging the claims made by King-Casas et al. (2008).

This is the newest class of studies and further refinements would be useful. There are few studies, each of which uses different methods. Studies have so far failed to consistently control for demographic and medication differences, which appear relevant in most other study categories.

4. Discussion

Findings from these 18 relevant studies, comparing behavioural data since 2006, suggest that certainty over BPD and non-patient global differences in empathy and MSI is untenable. Figure 4 charts the main findings from the current review.

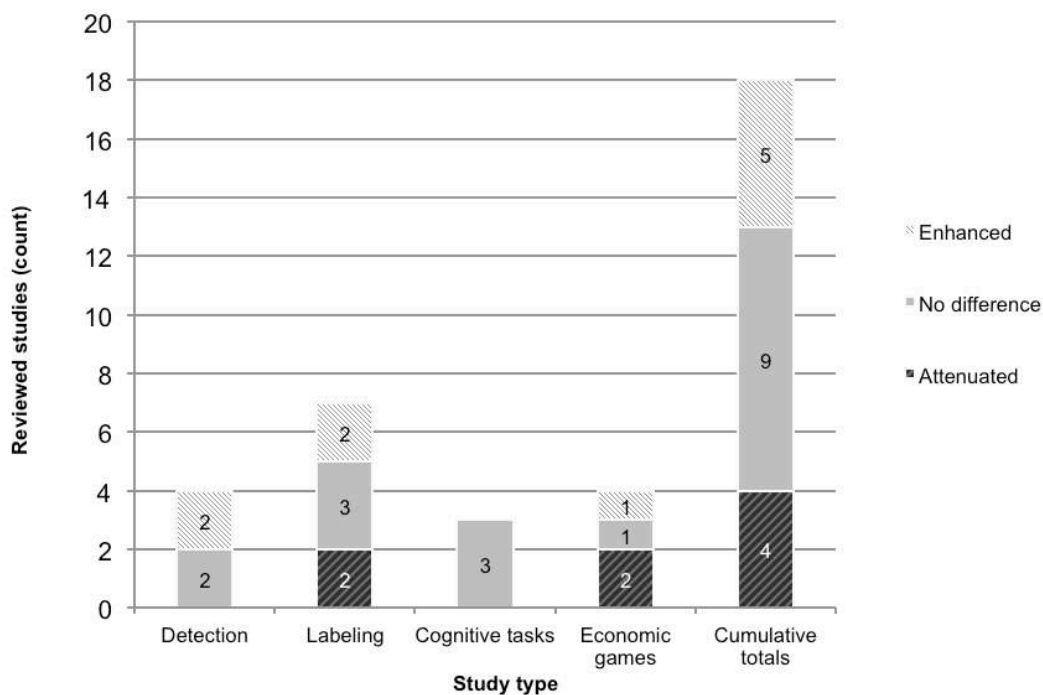


Figure 4: Counts of overall findings, by study type, since 2006

This variance is likely related to methodological inconsistency, personal instability in the sample population and diagnostic-category variance (DSM-IV-TR's BPD algorithm combines '256' symptom combinations into one category). Another DSM related concern is that although trauma frequently co-occurs with BPD (Minzenberg et al., 2006a) and impacts on affect-labelling skills (Dyck et al., 2009; Preißler et al., 2010), the DSM-IV-TR does not sub-divide BPD into classic, complex and non-traumatic forms. This appears to undermine the validity of the category and subsequent research.

A core theoretical assumption of MBT is that when an individual becomes emotionally aroused, one moves from controlled/cognitive to affective/automatic mentalizing processes (Bateman & Fonagy, 2011, p.45). To meaningfully test MBT's 'switch point' account, these factors should be experimentally manipulated, or at least statistically controlled for in further research. Intelligence, motivation, prior beliefs and current, non-task related affective and cognitive load are also possible influencing variables that could be usefully explored in relation to empathy and MSI in BPD. Future research is needed to empirically verify the patterns of theoretically predicted mentalization ability in BPD participants. Based on current research methods, it appears unreasonable to definitively conclude as to the nature of empathy and MSI skills in BPD populations.

4.1. Methodological issues

Many studies had a relatively small sample size, (i.e. median 26.5 BPD participants) and diverse methods make meta-analysis difficult. Many people with a BPD diagnosis are prescribed some form of psychiatric medication that may cause cognitive slowing. When examining basic perceptual processes with response time measurements, it may be beneficial to partial-out, or simply exclude those taking cognitive-slowing medication. The same argument regarding medication might also apply to complex, higher-order mentalizing tasks that rely on cue integration (Minzenberg et al., 2006b).

Only two studies (Arntz et al., 2009; Unoka et al., 2009) compared BPD with non-BPD 'complex need' (i.e. personality disordered) groups. These findings showed interesting differences, within and between those with complex needs, though few studies included a second comparison group.

It is also important to consider whether one can plausibly assert that any experimental tasks validly assess highly contextual and dynamic social cognition. Can this complex dyadic process be reduced to an experimental paradigm? Whilst experimental methods are controllable and replicable in principal, those reviewed lacked face-to-face human interaction. Some researchers have found that social cognition skills are not activated unless we believe we are interacting with another human (Braynov, 2013).

Finally, none of these tasks have found ways of convincingly measuring self-mentalizing skills. Affect detection, labelling studies and MSI tasks assess other-focused mentalizing skills. Economic games perhaps require the greatest incorporation of self-focused mentalizing, for example when choosing a strategy and responding to another in a multi-round game. In responding, behaviour can be taken as a proxy for the internal state. These games offer the greatest potential utility to this area of research.

4.2. Synthesis

The information from this review has been synthesised into a tentative model of mentalizing processes and contributing factors (Figure 5).

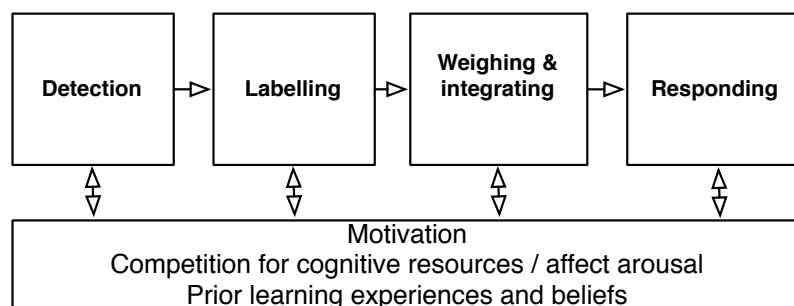


Figure 5: A proposed model of empathy and MSI processes, with possible influencing factors

The social cognition modules above, map onto the skills described in each of the review's four sub-sections. Other possible modules may be added to this provisional map. Plausible influencing factors (i.e. motivation, affect level, other cognitive demands and prior learning experiences) are shown below the four modules and are expected to modulate performance in each of the four stages of empathy and MSI. In addition there may be specific social cognitive biases – not here shown – that interact with mentalization. Finding and charting such biases onto this conceptual, model would improve its explanatory power, as would empirical testing. This model is proposed to help coordinate future empathy and MSI testing around BPD.

4.3. Future research

The following proposals attempt to address the issues raised in this review.

Of primary importance are attempts to modulate arousal of the attachment system, as this is central to MBT's understanding of mentalizing deficits in BPD. Methods have been used in adjacent BPD studies which offer suggestions as to how to ethically stimulate attachment arousal and would supplement more established paradigms (Gratz, Dixon-Gordon, Breetz, & Tull, 2013; Sieswerda, Arntz, Mertens, & Vertommen, 2007).

Another related adjunct would be use of basic cognitive-loading manipulations (i.e. digit-span or reverse digit-span recall) whilst engaging in mentalizing tasks. This might illuminate differences in higher-order social cognition integration in BPD.

As economic games offer the closest available fit with self-mentalizing skills, they should be used to readdress the over-representation of other-mentalizing tasks. Independent replication would be useful in this nascent arena. This might ideally combine new methods alongside a replication element to allow comparison (i.e. convergent validity) and innovation (Cumming, 2014).

Specific outlines for future studies might include a combination of an economic game before, and after, an intervention designed to arouse the attachment system. This design could also include an affect detection, or labelling task, pre and post intervention. Other possibilities to expand current knowledge would be a re-design of the 'Face in the Crowd' task (Hagenhoff et al., 2013) to include photo-images rather than crude line drawings.

Newer technologies might allow designs in this research area. For example, to better understand affect detection and labelling, eye-tracking equipment allows the measurement of gaze direction and time spent on specific areas of a face. This might supplement detection studies at the perceptual foundation level. Another new research tool are smartphone 'Apps' that can be used to improve diary studies. These technologies could provide tasks to participants throughout the day and collect arousal ratings. This design would allow greater understanding of inter-individual variability in mentalizing, whilst benefiting from the natural arousal present in every day life, outside of the laboratory.

4.4. Conclusion

Collecting empirical mentalizing data is complicated by at least four factors. First, definitions and conceptual boundaries are still being contended; these are the currency for competing therapeutic models legitimacy. Second there have been inconsistent research methods deployed and little independent study replication. Third, the BPD sample is characterised by instability, arguably creating more 'noisy' data. Finally, mentalizing is an indeterminate skill, the assessment of which is ecologically constrained. Despite these issues, the point of confluence between theory, research and clinical application frames an energetic debate on proposed mentalizing deficits. Taken together, there is fertile ground for further research,

offering great clinical utility and, of course, continued hope for those with complex needs.

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MAJOR RESEARCH PROJECT

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SECTION B

**Affect labelling and response strategy differences in Borderline
Personality Disorder: A quasi-experimental and economic game
approach.**

Journal of Personality Disorders - Official Journal of the International Society for the
Study of Personality Disorders

7,951 (520) words

Abstract

Empathy and mental state inference (MSI) are the mechanisms through which self and other representations are formed and revised. They also facilitate meaningful and attuned interaction. Mentalization-Based Therapy, amongst other models, claims that these skills are degraded in Borderline Personality Disorder (BPD). Yet support for this purported difference is equivocal and no previous studies have measured skills whilst arousing the attachment system, which is thought to impair empathy and MSI. Twenty-seven people meeting BPD criteria and a matched non-patient group had empathy assessed with the Reading the Mind in the Eyes Task and MSI assessed with a modified economic game. This was done before and after a novel attachment system intervention. Empathy skills were less accurate in the BPD group. There were no response time differences between groups. Post-intervention response times indicated a selective prioritisation effect, though only in non-patients. This is a possible adaptive bias for faster mentalizing and more careful processing of negative affect offset by less accurate positive affect labelling. No differences in economic game behaviour were found, though opponent fairness-ratings for a hostile opponent increased post-intervention in the BPD group only. The theoretical links and suggestions for clinical innovation and research development are provided.

Keywords: mentalization; empathy; borderline; unstable; economic game; affect labelling.

1. Introduction

The premise that disturbed self-other representations feature in Borderline Personality Disorder (BPD) is shared by several evidence-based clinical models. Cognitive Behavioural Therapy (CBT) and Schema-Therapy focus on negative beliefs about one's self and others (Arntz & Genderen, 2009; Davidson, 2007; Young, 1999). Transference-Based Therapy attributes a causal role in BPD to "limited capacity for a realistic evaluation of others" (Kernberg, 1984, p.14) and inconsistent self-image. Mentalization-Based Therapy (MBT: Bateman & Fonagy, 1999, 2004; Fonagy & Bateman, 2008) places self-other awareness at its therapeutic core. Social cognition skills are the common mechanism through which all of these representations are formed, and later updated. Empathy and mental state inference (MSI) are of principal interest.

Given the theoretical importance of differences in empathy and MSI for BPD, especially in MBT, one might expect irrefutable signs in these abilities between BPD and non-BPD groups in previous research. We will review existing research findings on reputed social cognition differences, before considering gaps in current knowledge and outlining the aims of this study.

Mentalizing encompasses empathy and MSI, yet it also crucially adds an additional self-focused dimension (i.e. aware of one's own thoughts and feelings). Of at least 28 published studies in this area (Dinsdale & Crespi, 2012), none comprehensively addressed self-mentalizing abilities. However, the economic game paradigm offers an interesting proxy from which to infer these both other and self-mentalizing skills. All economic games provide simple rules for interactions between two or more players. Player's aims are to accumulate tokens, with rewards typically linked to performance (Binmore, 2007).

Earlier game studies generally relied on the ‘Trustee game’ (Franzen et al., 2011; King-Casas et al., 2008; Unoka, Seres, Áspán, Bodi, & Keri, 2009) wherein Participant 1 (P1) shares a sum with Participant 2 (P2). The researcher triples this transfer before it reaches P2. P2 then chooses what percentage to return to P1. Both players can adopt cooperative and mutually beneficial strategies, or enter a freeloading-punishment cycle over the game’s numerous repeated rounds.

Two studies reported BPD difficulties in sustaining cooperation, due to a lack of norm-violation awareness (King-Casas et al., 2008) and low expectations (Unoka et al., 2009). However, Franzen et al. (2011) modified the game by including images of opponent facial affect. They found no differences in performance, contradicting earlier data. They also noticed that non-patients were biased toward costly cooperation with unfair opponents that displayed positive affect. The BPD group was more closely calibrated to opponent behaviour, ignoring misleading facial affect. Interestingly BPD self-fairness ratings were associated with opponent, rather than own, behaviour.

The fourth game study sought to test the earlier conclusion that BPD groups lacked social norm violation awareness. Wischniewski and Brüne (2012) asked participants to referee two other players. They found no differences in the BPD group’s use of punishment after observing unfair play.

We therefore see a range of conflicting findings in this area. Yet such studies offer useful behavioural data that allow inferences about self and other focused empathy and MSI. However, there are many more forms of economic game, each with unique characteristics. Also many of the BPD groups were not incentivised in the same ways as non-patients, a likely confounding motivational factor.

Affect labelling studies have been the most frequently used social cognition paradigm. These typically involve asking a participant to label affect presented in a facial photo-image. Nine studies, reported lower accuracy in BPD suggestive of a simple affective empathy deficit (Bland, Williams, Scharer, & Manning, 2004; Guitart-Masip et al., 2009; Levine, Marziali, & Hood, 1997; Minzenberg, Poole, & Vinogradov, 2006b; Preißler, Dziobek, Ritter, Heekeren, & Roepke, 2010; Unoka, Fogd, Füzy, & Csukly, 2011; Wagner & Linehan, 1999). However, more recent studies reported no differences between BPD and non-patient groups (Dyck et al., 2009; Fertuck, Grinband, & Stanley, 2013; Schilling et al., 2012). Or even enhanced accuracy in the BPD group (Fertuck et al., 2009; Frick et al., 2012) despite widely held assumptions about the existence of disturbed self-other representations.

None of the affect-labelling studies were basic independent replications. The most commonly used task was the Reading the Mind in the Eyes Task (RMET: Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). This is a collection of 36 eye-region photo-images showing different emotions and mental states and was first used by Fertuck et al. (2009) who reported enhanced BPD-group performance using the unmodified task. However, Preißler et al. (2010) used the same task and found no group differences. Schilling et al. (2012) also reported no group difference in accuracy, although the BPD group was more confident of their responses. Frick et al. (2012) constrained the duration of photo-image exposure and reported enhanced BPD accuracy. Clearly no consensus on BPD empathy skills has yet emerged.

Many studies and mentalization theory recommended stimulation of the attachment system during assessment of mentalizing abilities. We shall revise this theoretical impetus before considering methods to address this research gap.

Empathy and MSI are not thought to be globally impaired in BPD (Fonagy & Bateman, 2008). Rather they are thought to be fragile skills, attenuated by arousal of attachment system, according to the biobehavioural switch model (see Figure 1).

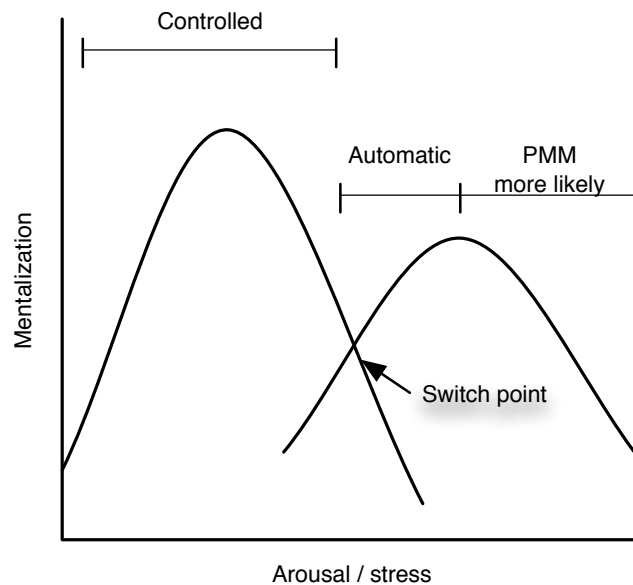


Figure 1: Mentalization's biobehavioural switch model

Note: Based on Bateman and Fonagy (2011, p45). PMM: Pre-Mentalizing Modes.

This model adds subtlety and complexity to predicted mentalizing difficulties in BPD. In summary, arousal and mentalizing ability are initially correlated. However, when an idiosyncratic arousal threshold is reached, ability decreases to a hypothetical 'switch' point. Then error-prone automatic mentalization or pre-mentalizing modes become prevalent. Errors and misunderstanding become more common, often resulting in relational and interpersonal distress and affective dysregulation.

No studies have deliberately aroused the attachment system to assess the veracity of the 'switch' model. Analogous interventions have been tried in adjacent clinical research. For example, Sieswerda, Arntz, Mertens and Vertommen (2007) used negative schema-related word lists (Young, 1999) in an affective-Stroop task

measuring schema-related interference. BPD participants responded slower than controls, when supraliminally exposed to negative schema-words. This suggests that a word-priming task may elicit behavioural changes in the BPD population. As the effect did not appear in non-schema related words, we may infer that the behavioural changes were due to arousal of the attachment system. Therefore these words were used in the present study with the aim of stimulating the attachment system in the context of a controlled experiment, otherwise lacking inter-personal dynamics. However, as such latent conceptual priming interventions function outside of conscious awareness, another task was needed to mask the actual intent of the intervention. A basic word-length comparison task was designed, using words taken from the Sieswerda and colleagues (2007) study.

1.1 Study aims

There are inconclusive findings about BPD participant's mentalizing skills and two salient gaps in our understanding. First, is the over-reliance on the Trustee game. This game is inherently geared toward cooperation breaking down due to higher payoffs for an occasionally freeloading P2; also it reveals little about what participants are inferring about their opponents. Second, the absence of attachment system arousal during more established empathy tasks means the 'switch' model has never been tested.

To address these limitations, the current study introduced an attachment system stimulation using a variant of the negative schema-word task (Sieswerda et al., 2007). Further, it used a novel economic game with an affect-labelling task amongst non-patient versus BPD groups, in a pre/post-intervention design. For consistency the RMET was used, with response times collected. In line with previous research, no

difference in RMET accuracy or speed was expected. Following mentalization theory decreased RMET scores were predicted in the BPD group post-intervention.

The ‘ultimatum game’ was the economic game selected. Guth, Schmittberger, and Schwarze's (1982) analysed all player interaction as uniquely anticipatory in the ultimatum game. The game therefore reveals a player’s inferences about their opponent. It is a two-player game where one player must choose between two non-negotiable outcomes (i.e. an ultimatum). The researcher allocates tokens to P1 in each round. P1 must suggest a share of that sum to P2. If P2 accepts the offer/ultimatum, both players receive their respective shares. If the P2 rejects P1’s offer, both players receive nothing (Binmore, 2007). The current study exploited the game’s usual low information state (i.e. nothing is known about one’s opponent) by providing RMET photo-images of ‘opponents’ in each round (similar to Franzen et al., 2011). The expectation was that such social-cue information might affect offers. A second modification was to ask for self-other fairness ratings after each round. Intentional deception was used to maintain the impression that real players were involved. After King-Casas et al. (2008) and Unoka et al. (2009) the BPD group was expected to be less successful in this one-shot game. After Franzen et al. (2011) self-fairness was expected to be biased by opponent behaviour. Specific hypotheses were thus:

- H₁ – Facial affect recognition accuracy (RMET) will be comparable between groups
- H₂ – Facial affect speed (RMET) will be comparable between groups
- H₃ – Facial affect performance (RMET) in the BPD group will reduce after intervention
- H₄ – Offers made in the economic games will vary by opponent-type

- H₅ – Self-fairness ratings during the economic game will be associated with opponent-type for the BPD-group only
- H₆ - BPD economic game performance will be impaired (fewer tokens) compared to non-patients.

2. Method section

2.1 Design

A quasi-experimental design was used. Statistical comparisons were planned both between and within groups. Figure 2 is an overview of the study tasks (also see Appendix C). Existing literature has sub-divided empathy tasks by target emotion affect-type. The current study adopted a three-level affect-type categorisation: negative, neutral and positive for all facial affect photo-images, in RMET and ultimatum games (See Materials for description).

Five 3x2x2 ANOVAs analyses were planned, each used group membership (two between-group levels: BPD or non-patient) and pre- or post word task intervention (two, within-groups levels) as predictors. The five ANOVA outcome variables were i) facial affect recognition accuracy (three levels of RMET stimuli: neutral, negative and positive affect) ii) facial affect recognition response times (RTs) (three levels of RMET stimuli, as previous) iii) offers made in economic games (three levels: blank, positive and negative opponent-type) and iv) self-fairness (three levels, as previous) and v) other fairness ratings (three levels: as previous). A *t*-test was planned for H₆.

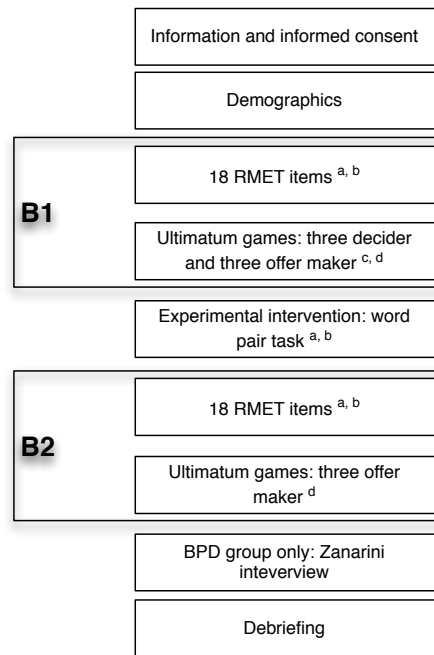


Figure 2: Overview of the study tasks

Note: RMET: Reading the Mind in the Eyes Task. ^a: accuracy, ^b: RT, ^c: offers accepted, ^d: offers made.

2.2 Participants

Table 1 provides information about both groups recruited for the study. The recruitment process is detailed in Section 3.1. The recruitment target was for an overall sample size of between 50 and 70 matched participants across both groups. This estimate was based on power calculations using G-Power software (Faul, Erdeleider, Buchner, & Lang, 2009). It is also in accord with existing studies (Section A) that reported significant effects with a mean BPD-group sample of 27 people.

Table 1: Sample demographic information, by group

Variable	Group 1 Non-patients	Group 2 BPD	Difference
<i>n</i>	27	27	
Sex	22 female (81%)	22 female (81%)	n.s. $\chi^2(1, N=54)=.75, p=0.45$
Mean age	35.4 <i>SD</i> 14.2	38.0 <i>SD</i> 10.9	n.s. $t(49.5)=.99, p=0.33$
Ethnicity			n.s. $\chi^2(6, N=54)=7.42, p=0.31$
White British	23 (85.2%)	21 (77.8%)	
White Irish	2 (7.4%)	1 (3.7%)	
Any other White background	2 (7.4%)	-	
Black or Black British Caribbean	-	2 (7.4%)	
White and Black Caribbean	-	1 (3.7%)	
Other	-	1 (3.7%)	
Highest education level			n.s. $\chi^2(6, N=54)=7.62, p=0.25$
Secondary school	2 (7.4%)	5 (18.5%)	
O levels/GCSEs	5 (18.5%)	7 (25.9%)	
A levels	2 (7.4%)	6 (22.2%)	
Technical or trade certificate	1 (3.7%)	-	
Diploma	3 (11.1%)	2 (7.4%)	
Degree	13 (48.1%)	7 (25.9%)	
Postgraduate degree	1 (3.7%)	-	
Psychiatric medication			
Mean medications per person***	0	2.2 <i>SD</i> 1.76	$\chi^2(6, N=54)=37.13, p<0.001$
Antidepressants	-	22 (81.5%)	
Benzodiazepines and hypnotics	-	8 (29.6%)	
Anxiolytics	-	4 (14.8%)	
Mood stabilizers	-	5 (18.5%)	
Analgesics	-	1 (3.7%)	
Major tranquillizers	-	14 (52%)	
Mean SAPAS score*	1.4 <i>SD</i> 0.75	5.6 <i>SD</i> 1.78	$t(52)=11.4, p<0.001$

Note: Frequencies are displayed, unless otherwise stated. ***= $p<0.001$

Patients and non-patients differed in their medication use and Standardised Assessment of Personality – Abbreviated Scale (SAPAS) scores. SAPAS is a non-diagnostic screening tool thought to indicate the likely presence of complex needs, based on eight yes/no questions. In all other respects the groups were matched. All BPD group members had been administered the SCID-II (First, Spitzer, Gibbon, Williams, & Benjamin, 1997) as part of their entry process into their treatment service. All met criteria for BPD and at least two other Axis-II diagnoses when joining the therapy service.

2.3 Materials

Since accurate and consistent RTs and online participation for non-participants were requirements of the design, a consultant programmed the following materials

using Flash and the Adobe Air¹ platform. There is growing support for online methods (Brand & Bradley, 2011; Keller, Gunasekharan, Mayo, & Corley, 2009). This platform allowed for comparable RTs and reliable material presentation regardless of the specification of the participant's computer. It also mitigated variance caused by slower data connections, as all information was automatically downloaded before the tasks initiated. The software was constrained to not operate on smartphones or tablets to ensure comparable data (see 7.4).

2.3.1 Demographics and screening

Questions relating to demographic information and mental and severe physical health were developed. The online version of the task would direct those with any health issues (past or present), or those for whom English was a second language, out of the study.

2.3.2 Standardised Assessment of Personality–Abbreviated Scale (SAPAS)

This measure was included to help screen out non-patient participants who may meet criteria, though had no formal BPD diagnosis. It is an eight item measure designed to indicate likely personality disorder (Moran, Leese, Lee, & Walters, 2003). All items are yes/no questions (e.g. “In general, do you trust other people?”). Scores were calculated to a maximum of eight. Scores over two are thought to predict complex needs in 90% of cases.

2.3.3 Reading the Mind in the Eyes

This study used the standard RMET (Baron-Cohen et al., 2001), whilst also collecting RTs. For consistency with previous research, the RMET items were categorised by affect-type. Three independent experts, blind to the nature of the research, categorised each item's correct answer into positive, neutral and negative

¹ <http://www.adobe.com/uk/products/air.html>

affect-types. There was good inter-rater agreement (intra-class correlation coefficient = .78, $p < 0.001$). The sex of the person in each photo-image was also coded.

The 36 photo-images were then allocated to two blocks (B1: prior to intervention and B2, post-intervention) ensuring equal distribution of affect-types and sex. The sequence of photo-image presentation was randomised within block. Figure 3 shows an example RMET screenshot.

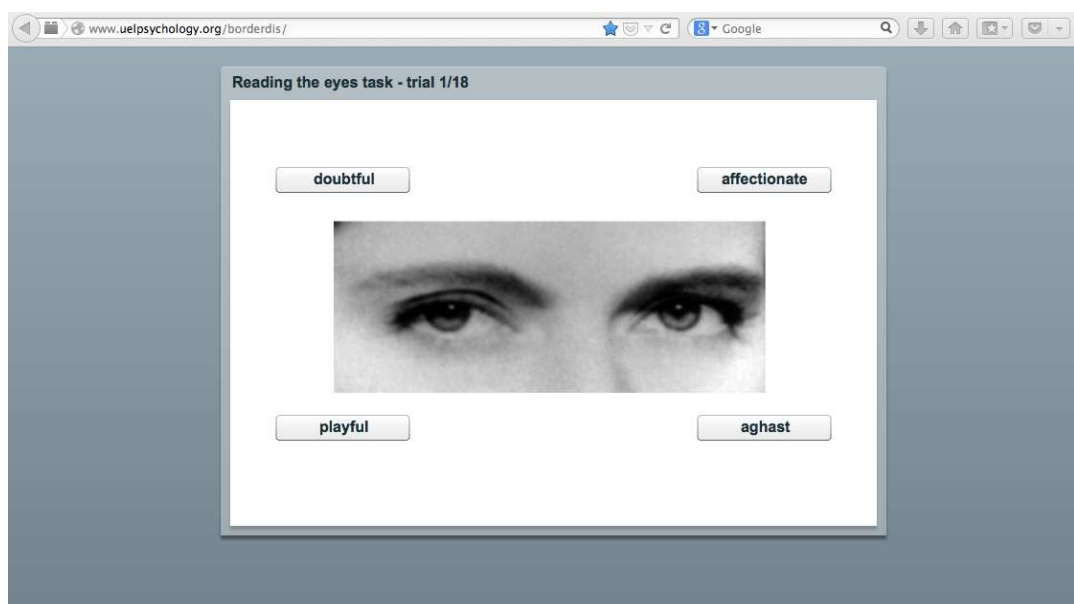


Figure 3: A screenshot of the RMET stimuli

Placing the cursor over any response word revealed a definition, taken from the RMET materials. Responses and RT (milliseconds) were collected. No in-task feedback was provided to participants.

2.3.4 *Ultimatum game*

In-game interaction consists simply of proposing a number of tokens to send ('offer maker' role), or accepting or rejecting offers received from opponents ('decider' role).

Participants always began playing three ‘decider’ games, to help familiarise them with the game. In these games three different, unseen opponents sent three offers: 50, 10 and 77 tokens that were either accepted or rejected. The sequence of these offers was randomised. Participant choices (i.e. accept or reject) were recorded.

To modify the ultimatum game to provide opponent cue information four RMET photo-images were chosen: Two positive and two presenting negative affect-types. The four images were embedded onto the offer-maker game screens. No photo-images were presented in two games to maintain the classic zero-information state (hereafter ‘blank opponent-type’). Participants were not explicitly instructed to link the image with their opponent. The six games were allocated to B1 and B2 ensuring equal opponent-type representation before and after the intervention. Opponent-type sequence was randomised within blocks.

When playing as ‘offer maker’ offers were recorded (i.e. number of tokens shared out of 100) and whether the ‘opponent’ accepted the offer (i.e. a cumulative token count). Figure 4 shows an ‘offer maker’ game trial screen.

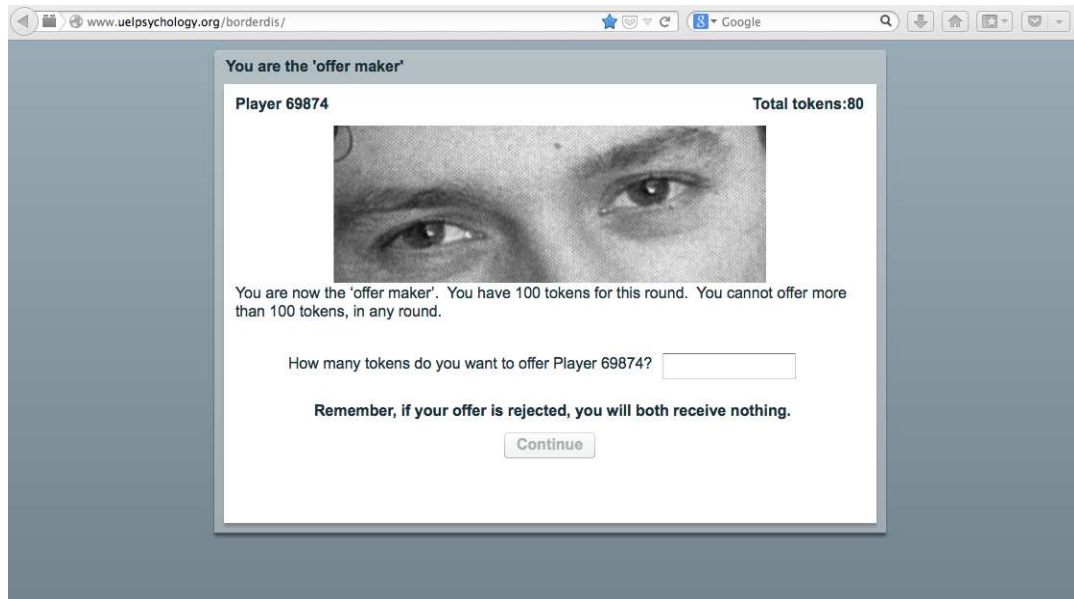


Figure 4: A screenshot of an ‘offer maker’ game against a ‘positive’ opponent.

After each ‘offer maker’ game, participants rated their own and their opponent’s behaviour using a five-point scale (1= very unfair to 5=very fair).

The design encouraged participants to believe they were competing with real opponents, though they were not. Based on game theory research (Camerer, 2003) all offers were accepted by the opponent, unless they were below 20 tokens. When offers were made below 20 tokens, offers were rejected half the time. This rule was operationalized using an algorithm and feedback provided after each offer. Artificial delays were introduced between interactions, to reinforce the impression that real players were responding. A tally of ‘Total tokens’ was shown in the top corner of game screens. In summary, opponent information was added to ultimatum games in a novel manipulation.

2.3.5 *Word task intervention*

The second design aim was an intervention designed to elicit attachment system arousal after B1 economic games and RMETs. A word-length comparison

task was developed to tacitly evoke arousal. Participants were asked to rapidly choose the shortest word from 12 presented word pairs. What was not disclosed was that nine of the words were taken from Sieswerda, Arntz, Mertens, and Vertommen, (2007) and known to evince differential reaction responses in those meeting criteria for BPD compared to non-patients. Three of the word pairs were non-schema related to avoid revealing the latent purpose of the intervention.

Intentional deception was required for these priming-type effects (common in the cognitive research on emotion-perception links, see for example Förster, 2009 p.103). See ‘Appendix E – Intervention word pair selection process’ for more detail on how this task was developed. Figure 2 shows the final design of this task.

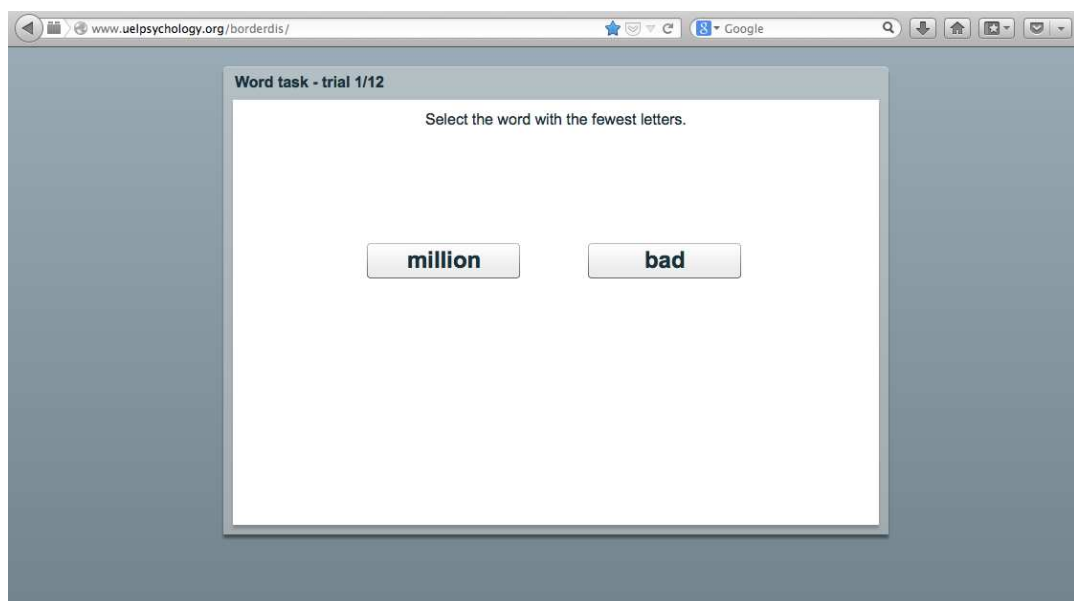


Figure 5: A screenshot of the word task

These items were presented in random order with response and RTs collected.

2.3.6 ZAN-BPD

The Zanarini BPD Severity Scale (ZAN-BPD: Zanarini, 2003) is a semi-structured clinical interview comprising nine questions that map onto the DSM-IV-

TR's four BPD components: affective instability, cognitive and relationship instability and impulsive behaviours. For each item a score between zero (no signs of problem) and four (severe disturbance or distress) is awarded. The highest score is 36, representing the greatest severity. Interviews sampled the two weeks preceding study participation. Total and sub-domain scores were collected (i.e. impulsivity, cognitive, affective and relational).

2.4 Procedure

A service user consultation was undertaken on the matter of incentives, required in economic game research to motivate players. The consultation suggested a mixed incentive structure to encourage participation (e.g. one random prize and two prizes for the most and second most tokens in the ultimatum game). The consultation advised offering shopping vouchers in £15, £25 and £10 amounts respectively.

The online version was posted on a psychology research website² for non-patient recruitment. The research was also introduced at several community meetings in the day therapy service from which the study recruited participants for the BPD group. The researcher then approached service-users directly to invite participation. Testing typically took place during appropriate slots in the therapy programme or on days participants were not attending therapy. All data collection ended in March 2014.

Only the BPD group was administered the ZAN-BPD. Discussion of BPD symptoms (e.g. deliberate self-harm, or interpersonal abandonment) can cause distress for some. Therefore, the ZAN-BPD was administered after the experimental tasks. Arrangements were made with the service to support anyone who became distressed

² Psychological Research on the net <http://psych.hanover.edu/research/exponnet.html> directing to <http://www.uelpsychology.org/borderdis>

during participation. For consistency the principal investigator who was trained in its use administered all ZAN-BPD.

2.5 Ethics

All participants gave written consent after reading the Study information leaflet (Section C and Appendix D) or the electronic equivalent for non-patients. All understood their right to withdraw without penalty. For further consideration of ethical issues see Appendix F, including the use of two intentional deceptions (intended purpose of word task and impression that real ultimatum game opponents) and the use of incentives. The research was approved by Canterbury Christ Church University, the Integrated Research Application System (IRAS) panel for London and the Southeast and relevant NHS Trust's R&D departments.

3. Results

3.1 Recruitment process

One-hundred-and-forty non-patient participants were recruited online. Of these, 75 (54%) were excluded due to reported current or previous mental, or severe physical, health issues. Those with English as a second language were also screened out to avoid anomalous response times caused by translation delays. Twenty-five (18%) non-patients were also removed, due to SAPAS scores of three or more. SPSS was used to randomly select 27 cases for comparison with the BPD group.

Twenty-seven people from a day treatment programme specifically for people with a diagnosis of Borderline Personality Disorder were recruited for the BPD group. At the end of data collection, service users were thanked for their cooperation and a feedback session planned. The researcher reported back, as required, to the approving ethics panel and R&D departments (see Section C).

3.2 Descriptive statistics

3.2.1 *RMET accuracy*

Each item response was coded '1' for a correct answer, up to a maximum of 36. As there were unequal numbers of positive and negative affect-type items in each block (i.e. B1: four positive and five negative items. B2: five positive and four negative), an affect-type average was calculated to allow overall comparison (Table 2). Scores were normally distributed.

Table 2: Mean accuracy for RMET, by group

Variable	Group 1 Non-patients	Group 2 BPD	Difference
<i>n</i>	27	27	
Overall RMET score***	28.52 (71%) ±3.72	23.85 (66%) ±4.41	$t(52)= 4.2, p<0.001$
Block 1 RMET score***	14.04 (78%) ±2.26	11.3 (63%) ±2.5	$t(52)= 4.2, p<0.001$
Negative affect-type ^{a*}	0.77 ±0.2	0.60 ±0.25	$t(52)= 2.7, p=0.009$
Neutral affect-type ^{a**}	0.75 ±0.19	0.60 ±0.16	$t(52)= 3.3, p=0.002$
Positive affect-type ^{a*}	0.85 ±0.23	0.73 ±0.2	$t(52)= 2.01, p=0.05$
Block 2 RMET score**	14.48 (80%) ±2.03	12.6 (70%) ±2.52	$t(52)= 3.1, p=0.003$
Negative affect-type ^{a*}	0.81 ±0.2	0.66 ±0.2	$t(52)= 2.5, p<0.013$
Neutral affect-type ^{a**}	0.85 ±0.14	0.69 ±0.19	$t(52)= 3.6, p<0.001$
Positive affect-type ^a	0.72 ±0.025	0.75 ±0.2	<i>ns</i>
All negative affect images ^{a***}	0.79 ±0.15	0.63 ±0.2	$t(52)= 3.4, p=0.001$
All neutral affect images ^{a***}	0.8 ±0.14	0.64 ±0.15	$t(52)= 4.2, p<0.001$
All positive affect images ^a	0.79 ±0.19	0.74 ±0.14	$t(52)= 1, p=0.3$

Notes: ^a= average affect-type item accuracy. RMET: Reading the Mind in the Eyes task. *: $p<0.05$. **: $p<0.005$. ***: $p<0.001$.

The non-patient group significantly outperformed the BPD group in all *t*-tests, with accuracy for positive affect-type the exception, for which there was no group difference. Paired *t*-test comparisons suggest that non-patients' overall scores were not different between blocks. Yet the BPD group's accuracy increased ($t(26)=-2.61, p=0.02$). This may indicate a BPD social cue learning effect, as suggested in Domes et al. (2008). Though no in-task feedback was provided to assist learning and it is unusual for a practice effect to only affect one group.

3.2.2 RMET response times

Response times were collected for each item by the software environment. RTs for incorrect RMET responding were excluded. Mean RTs were calculated for B1 and B2 and for affect-type (Table 3). To facilitate comparison, raw times were converted using the $1/x$ reciprocal function (Whelan, 2008), resulting in normally distributed data.

Table 3: RMET average item response times in seconds, by group

Variable	Group 1 Non-patients n=27	Group 2 BPD n=27	Difference
RMET overall	7.20 ±2.8	6.34 ±2.6	
RMET Block 1	8.23 ±4.1	6.9 ±2.6	
Negative affect-type	8.62 ±6.7	6.9 ±2.6	
Neutral affect-type	8.11 ±3.7	6.9 ±3.1	
Positive affect-type	8.54 ±3.9	7.1 ±4.6	
RMET Block 2	6.25 ±1.9	5.7 ±2.7	
Negative affect-type*	7.68 ±3.2	5.8 ±2.9	$t(52)=-2.45, p=0.018$
Neutral affect-type	5.88 ±2.1	5.59 ±2.3	
Positive affect-type	5.88 ±1.9	6.03 ±5.15	

Note: *: $p<0.05$. Means based on raw data, difference calculated with transformed data.

There were no overall or block-level differences between the two groups. Although the BPD group means suggest quicker response times, these were only significant when labelling negative affect-type in B2 (i.e. post-intervention).

Paired t -tests showed that non-patients became quicker in B2, both overall, ($t(26)=-4.55, p<0.001$) and when labelling neutral ($t(26)=-6.68, p<0.001$) and positive affect ($t(26)=-4.42, p<0.001$). Non-patient RTs for negative affect-type in B1 and B2 were comparable.

The BPD group's speed increased when labelling all affect types in Block 2 (paired t -tests $p\leq 0.001$).

3.2.3 *Ultimatum game - offers made and accepted*

Ultimatum games generated three forms of behavioural data (

Table 4). First mean offers were calculated (1 - 100 tokens) for each of the three opponent types: blank, positive and negative affect-type. B1 and B2 data were combined as averages in

Table 4. Offers below 50 represent less generous and so more risky tactics. A participant's acceptance or rejection of offers received was recorded, when playing as the 'decider'. Finally, the total number of tokens accumulated in all nine games (i.e. three as decider, six as offer maker) was recorded.

Table 4: Mean offers made and received, by opponent-type and group.

Variable	Group 1 Non-patients	Group 2 BPD	Difference
Overall mean offers made	44.89 ±16.00	45.97 ±13.11	
Mean offer to 'blank' opponent	44.78 ±15.6	47.67 ±14.2	
Mean offer to 'positive' opponent	47.1 ±16.4	45.8 ±16.3	
Mean offer to 'negative' opponent	42.7 ±18.9	44.4 14.8	
Accepted offer 1 – 50 tokens	26 (96%)	25 (93%)	
Accepted offer 2 – 10 tokens	3 (11%)	5 (19%)	
Accepted offer 3 – 77 tokens	24 (89%)	23 (85%)	

The non-patient group made smaller offers to all opponent-types, compared to the BPD group, except for the positive-type opponent to whom they made a larger relative offer. These between-group differences were not significant. Offers converge with game theoretic predictions (Camerer, 2003). Both groups' lower acceptance rate of the 77 token offer, compared to the 50 token offer appears noteworthy, yet is non-significant (Wilcoxon signed ranks $p>0.14$).

There were also no group differences in total tokens earned. Non-patients averaged 385 tokens (± 101) and the BPD group averaged 394 tokens (± 77) ($p=0.7$). At the simplest level of analysis the ultimatum game does not appear to have evinced any behavioural differences between groups.

These data do not therefore support H_6 . Specifically, that BPD performance in economic games would be impaired relative to non-patients.

3.2.4 *Self and other fairness*

Means of participant's rated self and opponent's fairness are provided in Table 5.

Table 5: Ultimatum game self and other fairness ratings

Variable	Group 1 Non-patients	Group 2 BPD	Difference
<i>N</i>	27	27	
Overall self fairness rating	3.96 ±0.82	3.93 ±0.84	
Mean self rating – blank	3.98 ±0.85	4.02 ±0.86	
Mean self rating – negative	4.04 ±0.93	4.0 ±1.02	
Mean self rating – positive	3.85 ±1.1	3.78 ±0.87	
Overall other fairness rating	4.14 ±0.66	4.2 ±0.79	
Mean other rating – blank	4.1 ±0.82	4.03 ±0.91	
Mean other rating – negative	4.06 ±0.85	4.43 ±0.86	
Mean other rating – positive	4.3 ±0.71	4.15 ±0.96	

These data reveal no significant group differences, with participants from both groups typically reporting both their own, and their opponent’s behaviour to be ‘fair’.

3.2.5 *Word task intervention*

Correctly selecting the shortest word in each pair was scored ‘1’, up to a maximum of 12. Response times for each word pair were collected and means were calculated (Table 6).

Table 6: Word task intervention mean accuracy and item response times

Variable	Group 1 Non-patients	Group 2 BPD	Difference
Overall accuracy	10.7 ±1.2	10.9 ±0.2	
Mean item response times (seconds)	2.09 ±0.62	2.3 ±0.74	

Note: Comparisons used 1/x transformed data.

The aim of this intervention was to elicit activation of the attachment system, without revealing this intention to participants. Therefore these data suggesting a ceiling-level of accuracy are not necessarily a concern. There were no significant group differences for accuracy, or mean item RTs. Average response times for this intervention and the RMET were correlated at trend level ($r(54) = .25$, $p = 0.059$).

3.2.6 ZAN-BPD data

After completing the experimental tasks the BPD group was administered the ZAN-BPD. Table 7 provides these data, based on reported behaviour over the two weeks preceding study participation.

Table 7: BPD group's ZAN-BPD descriptive statistics

Variable	Mean	Range	Clinical cutoff
<i>n</i> =27			
Total	17.56 ±7.67	2 - 28	14.3 ±6.8
Affect	6.48 ±2.56	1 - 10	5.9 ±2.9
Cognitive	4.7 ±2.51	0 - 8	3.5 ±2.4
Impulsivity	3.85 ±2.63	0 - 8	1.7 ±1.4
Relationships	2.85 ±1.78	0 - 6	3.2 ±2.0

Based on the instrument norms, the sample fell within the expected range for BPD. An examination of associations revealed some interesting correlations with the affective instability sub-scale. Affective instability was significantly positively correlated with mean offers made to all opponent-types in the ultimatum game ($r(27)=.45, p=0.019$). This implied those with higher levels of affective instability in the two weeks prior to testing tended to be more generous in their offers.

3.3 Inferential hypothesis testing

As H_6 was rejected in section 3.2.3, the remaining five hypotheses were tested using inferential methods. These relied on multiple 3x2x2 split-plot ANOVAs.

3.3.1 H_1 – Facial affect recognition accuracy (RMET) will be comparable between groups

The first ANOVA examined differences in RMET accuracy. Group membership (two between-group levels: BPD or non-patient) and intervention (two within-group levels: B1 or B2 accuracy) were predictor variables. The outcome variable was RMET item accuracy (three within-group levels: neutral, negative and positive affect-type).

RMET accuracy data were normally distributed (Shapiro-Wilk $p > 0.19$) and of equal variance (Levene's $F(1,52)=2.67, ns$). These data met the required assumptions, with Greenhouse-Geisser adjustments to compensate for violated sphericity. As indicated in Table 2, there were significant group differences in accuracy ($F(1, 52)=15.47, p < 0.001, \eta^2=0.23$). Non-patients had an overall accuracy of 79% (95% CI: 75% - 84%) versus the BPD group's 67% (CI: 63% - 71%).

There were no significant differences in accuracy by affect-type (i.e. negative, neutral and positive emotions). This may suggest all affect-types were of equal difficulty. The intervention did not have a significant main effect on accuracy ($p=0.13$), which again suggests that B1 and B2 items were of comparable difficulty. Intervention x Affect-type was the only significant interaction ($F(2,104)=4.85, p=0.01, \eta^2=0.09$); depicted in Figure 6, though an Affect-type x Group interaction approached significance ($F(2,104)=2.99, p=0.056, \eta^2=0.05$).

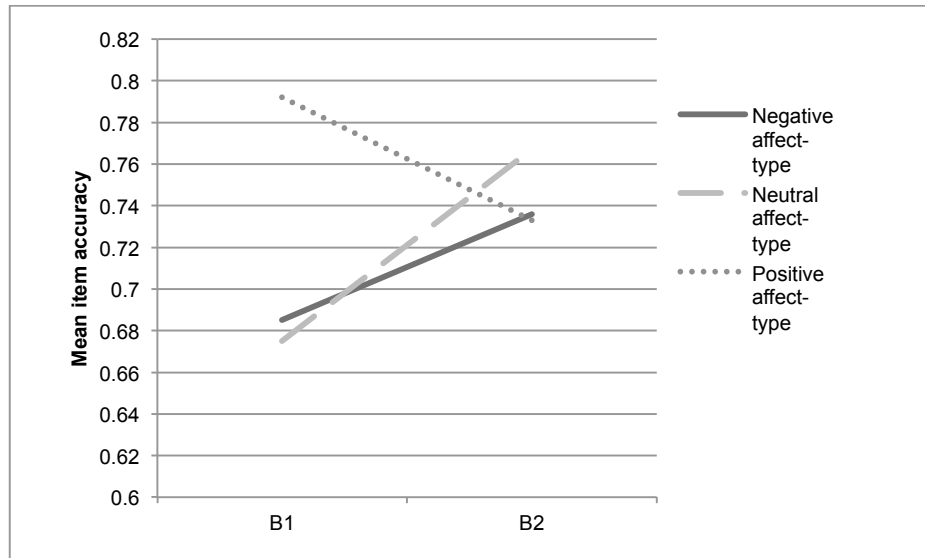


Figure 6: RMET accuracy Intervention x Affect-type interaction

Figure 6 suggests that overall accuracy broadly converged in B2 for all three affect-types. The labelling of positive affect-type was most accurate prior to the intervention ($m=0.79 \pm 0.03$, 95% *CI*: 0.73 – 0.85), compared to all other analysed affect-type levels. Unlike neutral and negative affect-types, positive affect labelling became less accurate after the intervention ($m=0.73 \pm 0.03$, *CI*: 0.67 – 0.79). Across the sample both negative and neutral affect-type performance improved in B2 (i.e. from $m=0.69 \pm 0.03$, *CI*: 0.62 – 0.75 and $m=0.68 \pm 0.02$, *CI*: 0.63 – 0.72 to $m=0.74 \pm 0.03$, *CI*: 0.66 – 0.78 and $m=0.77 \pm 0.02$, *CI*: 0.72 – 0.81 respectively).

This interaction suggests the intervention had a differential effect on performance, moderated by affect-type (Baron & Kenny, 1986). Specifically, in B2, interpretation of ambiguous social signals (neutral affect-type) and social threat cues (negative affect-type) was enhanced, relative to labelling of non-threatening signals (positive affect-type) that were less reliably recognised, across the entire sample.

A significant Group-factor difference means H_1 must be rejected – that RMET accuracy will be comparable between groups. Rather, the BPD group appears to be

less accurate, compared to the non-patient group. The experimental intervention did appear to impact affect labelling accuracy, when moderated by affect-type.

3.3.2 H_2 – Facial affect speed (RMET) will be comparable between groups

An ANOVA similar to the previous 3x2x2 split-plot was used. However reciprocally transformed average item RTs were the outcome variable (three, within-group affect-type levels). The other two factors remained the same. The Greenhouse-Geisser adjustment was used.

As indicated in

Table 3, there were no significant group differences in response time ($p=0.12$) or accuracy for each affect-type ($p=0.24$) using ANOVA. Intervention was the only significant main effect ($F(1,52)=39.55, p=0.001 \eta^2=0.43$) across the entire sample. This supports the earlier reported paired t -test, suggesting that the sample became quicker in Block 2 (from $m=7.7$ seconds/item ± 0.5 , $CI: 6.7 - 8.7$ in Block 1 to $m=6.1$ seconds/item ± 0.4 , $CI: 5.4 - 6.9$ in Block 2).

There were significant interactions for Intervention x Affect-type ($F(2,104)=7.57, p=0.01 \eta^2=0.13$) and also Intervention x Affect-type x Group ($F(2,104)=3.74, p=0.03 \eta^2=0.07$). These interactions reveal that response times decreased at differential rates, based on both group membership and the RMET item affect-type. Figure 7 shows the more simple two-way interaction.

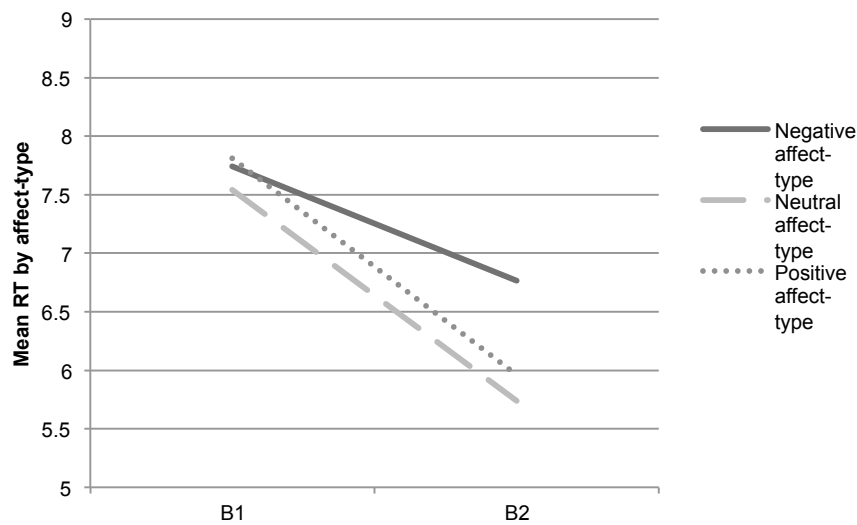


Figure 7: RMET response time Intervention x Affect-type interaction

The general sample-level pattern appears quicker RT in B2, yet negative affect-type RTs changing at a less dramatic rate. Earlier RMET accuracy data suggested that negative affect-type accuracy increased in B2, so it seems unlikely that the items were more difficult. By considering accuracy and RT data for negative affect-types together, it is argued that more attention, or deliberation, was allocated to negative affect-type images in B2, after arousal of the attachment system.

It appears that the sample on average i) sped up and ii) exhibited a tendency to deliberate on negative affect-types for relatively longer compared to other affect-types in B2. This may be emerging evidence of a *selective prioritisation effect*. Specifically, the tendency when under attachment system arousal to take less time assessing other's emotions - an attentional prioritisation of social cues. These data suggest that negative affect, a form of potentially hostile social cue, is allowed selectively allocated relatively more deliberation time. This behavioural bias to attend more carefully to negative affect-types when aroused may represent an adaptive

response to social cue information. Figure 8 shows the three-way interaction now including the Group level.

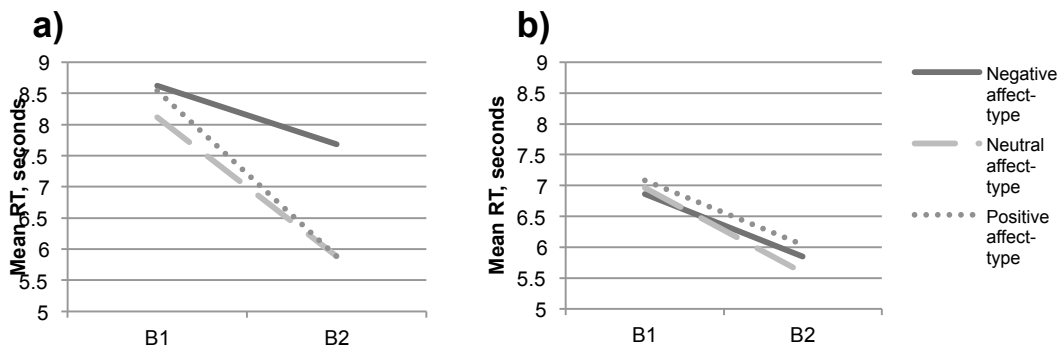


Figure 8: RMET response time Intervention x Affect-type x Group interaction

Note: a) non-patient group, b) BPD group. RT: Response time. NP: Non-patient group.

This figure suggests that the candidate selective prioritisation effect was not equally represent in BPD and non-patient groups. Rather, compared to the non-patients, the BPD group was marginally quicker in B1 (*ns*) and its RTs decreased at a uniform rate across all affect-types in B2 ($m=1.0 - 1.3$ seconds quicker per B2 item). Non-patients began at a marginally slower pace then reduced RTs dramatically in neutral ($m=2.3$ seconds quicker/B2 item) and positive affect-types ($m=2.7$ seconds quicker/B2 item). Non-patient's negative affect-type RTs did not change in B2 in a statistically significant manner ($p=0.42$). These data may also point to a general speed increase in B2, whilst also suggesting a selective prioritisation effect in non-patients only. That is to say that non-patients maintained a more cautious, deliberative strategy when labelling negative affect stimuli – compared to the BPD group and other affect-types. The cost of this strategy was non-patient's accuracy in labelling positive affect, which decreased in B2 (Table 2). In other words non-

patients deprioritised positive affect-types make less accurate, quicker inferences after the intervention.

These data lend qualified support for H₂. Although there were no group-level differences in response time, there were interactions related to group and affect-type. These may indicate two RT behavioural strategies when under attachment stress. In the BPD group a uniform acceleration for all affect-types. For non-patients, a selective prioritisation effect allocating more time to negative affect at the cost of accuracy in positive affect-types.

3.3.3 H₃ – Facial affect performance (RMET) in the BPD group will reduce after intervention

Performance is a trade-off between accuracy and speed. The Inverse Efficiency Score technique (IES: Townsend & Ashby, 1983) was used to calculate B1 and B2 performance (i.e. mean item response time, including errors / percentage accurate). Higher scores denote poorer performance (Table 8).

Table 8: Inverse Efficiency scores for both groups, pre- and post-intervention

Variable	Group 1 Non-patients	Group 2 BPD
Inverse Efficiency Score		
Block 1	10,948 ±6,602	11,733 ±5,919
Block 2	7,933 ±2,747	8,546 ±4,250

These data support the earlier findings that both group's performance improved in B2 and that the non-patient's performed better than the BPD group. A paired *t* test revealed that the BPD group's Block 2 performance was significantly better than Block 1 ($t(26)=4.26$, $p<0.001$). H₃ was therefore rejected - that the BPD group's post-intervention RMET performance would reduce due to a shift into pre-mentalizing modes.

3.3.4 H_4 – Offers made in the economic games will vary by opponent-type

Another split-plot 3x2x2 ANOVA was used, this time the outcome variable was the number of tokens offered (three within-group levels: blank, positive and negative opponent-type). The other two factors remained intervention and group. As indicated by the earlier t test, there were no group differences. There was also no main effect for intervention or opponent-type. The only significant interaction was Opponent-type x Intervention ($F(2,104)=381.7, p=0.039, \eta^2=0.03$), shown in Figure 9.

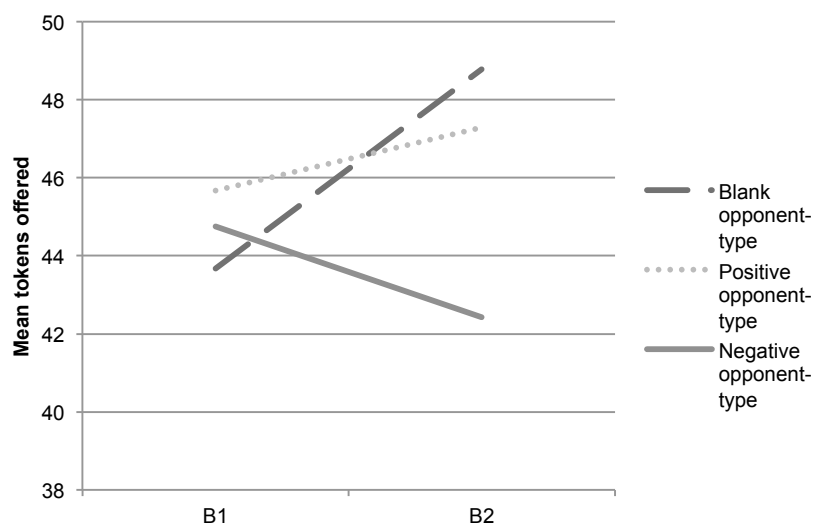


Figure 9: Tokens offered, Opponent-type x Intervention interaction

This depicts the tendency in the entire sample to make more generous offers after the intervention for blank (B1: $m=43.67 \pm 2.1$, 95% CI : 39.5 – 47.8, B2: $m=48.8 \pm 2.7$, CI : 43.3 – 52) and positive (B1: $m=45.6 \pm 2.1$, CI : 41.4 – 50, B2: $m=47.3 \pm 3$, CI : 41.4 – 53) opponent-types. However, the inverse pattern appeared for negative opponent-types, to whom smaller offers were made in B2 (B1: $m=44.8 \pm 2.5$, CI : 39.7 – 49.8, B2: $m=42.4 \pm 2.5$, CI : 37.4 – 47.5).

H_4 is partially supported. Whilst there was no main effect for opponent-type, this factor did interact with the intervention suggesting that behaviour was partly moderated by opponent-type cue information. It is not therefore clear how effective the opponent-type modification alone was in the current design. Further investigation is warranted to address this issue.

3.3.5 H_5 – Self-fairness ratings during the economic game will be associated with opponent-type for the BPD-group only

Two split-plot 3x2x2 ANOVAs were used with either the dependent variable of self-fairness or other-fairness ratings (three, within-group opponent-type levels). The other factors were unchanged from earlier tests. Using self fairness-ratings as the DV revealed no significant main effects or interactions. This rules out support for H_5 , which derived from Franzen et al. (2011).

However, the second ANOVA, included here to provide full coverage of the data, returned significant main effects for Intervention ($F(1, 52)=8.97, p<0.004, \eta^2=0.15$) using Greenhouse-Geisser adjustment. This shows that opponent-fairness ratings increased in B2 (from $m=4.04 \pm 0.11$ to $m=4.3 \pm 0.11$). However this change, whilst statistically significant is of limited practical significance due to the small variation in means (i.e. one quarter of a point on the five-point scale). Both Opponent-type ($p=0.14$) and Group ($p=0.8$) main effects were not significant.

Two interactions were significant. Those of Opponent-type x Group ($F(2, 104)=3.61, p<0.03, \eta^2=0.07$) (Figure 10) and Opponent-type x Intervention ($F(1, 104)=6.38, p<0.003, \eta^2=0.11$). Extensive coverage of these findings will not be given as these data all fall within a single fairness-rating point ($m= 4.0 - 4.4$) on a five-point scale and are therefore unlikely to be of practical significance.

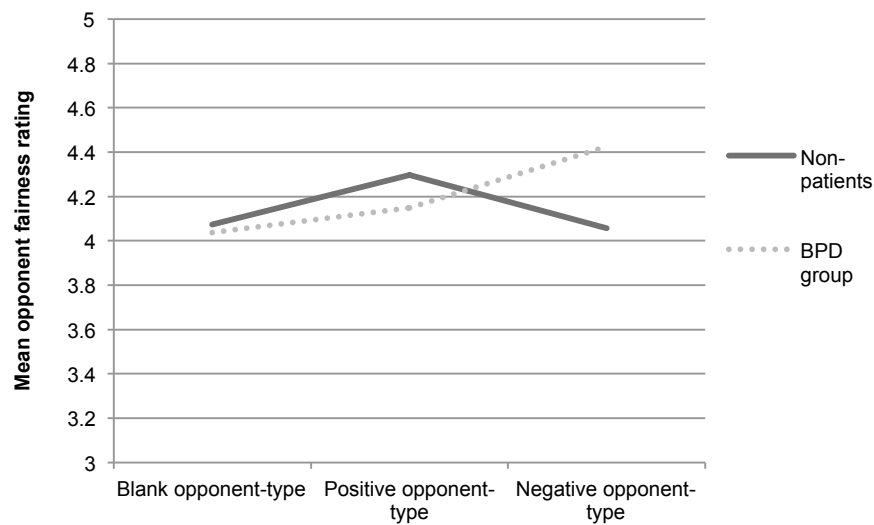


Figure 10: Opponent-type x Group opponent fairness rating interaction

In brief, this interaction may suggest that both groups rated their opponent's fairness in a broadly comparable manner, until rating the negative opponent-type. When rating the fairness of the 'blank' and positive opponent-types non-patients reported higher levels of fairness ($m=4.1 \pm 0.17$, $CI: 3.7 - 4.4$ and $m=4.3 \pm 1.6$, $CI: 4.0 - 4.6$ respectively), compared to the BPD group ($m=4.0 \pm 0.17$, $CI: 3.7 - 4.4$ and $m=4.1 \pm 1.6$, $CI: 3.8 - 4.5$ respectively). Yet this pattern was inverted, with the BPD group scoring higher for the negative opponent-type ($m=4.4 \pm 1.7$, $CI: 4.1 - 4.8$) compared to the non-patients ($m=4.1 \pm 1.7$, $CI: 3.7 - 4.4$).

When considering these opponent fairness data it is useful to remember that all opponent behaviour was consistent and rule bound across all trials. The interactions reported here suggest other factors were considered when rating opponent's behaviour.

4. Discussion

Mentalization, as measured by the tasks utilised in this study, appears subtly altered in the BPD group compared to non-patients (summary table in Appendix G). This section will review the experimental hypotheses in original order, connecting each to the wider literature and clinical practice, where appropriate. Before concluding limitations of the current study and considerations for future research are discussed.

BPD affect-labelling accuracy was found to be less accurate, before and after the intervention compared to the non-patient group (main effect for group accuracy, $F(1, 52)=15.47, p<0.001 \eta^2=0.23$). H_1 - comparable RMET performance in BPD, was rejected. This supports earlier studies (Bland et al., 2004; Guitart-Masip et al., 2009; Levine et al., 1997; Minzenberg et al., 2006b; Preißler et al., 2010; Unoka et al., 2011; Wagner & Linehan, 1999), whilst challenging those reporting either no affect labelling inaccuracy in BPD or better accuracy in BPD (Dyck et al., 2009; Fertuck et al., 2009, 2013; Frick et al., 2012; Schilling et al., 2012). This is the first RMET study to find such a deficit in BPD. Yet current understanding of BPD mentalization would not posit such a global deficit. Future replications that control for intelligence and trauma histories may help account for this finding, which does not neatly fit MBT's switch model.

H_2 was partially supported as response time (RT) data suggested comparable overall RMET times. An unexpected finding was that post-intervention speed increased in both groups (RT intervention main effect: $F(1,52)=39.55, p=0.001 \eta^2=0.43$) and a *selective prioritisation effect* in the non-patient, but not the BPD group was detected (RMET RT: Intervention x Affect-type x Group $F(2,104)=3.74, p=0.03 \eta^2=0.07$).

The *selective prioritisation effect* in non-patients may be an adaptive behavioural bias that would fit with Error Management Theory's (Haselton & Buss, 2000; Johnson, Blumstein, Fowler, & Haselton, 2013) assumption that errors result in asymmetric outcomes. Put simply, a failure to recognise hostility in a violent other presents the individual with a greater hazard, than the under-detection of affiliative signals (i.e. positive affect). Therefore it is adaptive to be cautious around threats and less attentive to less threatening social cues. This fits these data where non-patients were more cautiously attending to negative affect-types when the attachment system was aroused. The BPD group appeared to use an undifferentiated strategy of attending to all forms of affect equally, so improving overall accuracy, though consistently remaining less accurate than the selectively prioritising non-patients.

These data suggest that a normative response to threat is to speed up mentalizing by prioritising these processes (analogous to the rapid physiological activation prior to the flight/fight response (Schauer & Elbert, 2010)) and to under-detect (i.e. deprioritise) positive affect cues. This account converges with cognitive psychology research on emotion-attention links (Compton, 2003; Fenske & Raymond, 2006).

Clinical work on attentional control, alongside standard MBT may be considered a useful adjunct and may support pre-conscious skills not learnt in childhood. In BPD there is an increased likelihood of an invalidating developmental environment (Lieb, Zanarini, Schmahl, & Linehan, 2004; Minzenberg, Poole, & Vinogradov, 2006a). Arguably, an infant's reliance on an unavailable, inconsistent or harmful caregiver would not facilitate the emergence of the selective prioritisation bias that, in turn, may help simplify processing of the milieu. In the scenario of an attachment environment with high expressed emotion, the infant is driven toward the

caregiver to meet its basic needs, yet such an instinct is also stressful. A resultant coping strategy may be that seen in the BPD group's data: that of undifferentiated hypervigilance (Sieswerda et al., 2007) rather than selective prioritisation.

Clinically, appreciation of BPD's stress-related undifferentiated social cue prioritisation may allow techniques to reduce reliance on pre-mentalizing modes. Scaffolding to support a more nuanced and selective appraisal of milieu may already be thought of as a feature of MBT, though this finding, if verified, adds additional detail to the somewhat broad-brush 'switch' model. Non-clinical research would serve to establish the validity of this effect, alongside further BPD assessment.

An intervention was included to attempt a verification of MBT's 'switch' model. A novel stimulation of attachment arousal during the assessment of mentalization was partly effective. However, H_3 predicted less accurate mentalizing in the BPD group after the intervention and data did not support this. In fact skills modulated similarly in both groups (RMET accuracy intervention for Intervention x Affect-type $F(2,104)=4.85, p=0.01, \eta^2=0.09$) with relative improvements in detection of neutral and negative affect with a simultaneous reduction in positive cue accuracy. This interaction lends support to the selective prioritisation effect. Further, B2 accuracy and performance increased (inverse efficiency paired $t(26)=4.26, p<0.001$) in the BPD group, suggesting quicker and enhanced performance after intervention, a similar finding to Domes et al. (2008).

This suggests that either the intervention was not sufficiently intense to trigger the 'switch point' where automatic, error-prone mentalization takes over; or, that MBT's switch model is an incomplete account. The complexity of the switch model means that it is not easily operationalized. Mentalization is generally thought to decline with increased arousal, though the twin peaks of first controlled and then

automatic skills make discerning where a participant is on the mentalizing continuum, at any specific time point, difficult. As Figure 1 shows the switch model is possibly a tautological device, because too much, too little, or a moderate level of attachment arousal may impair mentalizing. The switch model offers convincing face validity but is difficult to falsify and so warrants re-examination. Clinically, such an esoteric model is difficult to simply explain, or think about with clients in vivo, without collapsing into a simple ‘low arousal good, high arousal bad’ analogy. This latter construction does not fit with the current data or MBT theory.

A methodological gap that this study aimed to address was over-representation of the Trustee game. Here, ultimatum game data suggested no differences between groups (total token t -test $p=0.7$), challenging previous multi-round game research reporting cooperation breakdown in BPD groups (King-Casas et al., 2008; Unoka et al., 2009).

The novel addition of opponent-type photo-images to the Ultimatum game resulted in different mean offers post-intervention for the entire sample (Opponent-type x Intervention $F(2,104)=381.7, p=0.039, \eta^2=0.03$): smaller offers were made to the negative affect-type opponent, yet increased offers to the blank and positive affect-type opponents. This supports H_4 – that modifying opponent type would alter offers. This pattern exists despite the fictional opponent acceptance/rejection algorithm being constant in all trials. These data potentially represent an affective cue distortion (i.e. be kinder to the happiest people). Such departures from rational behaviour are common in the judgment and decision-making literature (Hardman, 2009; Kahneman & Tversky, 1979). This finding also infers that both groups used comparable social cue integration during the games (i.e. combining facial affect-cues with self and other mentalizing MSI skill before offering). Game performance was

also similar, so rejecting H_6 , that of impaired BPD group economic game abilities. However, the ultimatum was a one-shot game that does not incorporate trust building and relational repair, so cannot be directly compared with Trustee game studies (Franzen et al., 2011; King-Casas et al., 2008; Unoka et al., 2009). What it reveals clinically is that any social cognition differences in BPD are subtle and nuanced. Overall the Ultimatum game appears to only be of use in BPD mentalizing research when used in concert with other manipulations and interventions.

Finally H_5 , after Franzen et al.'s (2011) finding was also rejected: the BPD group's self-fairness ratings were not linked to opponent behaviour. However opponent-fairness ratings may support the 'early invalidating environment' account made above, as BPD participants rated the second negative affect-type opponent as fairer than first. This was the inverse of the non-patient pattern (other-fairness rating, Opponent-type x Group interaction $F(2, 104)=3.61, p<0.03 \eta^2=0.07$). This may represent a BPD group cognitive strategy, learnt in early life to attempt to manage the distress of relying on a mis-attuned caregiver. Namely, compliant surrender (Arntz & Genderen, 2009) to reduce stress by differentially over-identifying with the hostile other. In this case, the B2 negative opponent-type as fairer than the pre-intervention comparison. Of course, such a cognitive strategy would result in vulnerability to abusive relationships, if not revised.

This study had several limiting factors. Caution is needed when considering RTs derived from a small number of trials per block. Greater numbers of trials and re-trials would allow more accurate mean RTs to be calculated, though at the possible cost of fatigue effects. The intervention included 3 non-schema words included amongst the 12 pairs. These decoy items might be removed so all trials include a negative-schema priming word. Also, more word-pairs would increase exposure and

intervention intensity, perhaps allowing data on the theoretical ‘switch’ point. At the design level, the study did not control for trauma, childhood adversity or working memory. It may be that the BPD diagnostic category comprises many ‘sub-types’ related to these dimensions, with mentalizing ability varying in each sub-type and contributing to the field’s heterogeneous findings.

At the theoretical level, it is not clear how one might empirically falsify the switch model. Further clarification of MBT’s conceptual cornerstone would assist in the design of future studies and potentially meaningful clinical application.

However the study did feature a realistic clinical sample and equal incentives, offered to both groups to minimise motivational confounds. The study also had good retention rates with no dropouts after the screening phase.

5. Conclusion

The study added to the growing number of empirical evaluations of empathy and MSI in BPD populations. Both skills are sub-sets of mentalizing and are of importance to numerous clinical theories and evidence-based treatments. Using the established RMET, there were found to be lower abilities and enhanced learning effects in BPD. Response times pointed to an absence of a selective prioritisation effect, when under attachment arousal in BPD. This is of clinical and research interest. The study also deployed a promising and novel intervention that appeared to moderately stimulate attachment arousal, though not to a level of reduced mentalization purported in theory. Replication and extension of this method is warranted. It is also proposed that without considered review of the diagnostic category, definitive findings on mentalizing ability in BPD will remain unlikely due

to heterogeneity within the category. On balance, the theoretical tenor of MBT appears to be supported by these data and new methods.

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7. Appendices

7.1 Appendix A - DSM-IV TR criteria for Borderline Personality Disorder

Five of the following nine criteria needed to meet criteria for BPD

Affective criteria

- Inappropriate intense anger or difficulty controlling anger— e.g., frequent displays of temper, constant anger, recurrent physical fights
- Chronic feelings of emptiness
- Affective instability due to a marked reactivity of mood— e.g., intense episodic dysphoria, irritability, or anxiety usually lasting a few hours and only rarely more than a few days

Cognitive criteria

- Transient stress-related paranoid ideation or severe dissociative symptoms
- Identity disturbance: striking and persistent unstable self- image or sense of self

Behavioural criteria (forms of impulsivity)

- Recurrent suicidal behaviour, gestures, or threats, or self- mutilating behaviour
- Impulsivity in at least two areas that are potentially self- damaging that do not include suicidal or self-mutilating behaviour

Interpersonal criteria

- Frantic efforts to avoid real or imagined abandonment that do not include suicidal or self-mutilating behaviour
- A pattern of unstable and intense interpersonal relationships characterised by alternating between extremes of idealisation and devaluation

AND BOTH:

- Evidence of onset in early childhood
- Symptoms must impact on functioning

7.2 Appendix B – Hart’s literature review rubric

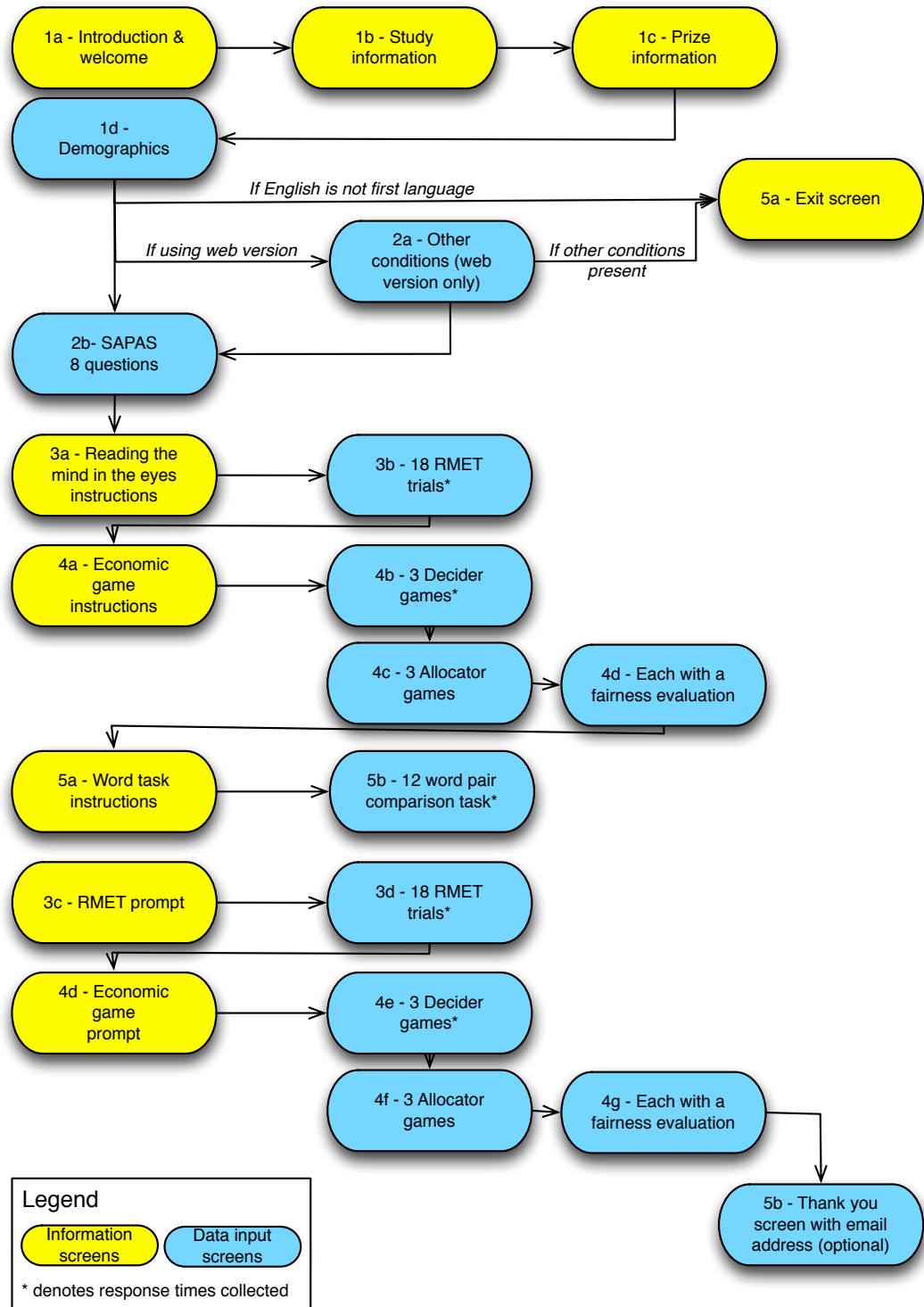
Table 1
Literature Review Scoring Rubric

Category	Criterion	1	2	3	4
1. Coverage	A. Justified criteria for inclusion and exclusion from review.	Did not discuss the criteria inclusion or exclusion	Discussed the literature included and excluded	Justified inclusion and exclusion of literature	
2. Synthesis	B. Distinguished what has been done in the field from what needs to be done.	Did not distinguish what has and has not been done	Discussed what has and has not been done	Critically examined the state of the field	
	C. Placed the topic or problem in the broader scholarly literature	Topic not placed in broader scholarly literature	Some discussion of broader scholarly literature	Topic clearly situated in broader scholarly literature	
	D. Placed the research in the historical context of the field.	History of topic not discussed	Some mention of history of topic	Critically examined history of topic	
	E. Acquired and enhanced the subject vocabulary.	Key vocabulary not discussed	Key vocabulary defined	Discussed and resolved ambiguities in definitions	
	F. Articulated important variables and phenomena relevant to the topic.	Key variables and phenomena not discussed	Reviewed relationships among key variables and phenomena	Noted ambiguities in literature and proposed new relationships	
	G. Synthesized and gained a new perspective on the literature.	Accepted literature at face value	Some critique of literature	Offered new perspective	
	3. Methodology	H. Identified the main methodologies and research techniques that have been used in the field, and their advantages and disadvantages.	Research methods not discussed	Some discussion of research methods used to produce claims	Critiqued research methods
	I. Related ideas and theories in the field to research methodologies.	Research methods not discussed	Some discussion of appropriateness of research methods to warrant claims	Critiqued appropriateness of research methods to warrant claims	
4. Significance	J. Rationalized the practical significance of the research problem.	Practical significance of research not discussed	Practical significance discussed	Critiqued practical significance of research	
	K. Rationalized the scholarly significance of the research problem.	Scholarly significance of research not discussed	Scholarly significance discussed	Critiqued scholarly significance of research	
5. Rhetoric	L. Was written with a coherent, clear structure that supported the review.	Poorly conceptualized, haphazard	Some coherent structure	Well developed, coherent	

Note: The column-head numbers represent scores for rating dissertation literature reviews on 3-point and 4-point scales (endnote 4 explains our choice of the two types of scales). Adapted from *Doing a Literature Review: Releasing the Social Science Research Imagination* (p. 27), by Christopher Hart, 1999, London, SAGE Publications. Copyright 1999 by SAGE Publications. Adapted with permission.

7.3 Appendix C – Schematic of the study elements

Study materials plan



7.4 Appendix D – Entire materials text

The following is indicative of the test materials to be used in the study called ‘Mental state inference in Borderline Personality Disorder’.

1a – “Welcome”	(both patient and non-patient groups unless otherwise stated)
<p>My name is --/REDACTED/-- and I’m a trainee clinical psychologist at Canterbury Christ Church University. I would like to invite you to participate in a research study.</p> <p>Here is some information to help you decide whether to take part and what it would involve for you. I’d be happy to talk about this in more depth, if you have any questions or concerns.</p> <p>We are measuring specific <i>strengths</i> in people’s abilities to work out the emotions and intentions of other people. I want to see if any differences exist between people with a diagnosis of borderline personality disorder diagnosis and those without the diagnosis.</p> <p>To do this, we would really value your help with some tasks and by playing some games.</p> <p>next button – new screen</p>	Next buttons should be in the same place (bottom right) throughout the study.
<p>1B</p> <p>Before taking part in this study, please read the information below.</p> <p>What is this survey about? People’s ability to accurately understand the thoughts and feelings of others is believed to vary. Some treatments for people who have been given a diagnosis of ‘borderline personality disorder’ are aimed at improving person’s skills in this area. By taking part in this study, you are helping to refine ways of working with people who may have been given this diagnosis. Research in this area is also of value to how we understand human experiences, development of relationships and emotional well-being. This study is designed to not cause any undue distress. However, if you find it difficult or upsetting to complete these tasks, you can stop at any time.</p> <p>Completing the study Please only participate in this study once. It will take up to 20 minutes to complete Please note that some tasks are timed, so accuracy and speed are important Please read instructions carefully, as there will be different sets of instructions on each page. Participation is voluntary and you may withdraw from the study at any time.</p> <p>If you wish to do so, simply close this window</p> <p>next button – new screen</p>	

<p>Ic "Part 2 – more information about prizes" If you choose to do so, you may submit your email address for a chance to win a shopping vouchers worth up to £50.</p> <p>Confidentiality All data collected about you will be kept strictly confidential and your responses to the questions will not be linked to your email address. The collected data will be used for statistical analysis, the results of which might be published in the future. You will, however, not be identified in any publication. - If you provide an email address, this will be stored separately from your data and will be permanently deleted once data have been collected and the vouchers have been claimed. - Data collected in this survey will be stored securely on a CD in a locked cabinet and will be disposed of securely after 10 years.</p> <p>What if there is a problem? - If you have a concern about any aspect of this study, please contact me and I will do my best to answer your questions (epw2@canterbury.ac.uk or 03330117070). If you remain unhappy and wish to complain formally, you can do this by contacting Professor Paul Camic, Research Director on (44) 03330117070.</p> <p>Who do I contact if I need more information? - If you have any questions about the study, please contact me on 03330117070 or --/ REDACTED /--</p> <p>Please click Next if you understand the statements above and consent to participate in this study. If you do not wish to continue, simply close this window.</p> <p>next button – new screen</p>	<p>[The prize text may change based on service user consultation on the prize/reward structure.]</p>
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<p>Id – “Part 3 - About you”</p> <p>1. I am</p> <p><input type="radio"/> Female <input type="radio"/> Male</p> <p>2. Age:</p> <p><input type="text"/></p> <p>Is English the first language you learnt? Yes/ No</p> <p>3. Ethnicity: [tick box, one only]</p> <p><input type="radio"/> White British</p> <p><input type="radio"/> White Irish</p> <p><input type="radio"/> Any other White background</p> <p><input type="radio"/> Asian or Asian British Indian</p> <p><input type="radio"/> Asian or Asian British Pakistani</p> <p><input type="radio"/> Asian or Asian British Bangladeshi</p> <p><input type="radio"/> Any other Asian background</p> <p><input type="radio"/> Chinese</p> <p><input type="radio"/> Black or Black British African</p> <p><input type="radio"/> Black or Black British Caribbean</p> <p><input type="radio"/> Any other Black background</p> <p><input type="radio"/> White and Black Caribbean</p> <p><input type="radio"/> White and Black African</p> <p><input type="radio"/> White and Asian</p> <p><input type="radio"/> Any other Mixed background</p> <p><input type="radio"/> Prefer not to state</p> <p><input type="radio"/> Other (please specify): [free text box]</p> <p><input type="text"/></p> <p>Select your highest level of completed education</p> <p>Primary school</p> <p><input type="radio"/> Secondary school</p> <p><input type="radio"/> O levels/GCSEs</p> <p><input type="radio"/> A levels</p> <p><input type="radio"/> Technical or Trade Certificate</p> <p><input type="radio"/> Diploma</p> <p><input type="radio"/> Degree</p> <p><input type="radio"/> Postgraduate Degree</p> <p>4. What is the highest level of education you have completed? [tick box]</p> <p>[next button – new screen]</p>	<p>If first language is not English, redirect respondent to ‘Exit Page’ at the end.</p>
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<p>2a – “Do you have a diagnosis or history of any of the following?” [tick box response for yes or no required]</p> <table border="0" style="width: 100%;"> <thead> <tr> <th style="width: 60%;"></th> <th style="width: 20%; text-align: center;">Yes</th> <th style="width: 20%; text-align: center;">No</th> </tr> </thead> <tbody> <tr><td>epileptic seizures</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>abnormal pregnancy/problems at birth</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>head injury</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>schizophrenia / psychotic experiences</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>personality disorder</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>autism or autistic spectrum disorder</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>non-epileptic seizures</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>depression</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>brain tumour</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>cancer</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>stroke</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>Anxiety disorder</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> <tr><td>bipolar disorder</td><td style="text-align: center;"><input type="radio"/></td><td style="text-align: center;"><input type="radio"/></td></tr> </tbody> </table> <p>6. Are you currently diagnosed with any other illness? Please specify (Optional)</p> <div style="border: 1px solid black; width: 500px; height: 20px; margin-bottom: 5px;"></div> <p>[free text]</p> <p>7. Are you currently taking any medicines? Please specify (Optional) [free text]</p> <p>[Click next]</p>		Yes	No	epileptic seizures	<input type="radio"/>	<input type="radio"/>	abnormal pregnancy/problems at birth	<input type="radio"/>	<input type="radio"/>	head injury	<input type="radio"/>	<input type="radio"/>	schizophrenia / psychotic experiences	<input type="radio"/>	<input type="radio"/>	personality disorder	<input type="radio"/>	<input type="radio"/>	autism or autistic spectrum disorder	<input type="radio"/>	<input type="radio"/>	non-epileptic seizures	<input type="radio"/>	<input type="radio"/>	depression	<input type="radio"/>	<input type="radio"/>	brain tumour	<input type="radio"/>	<input type="radio"/>	cancer	<input type="radio"/>	<input type="radio"/>	stroke	<input type="radio"/>	<input type="radio"/>	Anxiety disorder	<input type="radio"/>	<input type="radio"/>	bipolar disorder	<input type="radio"/>	<input type="radio"/>	<p>This screen is only shown in the online (non-patient) version of the study.</p> <p>redirect to exit page if answered yes to any of the condition/illness questions</p>
	Yes	No																																									
epileptic seizures	<input type="radio"/>	<input type="radio"/>																																									
abnormal pregnancy/problems at birth	<input type="radio"/>	<input type="radio"/>																																									
head injury	<input type="radio"/>	<input type="radio"/>																																									
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Anxiety disorder	<input type="radio"/>	<input type="radio"/>																																									
bipolar disorder	<input type="radio"/>	<input type="radio"/>																																									
<p>2b – “Part 4”</p> <p>Please answer the following yes or no questions:</p> <p>In general, do you have difficulty making and keep keeping friends? Would you normally describe yourself as a loner? In general, do you trust other people? Do you normally lose your temper easily? Are you normally an impulsive sort of person? Are you normally a worrier? In general, do you depend on other a lot? In general, are you a perfectionist?</p> <p>[next button – new screen.]</p>	<p>This screen is only shown in the online (non-patient) version of the study.</p> <p>A table with Yes / No options, like the previous page.</p> <p>Record 1 for yes, 0 for no.</p>																																										

<p>3a – “Part 5 - Reading the eyes task instructions:” For each set of eyes, choose and click which word best describes what the person in the picture is thinking or feeling. You may feel that more than one word is applicable but please choose just one word, the word that you consider to be most suitable.</p> <p>Before making your choice, make sure that you have read all 4 words. You should try to do the task as quickly as possible as you will be timed until you press the ‘Next’ button. If you really don’t know what a word means you can look it up by placing your mouse cursor over the word.</p> <p>The next screen is an example to try out.</p> <p>[next button – advances to practice trials.]</p>	<p>[all participants]</p>
<p>A blank screen with the practice image in the centre of the screen and with the four possible answer words around the image (see Excel sheet for words and example layout).</p> <p>Beneath each word option is a radio button. Hovering over the word pops-out the definition, as provided at the end of this document.</p> <p>When you are ready to begin these trials, click ‘Next’. Remember to work as quickly and accurately as possible.</p> <p>[next button]</p>	
<p>3b [Randomised selection of 18 Reading the Mind in the Eyes tasks. Each Part comprising: black and white photo –picture in the centre of the screen and four word options in each corner of the screen.</p>	<p>Please randomise (or at least shuffle) the following RMET tasks for this block: 9, 13,14,17, 18, 19, 20, 23, 24, 26, 28, 29, 30, 32, 33, 34, 35, 36</p> <p>Please collect response times to 100th of a second for all trials and response.</p>

<p>4a – “Economic games” You will play some games as either an ‘offer maker’ or ‘decider’ game.</p> <p>When playing as the <u>offer maker</u>, we give you 100 tokens that you must share with your opponent.</p> <p>If the opponent accepts your sharing proposal, you both receive the proposed share. But, if the other player rejects your proposed split of the tokens, then you both receive nothing in that game. Counter-offers and negotiation are not allowed. You will play a lot of games with different opponents.</p> <p>When playing as <u>decider</u>, you are just shown an offer and just asked to accept or reject the offer.</p> <p>We will count how many tokens you build up in all of the games you play, [next button – new Part]</p>	
<p>4b – “Decider games” You have received an offer of 50 tokens from player number:16321. Do you wish to accept or reject the offer?</p>	<p>[‘Accept’ or ‘Reject’ button – response time to 100th of a second is collected along with choice. Participant is taken to the next opponent games which offer 10 and 77 tokens.]</p> <p>[A running total of tokens collected appear in the top right corner of the screen. The maximum the end of 4b is 137 tokens]</p> <p>The player number is a made up five digit string.</p> <p>Between trials show a “finding player” dialogue for approximately 2 seconds to give the impression that the system is matching players.</p> <p>No images are shown on screen, only</p>

	text.
<p>4c – “Allocator games”</p> <p>‘You have 100 tokens for this round. You cannot offer more than 100 tokens, in any round. How many tokens do you want to offer player [93932]?’ Remember, if your opponent does not accept your offer you will receive no tokens’ 1 round with a blank screen - no opponent image [text box for number entry between 0 and 100] [button ‘submit offer’]</p> <p>[message – “awaiting player’s response” for 1 -4 seconds] then participants are provided with feedback: “Your offer was accepted” Or “Your offer was rejected” and the total tokens counter updated with new total on the next screen. [next button]</p> <p>[new screen] ”how fair were you in the last round?” 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] How fair was the opponent? 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] [next button – new screen]</p>	<p>[Three games in randomised/shuffled order.</p> <p>For each ‘opponent’ collect offers made (0-100 tokens) and response times to 100th of a second.</p> <p>Offers below 30 tokens will be rejected half the time (in line with norms from the economic game literature (Camerer, 2003) in ALL trials.</p> <p>Keep the running tally in the top right corner of the screen, showing how many tokens have been accumulated through successful rounds.</p>

<p>'You have 100 tokens for this round. You cannot offer more than 100 tokens, in any round. How many tokens do you want to offer player 69874? Remember, if your opponent does not accept your offer you will receive no tokens'</p> <p>[image 20] [text box for number entry between 0 and 100] [button 'submit offer']</p> <p>[message – “awaiting player’s response” for 1 -4 seconds] then participants are provided with feedback: “Your offer was accepted” Or “Your offer was rejected” and the total tokens counter updated with new total on the next screen. [next button]</p> <p>[4d - new screen] "how fair were you in the last round?" 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] How fair was the opponent? 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] [next button – new screen]</p>	<p>This screen will have eye region picture 20 below the instruction text and above the free text entry box</p> <p>In all other respects it is the same as all other Allocator games.</p> <p>Running total showing. Collecting response times to 100th second and offer made.</p> <p>Offers below 30 tokens will be rejected half the time (in line with norms from the economic game literature (Camerer, 2003) in ALL trials.</p>
<p>'You have 100 tokens for this round. You cannot offer more than 100 tokens, in any round. How many tokens do you want to offer player 45298? Remember, if your opponent does not accept your offer you will receive no tokens'</p> <p>[image image 35] [text box for number entry between 0 and 100] [button 'submit offer']</p> <p>[message – “awaiting player’s response” for 1 -4 seconds] then participants are provided with feedback: “Your offer was accepted” Or “Your offer was rejected” and the total tokens counter updated with new total on the next screen. [next button]</p> <p>[new screen] "how fair were you in the last round?" 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] How fair was the opponent? 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] [next button – new screen]</p>	<p>This screen will have eye region picture 35 below the instruction text and above the free text entry box</p>
<p>5a – “Word task instructions” On the next page you will see a word list with 12 pairs of words. For each pairing you need to select the word with the fewest letters. For example: Cat --- Cattle – Cat is the correct answer Train --- Love – Love is the correct answer This task is also timed so work as quickly as you can. The timer stops when you press ‘Next’ – but you won’t be able to change your reply once you move to the next screen, so keep moving. [Next page]</p>	<p>No need to show running token total on these screens. It should return in screen 4e.</p>

<p>5b – [Blank screen with]: “Choose the shortest word”.</p> <p>WORD1 - WORD2 □ □</p> <p>[Next – right aligned on near bottom of the screen]</p>	<p>Both words have a radio button beneath them. The words are aligned in the middle of the screen and in a reasonably large font.</p> <p>There’s a Next button at the bottom of the screen.</p> <p>Collect responses and response times for each pair.</p> <p>This format will be repeated 12 times. The target words are included at the end of this table.</p> <p>After all 12 word pairs are completed all participants return to more economic games]</p>
<p>3c – “Reading the eyes continued “Well done. You’re well over half way now. Here are some more reading the eyes tasks to attempt Remember these are timed so be as quick and accurate as you can.” [next button]</p>	
<p>3d [Randomised selection of 18 Reading the Mind in the Eyes tasks. Each Part comprising: black and white photo –picture in the centre of the screen and four word options in each corner of the screen.</p>	<p>Please randomise (or at least shuffle) the following RMET tasks for this block: 1-8, 10-12, 15, 16, 21, 22, 25, 27, 31</p> <p>Please collect response times to 100th of a second for all trials and response.</p>
<p>4c – “Allocator games” This is the last part of the study. [next]</p>	

<p>'You have 100 tokens for this round. You cannot offer more than 100 tokens, in any round. How many tokens do you want to offer player 69874? Remember, if your opponent does not accept your offer you will receive no tokens' [image 26] [text box for number entry between 0 and 100] [button 'submit offer']</p> <p>[message – "awaiting player's response" for 1 -4 seconds] then participants are provided with feedback: "Your offer was accepted" Or "Your offer was rejected" and the total tokens counter updated with new total on the next screen. [next button]</p> <p>[4d - new screen] "how fair were you in the last round?" 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] How fair was the opponent? 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] [next button – new screen]</p>	<p>This screen will have eye region picture 26 below the instruction text and above the free text entry box</p> <p>In all other respects it is the same as all other Allocator games.</p> <p>Running total showing. Collecting response times to 100th second and offer made.</p> <p>Offers below 30 tokens will be rejected half the time (in line with norms from the economic game literature (Camerer, 2003) in ALL trials.</p>
<p>'You have 100 tokens for this round. You cannot offer more than 100 tokens, in any round. How many tokens do you want to offer player 45298? Remember, if your opponent does not accept your offer you will receive no tokens' [image image 1] [text box for number entry between 0 and 100] [button 'submit offer']</p> <p>[message – "awaiting player's response" for 1 -4 seconds] then participants are provided with feedback: "Your offer was accepted" Or "Your offer was rejected" and the total tokens counter updated with new total on the next screen. [next button]</p> <p>[new screen] "how fair were you in the last round?" 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] How fair was the opponent? 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] [next button – new screen]</p>	<p>This screen will have eye region picture 1 below the instruction text and above the free text entry box</p>
<p>'You have 100 tokens for this round. You cannot offer more than 100 tokens, in any round. How many tokens do you want to offer player [35741]? Remember, if your opponent does not accept your offer you will receive no tokens' 1 round with a blank screen - no opponent image [text box for number entry between 0 and 100] [button 'submit offer']</p> <p>[message – "awaiting player's response" for 1 -4 seconds] then participants are provided with feedback: "Your offer was accepted" Or "Your offer was rejected" and the total tokens counter updated with new total on the next screen. [next button]</p> <p>[new screen] "how fair were you in the last round?" 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] How fair was the opponent? 1 – very unfair, 7 – very fair. [1-7 scale using radio buttons] [next button – new screen]</p>	<p>Three games in randomised/shuffled order.</p> <p>For each 'opponent' collect offers made (0-100 tokens) and response times to 100th of a second.</p> <p>Offers below 30 tokens will be rejected half the time</p>

	<p>(in line with norms from the economic game literature (Camerer, 2003) in ALL trials.</p> <p>Keep the running tally in the top right corner of the screen, showing how many tokens have been accumulated through successful rounds.</p>
<p>5b – “Thank you”.</p> <p>Thank you for your participation in this study.</p> <p>To be eligible for the prizes please provide your email address now. This will be kept separately from your responses and will be deleted as soon as the prizes are given out.</p> <p>You will be notified if you won by email on 15 December. We will not email those who have not been successful this time.</p> <p>This study is related to ‘Mentalization’. If you are interested in learning more about this idea, see here: http://en.wikipedia.org/wiki/Mentalization</p> <p>If you do not wish to participate in this study, or have any further queries, please email me at: --/ email redacted /--</p> <p>Thank you once again close browser window</p>	
<p>5a - EXIT SCREEN</p> <p>“Thank you:</p> <p>I am very grateful for the time you have taken to participate in this study. However, due to the requirements of this study, you are not eligible to complete the tasks.</p> <p>If you have any questions, please contact me via -redacted-</p> <p>Many thanks, once again</p> <p>--redacted--</p> <p>You can now close this window.</p>	<p>Those who fail to meet inclusion criteria will be directed here. And then leave the study.</p>

The following information is used to support the above materials, including RMET emotional word definitions and the word lists for 5a.

Word definitions [\[pop up when hovering cursor over the target word for 3b and 3d\]](#)

WORD DEFINITIONS

ACCUSING blaming

The policeman was **accusing** the man of stealing a wallet.

AFFECTIONATE showing fondness towards someone

Most mothers are **affectionate** to their babies by giving them
lots of kisses and cuddles.

-- rest of section redacted --

Word comparison word list for 5b

1	addition	vulnerable
2	worthless	meeting
3	rejection	cause
4	wonder	abstract
5	cheat	amount
6	invitation	failure
7	victim	produce
8	base	common
9	million	bad
10	hopeless	bargain
11	luck	vital
12	lie	subject

7.5 Appendix E – Intervention word pair selection process

In order to generate a suitable selection of emotive ‘attachment stimulating’ words, alongside a list of non-emotive or neutral words for this intervention items were translated from Sieswerda, Arntz, Mertens, and Vertommen, (2007) into English. Schema related words are those which are thought to reflect affect-laden beliefs (i.e. schema) about oneself or others (Arntz & Genderen, 2009; Young, 1999). Such words were found to cause negative interference in an affective Stroop task, only in the BPD group Sieswerda et al (2007).

Three words were taken from their non-schema list to try and maintain the deception of the task by keeping some trials as seemingly innocuous word pairs. Nine words were taken from their negative schema-related word lists (e.g. rejection, failure, bad).

To create suitable pairs similar partners were needed for these 12 words from Sierswerda and colleagues. This was done by taking the twelve words and then analysing them using two British language usage databases³. Each word was evaluated by: number of letters, number of syllables, familiarity, ‘imagability’ rating, age of acquisition, concreteness rating and Kucera-Francis written frequency. These data were then used as defining parameters for the generation of equivalent but neutral word lists from the same databases. Twelve words were then randomly selected from the generated list, forming a neutral word list. T-tests were carried out to compare schema-related and neutral word lists on those word characteristics listed above. No significant differences were found (all $t_s > 0.28$).

³ English Lexicon Project, <http://elexicon.wustl.edu/query14/query14.asp> and the MRC Psycholinguistic Database http://websites.psychology.uwa.edu.au/school/MRCDatabase/uwa_mrc.htm

The two word lists were brought together to form word pairs. Each pair was checked to ensure that i) one item had fewer letters ii) correct answers (shortest words) were equally distributed between schema and neutral word lists. Finally the left-right positioning of the pairs was randomly shuffled, so schema words appeared in both left and right hand positions. Pair sequence order was also randomised by the task software.

7.6 Appendix F – Ethical considerations

There were four main ethical issues that were discussed with panels, supervisors and service users. These being, two intentional deceptions, the use of prizes as incentives, detection of non-diagnosed complex needs in the non-patient group and over-stimulation of attachment system in BPD participants during tasks.

These will be addressed in order:

1) Intentional deception.

The first deception was the need to present economic games, as if playing against online players. This was needed because research suggests that behaviour is different when a participant knows they are playing against a human, or against another person (Braynov, 2013). Delays and text (i.e. “Please wait, finding a new player”) were introduced to maintain this illusion.

The second intentional deception was the latent use of attachment-related words in the intervention. Again, for these latent-priming effects to be effective, they must remain outside of awareness. Given the this form of intervention had been found effective before and it presented a minimally distressing solution to the study’s design requirements, it was presented to ethics panels, supervisors and latterly, service users, for their input.

In discussion with the advisors stated above, it was decided that these deceptions were reasonable. Given the close-knit community context of the recruiting service, it was decided to not disclose the deception until data collection had been completed, to avoid contaminating the sample.

2) The use of prizes

Incentives are a required part of economic game research in economics, game theory and behavioural finance as such rewards are thought to motivate behaviour.

Therefore, to confirm with the basic methods of such research, they were offered here. These were discussed with the above stated advisors along with a rationale. A range of reward schedules were presented to a service user group for discussion. They chose the mixed-incentive model that included one prize allocated on a random drawer basis and two prizes for highest token earned in the economic game. It was also recommended that high street shopping vouchers, rather than cash prizes would reduce the risk of the money being spent on substances.

3) Detection of non-diagnosed complex needs

Given half the sample were recruited via online methods, this presents as an ethical dilemma. SAPAS scores are thought to reliably indicate personality disorders, yet these people were neither alerted, nor contacted at time of participation. Data analysis revealed that 25 people were likely to meet criteria in this study. Given the global coverage of online methods and the diversity of mental health services on offer, it was not possible to provide specific sign-posting. However, it was agreed that the researcher's contact details would be provided to all participants. If anyone was concerned about or affect by, any of the tasks involved in the study they would be directed to a local care professional and mental health support line (e.g. SANEline in the UK). This mitigation plan cannot fully resolve issues of unknown, and possibly unhelpful diagnoses in online participation studies.

4) Undue distress during tasks

Possible distress to participants during task completion of RMET, economic games and the word-length comparison/experimental intervention task were considered. It was anticipated that none of these would cause distress. However, in the BPD group

some service users may have become distressed whilst being interviewed for the BPD screening measure (ZAN-BPD).

However, the scale was used regularly in the recruiting service and there were no reports that using the screening questionnaire led to undue distress during clinical or research activity. The researcher also coordinated with the recruiting service to ensure that participants could use existing support arrangements, if so needed.

7.7 Appendix G – Overview of findings table, by hypothesis

Hypothesis	Result	Group (n)	
		NP (27)	BPD (27)
H1 - RMET accuracy will be comparable between groups	R	Consistently more accurate across blocks Only negative and neutral affect-type accuracy increased in B2.	Less accurate in both blocks.
H2 – RMET speed will be comparable between groups	P	Comparable RT, both groups quicker in B2. Selective prioritisation effect post-intervention	Undifferentiated speed increase post - intervention
H3 – RMET performance in the BPD group will be reduced after intervention	R	-	Performance improved after intervention.
H4 – Modulation of opponent-type will affect offers	S	Post intervention, more generous offers to blank and positive opponent-types, smaller offers to negative opponent-type.	
H5 – Self-fairness ratings in the BPD group will be associated with opponent-type	R	-	No effect for self-fairness
		Other-fairness, stable across games	Post-intervention other-fairness ratings increased for negative opponent-type
H6 - BPD economic games performance will be impaired (fewer tokens) compared to non-patients.	R	No differences.	

Notes: R: Rejected. P: Partial support. S: Supported.

8. Section C - Appendix of Supporting Material

8.1 Journal style notes for Journal of Personality Disorders

Types of Articles

Regular Articles: Reports of original work should not normally exceed 30 pages (typed, double-lined spaces, and with standard margins, including tables, figures, and references). Occasionally, an author may feel that he or she needs to exceed this length (e.g., a report of a series of studies, or a report that would benefit from more extensive technical detail). In these circumstances, an author may submit a lengthier manuscript, but the author should describe the rationale for a submission exceeding 30 pages in the cover letter accompanying the submission. This rationale will be taken into account by the Editors, as part of the review process, in determining if the increased length is justified.

Invited Essays and Special Articles: These articles provide an overview of broad-ranging areas of research and conceptual formulations dealing with substantive theoretical issues. Reports of large-scale definitive empirical studies may also be submitted. Articles should not exceed 40 pages including tables, figures, and references. Authors contemplating such an article are advised to contact the editor in advance to see whether the topic is appropriate and whether other articles in this topic are planned.

Brief Reports: Short descriptions of empirical studies not exceeding 20 pages in length including tables, figures, and references.

Web-based submissions: Manuscripts must be produced electronically using word processing software, double spaced, and submitted along with a cover letter to <http://jpd.msubmit.net>

Authors may choose blind or non-blind review. Please specify which option you are choosing in your cover letter. If you choose blind review, please prepare the manuscript accordingly (e.g., remove identifying information from the first page of the manuscript, etc.). All articles should be prepared in accordance with the Publication Manual of the American Psychological Association. They must be preceded by a brief abstract and adhere to APA referencing format.

Tables should be submitted in Excel. Tables formatted in Microsoft Word's Table function are also acceptable. (Tables should not be submitted using tabs, returns, or spaces as formatting tools.) Figures should be submitted separately as graphic files (in order of preference: tif, eps, jpg, bmp, gif) in the highest possible resolution. Figure caption text should be included in the article's Microsoft Word file.

Permissions: Contributors are responsible for obtaining permission from copyright owners if they use an illustration, table, or lengthy quote (100+ words) that has been published elsewhere. Contributors should write both the publisher and author of such material, requesting nonexclusive world rights in all languages for use in the article and in all future editions of it.

References: Authors should consult the publication manual of the American Psychological Association for rules on format and style. All research papers submitted to the Journal of Personality Disorders must conform to the ethical standards of the American Psychological Association. Articles should be written in nonsexist language.

Any manuscripts with references that are incorrectly formatted will be returned by the publisher for revision.

8.2 Sample distribution graphs and SPSS output

Outputs for H₁ testing.

Explore - Group

Case Processing Summary

	Group	Cases					
		Valid		Missing		Total	
		N	Percent	N	Percent	N	Percent
RMET_1stHalfTotal	1	27	100.0%	0	0.0%	27	100.0%
	2	27	100.0%	0	0.0%	27	100.0%
RMET_2ndHalfTotal	1	27	100.0%	0	0.0%	27	100.0%
	2	27	100.0%	0	0.0%	27	100.0%

Descriptives

	Group		Statistic	Std. Error
RMET_1stHalfTotal	1	Mean	14.04	.435
		95% Confidence Interval for Mean		
		Lower Bound	13.14	
		Upper Bound	14.93	
		5% Trimmed Mean	14.03	
		Median	14.00	
		Variance	5.114	
		Std. Deviation	2.261	
		Minimum	10	
		Maximum	18	
		Range	8	
		Interquartile Range	4	
		Skewness	.080	.448
		Kurtosis	-.963	.872
	2	Mean	11.30	.492
		95% Confidence Interval for Mean		
		Lower Bound	10.29	
		Upper Bound	12.31	
		5% Trimmed Mean	11.33	

RMET_2ndHalfTotal	1	Median		11.00		
		Variance		6.524		
		Std. Deviation		2.554		
		Minimum		6		
		Maximum		16		
		Range		10		
		Interquartile Range		4		
		Skewness		-.088	.448	
		Kurtosis		-.615	.872	
		Mean		14.48	390	
	2	95% Confidence Interval for Mean	Lower Bound		13.68	
			Upper Bound		15.28	
		5% Trimmed Mean		14.60		
		Median		15.00		
		Variance		4.105		
		Std. Deviation		2.026		
		Minimum		9		
		Maximum		17		
		Range		8		
		Interquartile Range		3		
Skewness		-.690	.448			
Kurtosis		.350	.872			
Mean		12.56	484			
95% Confidence Interval for Mean	Lower Bound		11.56			
	Upper Bound		13.55			
5% Trimmed Mean		12.56				
Median		13.00				
Variance		6.333				
Std. Deviation		2.517				
Minimum		8				
Maximum		17				
Range		9				
Interquartile Range		3				
Skewness		-.250	.448			
Kurtosis		-.559	.872			

Tests of Normality

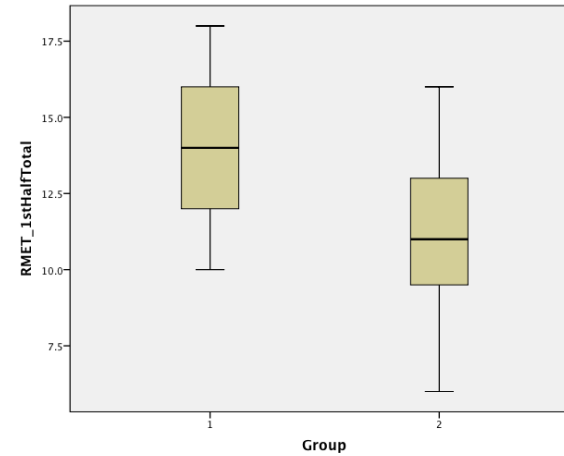
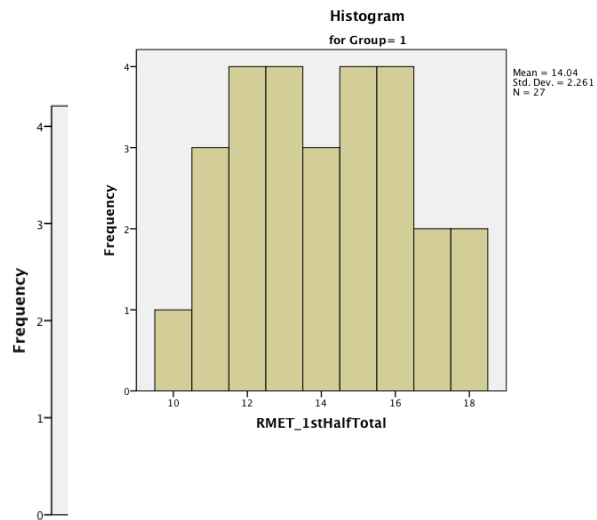
	Group	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
RMET_1stHalfTotal	1	.121	27	.200*	.960	27	.361
	2	.118	27	.200*	.975	27	.745
RMET_2ndHalfTotal	1	.144	27	.162	.922	27	.043
	2	.153	27	.103	.947	27	.185

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

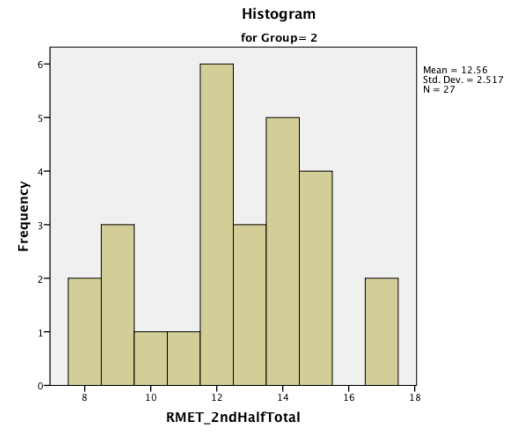
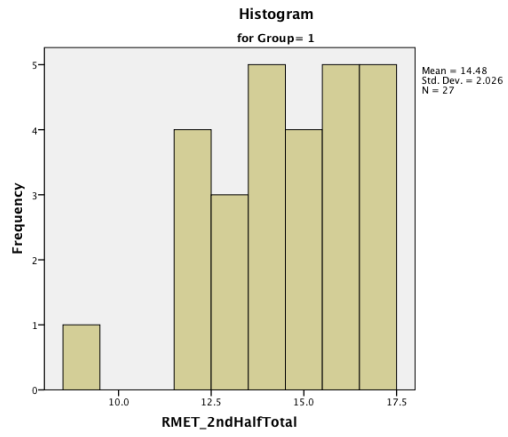
RMET_1stHalfTotal

Histograms



RMET_2ndHalfTotal

Histograms



ENDS

General Linear Model

Within-Subjects Factors
Measure: MEASURE_1

affecttype	intervention	Dependent Variable
1	1	FH_Neg
	2	SH_Neg
2	1	FH_Neu
	2	SH_Neu
3	1	FH_Pos
	2	SH_Pos

Between-Subjects Factors

Group	N
1	27
2	27

Descriptive Statistics

	Group	Mean	Std. Deviation	N
FH_Neg	1	.77	.213	27
	2	.60	.248	27
	Total	.69	.244	54
SH_Neg	1	.8148	.20325	27
	2	.6574	.24167	27
	Total	.7361	.23501	54
FH_Neu	1	.75	.193	27
	2	.60	.158	27
	Total	.67	.192	54
SH_Neu	1	.85	.135	27
	2	.69	.185	27
	Total	.77	.180	54
FH_Pos	1	.85	.233	27
	2	.73	.195	27
	Total	.79	.221	54
SH_Pos	1	.72	.250	27
	2	.75	.181	27
	Total	.73	.216	54

Box's Test of Equality of Covariance Matrices^a

Box's M	22.589
F	.942
df1	21
df2	9945.308
Sig.	.535

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + Group

Within Subjects Design: affecttype + intervention + affecttype * intervention

Multivariate Tests^a

Effect		Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
affecttype	Pillai's Trace	.063	1.704 ^b	2.000	51.000	.192	.063
	Wilks' Lambda	.937	1.704 ^b	2.000	51.000	.192	.063
	Hotelling's Trace	.067	1.704 ^b	2.000	51.000	.192	.063
	Roy's Largest Root	.067	1.704 ^b	2.000	51.000	.192	.063
affecttype * Group	Pillai's Trace	.094	2.650 ^b	2.000	51.000	.080	.094
	Wilks' Lambda	.906	2.650 ^b	2.000	51.000	.080	.094
	Hotelling's Trace	.104	2.650 ^b	2.000	51.000	.080	.094
	Roy's Largest Root	.104	2.650 ^b	2.000	51.000	.080	.094
intervention	Pillai's Trace	.044	2.404 ^b	1.000	52.000	.127	.044
	Wilks' Lambda	.956	2.404 ^b	1.000	52.000	.127	.044
	Hotelling's Trace	.046	2.404 ^b	1.000	52.000	.127	.044
	Roy's Largest Root	.046	2.404 ^b	1.000	52.000	.127	.044
intervention * Group	Pillai's Trace	.039	2.090 ^b	1.000	52.000	.154	.039
	Wilks' Lambda	.961	2.090 ^b	1.000	52.000	.154	.039
	Hotelling's Trace	.040	2.090 ^b	1.000	52.000	.154	.039
	Roy's Largest Root	.040	2.090 ^b	1.000	52.000	.154	.039
affecttype * intervention	Pillai's Trace	.175	5.417 ^b	2.000	51.000	.007	.175
	Wilks' Lambda	.825	5.417 ^b	2.000	51.000	.007	.175
	Hotelling's Trace	.212	5.417 ^b	2.000	51.000	.007	.175
	Roy's Largest Root	.212	5.417 ^b	2.000	51.000	.007	.175
affecttype * intervention * Group	Pillai's Trace	.054	1.454 ^b	2.000	51.000	.243	.054
	Wilks' Lambda	.946	1.454 ^b	2.000	51.000	.243	.054
	Hotelling's Trace	.057	1.454 ^b	2.000	51.000	.243	.054
	Roy's Largest Root	.057	1.454 ^b	2.000	51.000	.243	.054

a. Design: Intercept + Group
 Within Subjects Design: affecttype + intervention + affecttype * intervention
 b. Exact statistic

Mauchly's Test of Sphericity^a
 Measure: MEASURE_1

Within Subjects Effect	Mauchly's W	Approx. Chi-Square	df	Sig.	Epsilon ^b		
					Greenhouse-Geisser	Huynh-Feldt	Lower-bound
affecttype	.963	1.937	2	.380	.964	1.000	.500
intervention	1.000	.000	0	.	1.000	1.000	1.000
affecttype * intervention	.927	3.865	2	.145	.932	.984	.500

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + Group

Within Subjects Design: affecttype + intervention + affecttype * intervention

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
affecttype	Sphericity Assumed	.162	2	.081	2.010	.139	.037
	Greenhouse-Geisser	.162	1.928	.084	2.010	.141	.037
	Huynh-Feldt	.162	2.000	.081	2.010	.139	.037
	Lower-bound	.162	1.000	.162	2.010	.162	.037
affecttype * Group	Sphericity Assumed	.242	2	.121	2.996	.054	.054
	Greenhouse-Geisser	.242	1.928	.125	2.996	.056	.054
	Huynh-Feldt	.242	2.000	.121	2.996	.054	.054
	Lower-bound	.242	1.000	.242	2.996	.089	.054
Error(affecttype)	Sphericity Assumed	4.196	104	.040			
	Greenhouse-Geisser	4.196	100.263	.042			
	Huynh-Feldt	4.196	104.000	.040			
	Lower-bound	4.196	52.000	.081			
intervention	Sphericity Assumed	.065	1	.065	2.404	.127	.044
	Greenhouse-Geisser	.065	1.000	.065	2.404	.127	.044
	Huynh-Feldt	.065	1.000	.065	2.404	.127	.044
	Lower-bound	.065	1.000	.065	2.404	.127	.044
intervention * Group	Sphericity Assumed	.057	1	.057	2.090	.154	.039
	Greenhouse-Geisser	.057	1.000	.057	2.090	.154	.039
	Huynh-Feldt	.057	1.000	.057	2.090	.154	.039
	Lower-bound	.057	1.000	.057	2.090	.154	.039
Error(intervention)	Sphericity Assumed	1.413	52	.027			
	Greenhouse-Geisser	1.413	52.000	.027			
	Huynh-Feldt	1.413	52.000	.027			
	Lower-bound	1.413	52.000	.027			
affecttype * intervention	Sphericity Assumed	.328	2	.164	4.853	.010	.085
	Greenhouse-Geisser	.328	1.864	.176	4.853	.011	.085
	Huynh-Feldt	.328	1.968	.167	4.853	.010	.085
	Lower-bound	.328	1.000	.328	4.853	.032	.085
affecttype * intervention * Group	Sphericity Assumed	.096	2	.048	1.425	.245	.027
	Greenhouse-Geisser	.096	1.864	.052	1.425	.246	.027
	Huynh-Feldt	.096	1.968	.049	1.425	.245	.027
	Lower-bound	.096	1.000	.096	1.425	.238	.027
Error(affecttype*intervention)	Sphericity Assumed	3.515	104	.034			
	Greenhouse-Geisser	3.515	96.926	.036			

Huynh-Feldt	3.515	102.322	.034			
Lower-bound	3.515	52.000	.068			

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	affecttype	intervention	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
affecttype	Linear		.145	1	.145	3.021	.088	.055
	Quadratic		.017	1	.017	.522	.473	.010
affecttype * Group	Linear		.190	1	.190	3.946	.052	.071
	Quadratic		.052	1	.052	1.597	.212	.030
Error(affecttype)	Linear		2.499	52	.048			
	Quadratic		1.697	52	.033			
intervention		Linear	.065	1	.065	2.404	.127	.044
intervention * Group		Linear	.057	1	.057	2.090	.154	.039
Error(intervention)		Linear	1.413	52	.027			
affecttype * intervention	Linear	Linear	.161	1	.161	3.768	.058	.068
	Quadratic	Linear	.167	1	.167	6.722	.012	.114
affecttype * intervention * Group	Linear	Linear	.063	1	.063	1.482	.229	.028
	Quadratic	Linear	.033	1	.033	1.328	.254	.025
Error(affecttype*intervention)	Linear	Linear	2.224	52	.043			
	Quadratic	Linear	1.291	52	.025			

Levene's Test of Equality of Error Variances^a

	F	df1	df2	Sig.
FH_Neg	.680	1	52	.413
SH_Neg	.806	1	52	.373
FH_Neu	1.602	1	52	.211
SH_Neu	2.365	1	52	.130
FH_Pos	.344	1	52	.560
SH_Pos	4.144	1	52	.047

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + Group

Within Subjects Design: affecttype + intervention + affecttype * intervention

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Intercept	173.345	1	173.345	2203.685	.000	.977

Group	1.217	1	1.217	15.469	.000	.229
Error	4.090	52	.079			

Estimated Marginal Means

1. Grand Mean

Measure: MEASURE_1

Mean	Std. Error	95% Confidence Interval	
		Lower Bound	Upper Bound
.731	.016	.700	.763

2. affecttype * intervention

Measure: MEASURE_1

affecttype	intervention	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	1	.685	.031	.622	.748
	2	.736	.030	.675	.797
2	1	.675	.024	.627	.723
	2	.767	.022	.723	.812
3	1	.792	.029	.733	.850
	2	.733	.030	.674	.793

3. Group

Estimates

Measure: MEASURE_1

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.793	.022	.749	.837
2	.670	.022	.626	.714

Pairwise Comparisons

Measure: MEASURE_1

(I) Group	(J) Group	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound

1	2	.123*	.031	.000	.060	.185
2	1	-.123*	.031	.000	-.185	-.060

Based on estimated marginal means

*. The mean difference is significant at the

b. Adjustment for multiple comparisons: Bonferroni.

Univariate Tests

Measure: MEASURE_1

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	.203	1	.203	15.469	.000	.229
Error	.682	52	.013			

The F tests the effect of Group. This test is based on the linearly independent pairwise comparisons among the estimated marginal means.

4. affecttype

Estimates

Measure: MEASURE_1

affecttype	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.711	.024	.662	.760
2	.721	.019	.683	.760
3	.763	.023	.717	.808

Pairwise Comparisons

Measure: MEASURE_1

(I) affecttype	(J) affecttype	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
1	2	-.011	.026	1.000	-.074	.053
	3	-.052	.030	.264	-.126	.022
2	1	.011	.026	1.000	-.053	.074
	3	-.041	.026	.369	-.106	.024
3	1	.052	.030	.264	-.022	.126
	2	.041	.026	.369	-.024	.106

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.063	1.704 ^a	2.000	51.000	.192	.063
Wilks' lambda	.937	1.704 ^a	2.000	51.000	.192	.063
Hotelling's trace	.067	1.704 ^a	2.000	51.000	.192	.063
Roy's largest root	.067	1.704 ^a	2.000	51.000	.192	.063

Each F tests the multivariate effect of affecttype. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

5. intervention

Estimates

Measure: MEASURE_1

intervention	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
1	.717	.018	.680	.754
2	.746	.018	.710	.781

Pairwise Comparisons

Measure: MEASURE_1

(I) intervention	(J) intervention	Mean Difference (I-J)	Std. Error	Sig. ^a	95% Confidence Interval for Difference ^a	
					Lower Bound	Upper Bound
1	2	-.028	.018	.127	-.065	.008
2	1	.028	.018	.127	-.008	.065

Based on estimated marginal means

a. Adjustment for multiple comparisons: Bonferroni.

Multivariate Tests

	Value	F	Hypothesis df	Error df	Sig.	Partial Eta Squared
Pillai's trace	.044	2.404 ^a	1.000	52.000	.127	.044
Wilks' lambda	.956	2.404 ^a	1.000	52.000	.127	.044
Hotelling's trace	.046	2.404 ^a	1.000	52.000	.127	.044
Roy's largest root	.046	2.404 ^a	1.000	52.000	.127	.044

Each F tests the multivariate effect of intervention. These tests are based on the linearly independent pairwise comparisons among the estimated marginal means.

a. Exact statistic

6. Group * affecttype

Measure: MEASURE 1

Group	affecttype	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	1	.793	.034	.723	.862
	2	.800	.027	.746	.855
	3	.785	.032	.721	.849
2	1	.629	.034	.560	.698
	2	.642	.027	.588	.696
	3	.740	.032	.676	.804

7. Group * intervention

Measure: MEASURE 1

Group	intervention	Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
1	1	.792	.026	.740	.844
	2	.794	.025	.743	.844
2	1	.643	.026	.591	.695
	2	.698	.025	.647	.748

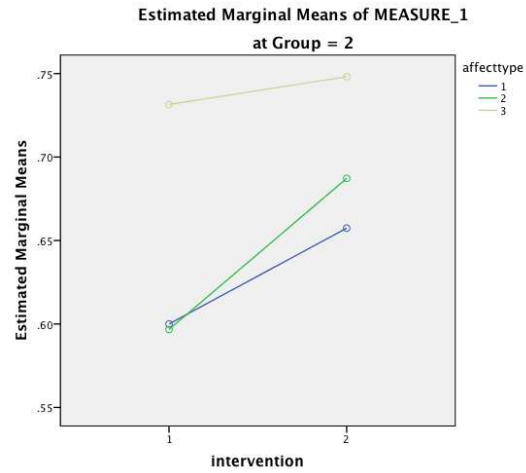
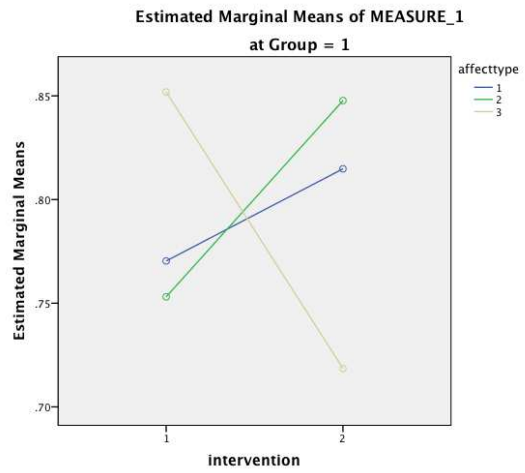
8. Group * affecttype * intervention

Measure: MEASURE 1

Group	affecttype	intervention	Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
1	1	1	.770	.044	.681	.860
		2	.815	.043	.729	.901
	2	1	.753	.034	.685	.821
		2	.848	.031	.785	.910
	3	1	.852	.041	.769	.935
		2	.719	.042	.634	.803
2	1	1	.600	.044	.511	.689
		2	.657	.043	.571	.744
	2	1	.597	.034	.529	.665
		2	.687	.031	.625	.750
	3	1	.731	.041	.649	.814
		2	.748	.042	.664	.832

Profile Plots

intervention * affecttype * Group



8.3 Ethics materials

Participant Identification Number for this study:

Version 1.2

CONSENT FORM

Title of Project: An investigation of mental state inference using an economic game

Name of Researcher: Elliott White

Please sign and date below to note your acceptance of the following points:

1. I confirm that I have read and understand the information sheet dated..... (version 1) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.

3. I understand that the researcher may look at relevant sections of my medical notes and give permission for these individuals to have access to my data.

4. No data from the testing will be shared with the rest of the team / unit staff

5. I understand that the information gained in this study will be used in a doctoral thesis and for future peer-reviewed publication

6. I agree to take part in the above study.

Name of Participant _____ Date _____

Signature _____

Name of Person taking consent _____ Date _____

Signature _____

Information about the research

An investigation of mental state inference using economic games

My name is Elliott White and I'm a trainee clinical psychologist at Canterbury Christ Church University. I would like to invite you to participate in a research study.

Here is some information to help you decide whether to take part and what it would involve for you. I'd be happy to talk about this in more depth, if you have any questions or concerns.

Overview

What is the purpose of the study?

Sometimes people are given a diagnosis of a 'personality disorder'. Like all mental health diagnoses, 'personality disorder' gets used when a person experiences a range of feelings or does some specific behaviours like hurting themselves. However, the label does not explain what causes these feelings or behaviours. Researchers collect information about people with these diagnoses to explore what might be causing the 'symptoms'. We then develop treatments based on this knowledge to help minimise people's distress.

One of the ideas about 'borderline personality disorder' is that people with this diagnosis misinterpret other people's thoughts and feelings. Earlier researchers believed people with a diagnosis of borderline personality disorder were less accurate when reading other people's emotions or thoughts.

Our research measures specific *strengths* in people's abilities to work out the emotions and intentions of other people, when looking at faces and playing economic games. These are games that use tokens, two players and some very simple rules. We want to see if any differences exist between people with the borderline personality disorder diagnosis and other people. To do this, we would really value your help with some tasks and by playing some games when we visit your unit.

Why have I been invited?

You are a member of therapeutic community or client in a personality disorder service. It is possible that you currently, or at some time, were diagnosed with a personality disorder.

Is taking part compulsory?

No. This research is not linked to your treatment or therapeutic community membership. Taking part is entirely voluntary. You are free to withdraw at any time, without giving a reason. If you complete the research, you will be eligible for a shopping voucher prize.

What will happen to me if I take part?

There are two parts to the study.

First you will be taken through some tasks on a computer including playing some simple games. These tasks and games will all be explained on-screen. This section will go as quickly as you can manage – there is no time limit. We expect this to take about 10 minutes but some may take a little longer, some a little quicker.

Second, we will ask you questions from a short questionnaire to understand how you experience 'borderline personality disorder' symptoms. This takes another 10-15 minutes. You may have been through this interview before, depending on what service you are in.

We will end with a short talk about what we did together. This is not part of the data collection, it is just to ensure you understand what we've been doing and to check that you're ok. The staff at your unit are also aware of the research and will be able to talk about it, if that would be helpful.

Expenses and payments

We are offering a prize of £25 or £10 shopping vouchers to those who earn the most tokens in the game. And a £15 voucher for one random participant. We will ask for an email address or other contact information, so we can arrange for the vouchers to reach you, should you win. Contact details, signed consent forms and study data will not be kept together, to ensure your privacy.

We will arrange sessions at your service, around the other activities of the therapy.

What are the possible disadvantages and risks of taking part?

The study is not designed to be distressing, but we invite you to be mindful of how you are feeling at the time you take part. For example, sometimes talking about recent experiences of symptoms, like feelings of emptiness, or self-harm, can leave us with strong feelings.

The tasks and games being played are not generally experienced as distressing. We encourage you to talk about any surprising or difficult responses with your community or service. This is a way of looking after your own emotional wellbeing. We are not expecting you to feel any undue distress.

What are the possible benefits of taking part?

The information we get from this study will help us understand borderline personality disorder so that we may improve the future treatment of people with such a diagnosis. We also hope that participation in the study is interesting and enjoyable. Finally, there is also a relatively good chance of winning a small shopping vouchers prize – due to the fairly small number of people taking part (fewer than 100).

What if there is a problem?

The study has been designed carefully and reviewed by many people to ensure it does not cause any undue distress.

The researcher can be contacted during visits to the unit, which will be advertised in a public notice board. Unit staff will also be able to contact the researcher, should they think that would be helpful between visits.

However, should you wish to make any complaint about the way you have been dealt with during the study, it will be addressed. Either by talking to the researcher, or with a staff member at the unit, who will be briefed on the study.

Professor Paul Camic, the Research Director for Canterbury Christ Church University's Applied Psychology Department, is aware of this research though

remains independent from it. He can be contacted via voicemail on 03330117070, should you wish to take the complaint further.

Will my taking part in the study be kept confidential?

Yes. We will follow ethical and legal practice and all information about you will be handled in confidence. This means keeping raw data without personally identifying information in a safe and securely encrypted place. All data will be destroyed at the earliest possible time. Reporting of results will neither name, nor identify, any individual participants.

However, just like your agreement with your service, if you say anything that suggests there may be a risk of harm to yourself, or others, this will be reported to a clinician in your service.

What will happen if I don't want to carry on with the study?

You can stop immediately, if you decide that you don't wish to continue. If that happens I would like to be able to use the data collected up to the point of your withdrawal. I would ask your permission to check if that's ok. There will be no consequence for stopping and it would not be reported to the staff in your unit or community, unless you disclosed something that suggested a risk of possible harm to yourself or others.

What will happen to the results of the research study?

The results will be used in a research project that will be submitted for academic review. The overall findings will also be shared with other researchers and clinical staff with an interest in this area.

Who is organising and funding the research?

The main funding and overseeing organisation is Canterbury Christ Church University. Various NHS Trusts have reviewed and approved the research, though they are not funding the work.

Further information and contact details

If you would like to discuss this further, or have any questions not answered here, please let me know next time I am visiting your service. Dates will be listed on a noticeboard.

If you would like to reach me before the next visit, or discuss something that has come up for you since participating, please contact a member of staff in your service.

ethics approval letter

This has been removed from the electronic copy

ethics approval letter

This has been removed from the electronic copy

R&D approval letter (if applicable),

This has been removed from the electronic copy

8.4 Trust feedback letters

These have been removed from the electronic copy. The research summary submitted as part of the feedback follows.

Research summary

Empathy and mental state inference (MSI) are the mechanisms through which self and other representations are formed and revised. They also facilitate meaningful and attuned interaction. Mentalization-Based Therapy, amongst other models, claims that these skills are degraded in Borderline Personality Disorder (BPD).

Yet support for this purported difference is equivocal and no previous studies have measured skills whilst arousing the attachment system, which is thought to impair empathy and MSI.

Who took part?

27 people meeting BPD criteria and a matched non-patient group had empathy assessed with the Reading the Mind in the Eyes Task and MSI assessed with a modified economic game. This was done before and after a novel attachment system intervention.

What was found?

Empathy skills were less accurate in the BPD group, though times were comparable with non-patients. Post-intervention response times indicated a selective prioritisation effect, though only in non-patients. This is a possible adaptive bias for faster mentalizing with more careful negative affect and more errors in positive affect labelling.

No differences in economic game behaviour were found, though opponent fairness-ratings for a hostile opponent increased post-intervention in the BPD group only. The theoretical links and suggestions for clinical innovation and research development are provided.

How will this help clinicians?

This research may help clarify some of the theoretical foundations of numerous treatments for BPD. Evidence of undifferentiated social cue prioritisation in BPD may help to better understand why some people's struggle in inter-personal situations. In time this research may help the development of interventions that support people during stressful and upsetting times.

About the researcher

Elliott White completed this research in partial fulfilment of the requirements of Canterbury Christ Church University for the degree of Doctor of Clinical Psychology. He can be contacted via epw@eml.cc for further information.

8.5 Copies of measures All materials are provided in Appendix D, except the Zanarini Borderline Personality Severity Scale. This scale has been removed from the electronic copy.