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Examining the shared and unique features of self-concept content and structure in borderline personality disorder and depression.

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8th May 2015

Dear Dr Hofmann,

Journal reference number: COTR-D-14-00213

Many thanks for your recent decision letter regarding our revised submission to Cognitive Therapy and Research: “Examining the shared and unique features of self-concept content and structure in borderline personality disorder and depression.” Please find attached a second revision where we have added the disclosure statement section. The supplemental materials have also been reformatted in line with the journal’s publishing guidelines. As a result, the manuscript and supplemental materials are no longer blind. The Springer COI corresponding author form has also been supplied. If there are any further amendments that you feel are necessary, we would be happy to incorporate them. We look forward to hearing from you in due course.

Yours sincerely,

Davy Evans & Barnaby Dunn

Response to editor

Journal reference number: COTR-D-14-00213

Based on the advice received, I feel that your manuscript could be accepted for publication should you be prepared to undertake additional revisions.

Specifically, I would like to ask you to carefully follow the publication guidelines of the journal. Please also include a paragraph entitled "Disclosures" before the Reference section.

Please list any financial disclosures, funding/support, and whether (and where) the data have already been presented. Please also provide a statement about rights of study participants (i.e., when was consent obtained and which institutional review board approved the study) and state that no animals have been used.

Author response: We thank the editor for the feedback. In this second revision we have added the disclosure statement section. The supplemental materials have also been reformatted in line with the journal's publishing guidelines. The Springer COI corresponding author form has also been supplied. If there are any further amendments that you feel are necessary, we would be happy to incorporate them.

Examining the shared and unique features of self-concept content and structure in borderline
personality disorder and depression.

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Compliance with Ethical Standards:

This study was supported by the UK Medical Research Council (U1055.02.002.00001.01) and was conducted while Davy Evans and Barnaby Dunn worked at the MRC Cognition and Brain Sciences Unit. Davy Evans, Tim Dalgleish, Robert B Dudas, Chess Denman, Maxine Howard and Barnaby D Dunn declare they have no conflict of interest. The data presented in this study were collected as part of Davy Evans's doctoral thesis, and have not been presented elsewhere.

All procedures involving human participants performed in the study were in accordance with the ethical standards of the Cambridge Psychology Research Ethics Committee (CPREC), the Cambridgeshire 2 NHS Research Ethics Committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors. Informed consent was obtained from all individual participants included in the study.

Examining the shared and unique features of self-concept content and structure in borderline personality disorder and depression.

Abstract

A number of clinical theories emphasise self-concept disturbance as central to borderline personality disorder (BPD). To date, however, there has been limited empirical examination of exactly how BPD changes the content and structure of self-concept. Moreover, it is unclear if patterns of self-concept disturbance are unique to BPD or are driven by axis-I comorbidities such as depression. To examine this issue, the present study adopted a dimensional design, examining how performance on a novel adaptation of a well-validated measure of self-concept (the Psychological Distance Scaling Task) was related to BPD and depression symptoms in a sample of 93 individuals with a wide range of symptom severity. While greater BPD severity was associated with less positive and more negative content of self-concept, this was driven by depression symptoms. Similarly, positive content was more diffuse and negative content more interconnected at higher levels of BPD severity, but for positive content, this was most clearly linked to comorbid depression features. In contrast, BPD severity (over and above depression symptoms) was uniquely associated with greater 'clustering' for positive and negative content (i.e. a more fragmented self-concept). This pattern of results lends support to clinical theories arguing that self-concept fragmentation is core to BPD and also supports the utility of dimensional analyses to identify patterns of cognitive-affective disturbance unique to BPD versus those shared with comorbid conditions like depression.

Key words: Self-Concept; Borderline Personality Disorder; Depression; Comorbidity.

Highlights:

- We measure content and structure of self in borderline personality disorder (BPD).
- We develop novel indices on an established measure of self-structure – the Psychological Distance Scaling Task (PDST).

- We control for symptoms of depression to examine specificity of effects to BPD.
- BPD was uniquely associated with a more fragmented self-concept.
- Clinical models of self-concept disturbance in BPD are supported.

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Introduction

1 Identity has been defined in everyday terms as your “knowledge of who you are”
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3 (Baumeister, 1999, p.246). More specifically, identity has been conceptualised as a ‘self-
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5 concept’: a structural psychological framework containing assumptions, beliefs, values and
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7 memories that influence processing of information pertaining to the self (e.g. Greenwald &
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9 Pratkanis, 1984; Marcia, 1980). Within cognitive psychology, self-concept has been defined
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11 as a ‘self-schema’: an internal system of knowledge structures that contain generalisations
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13 and abstractions about the self (Markus, 1977). A distinction has been drawn between
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15 propositional (content; e.g. a positive or negative view of the self) and structural (the degree
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17 to which positive or negative content is coherently organised/interconnected) aspects of the
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19 self-schema (Ingram, Miranda & Segal, 1998).
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24 Disturbances in sense of self have long been associated with poor mental health in
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26 clinical theory. The archetypal example of the association between self-concept disturbance
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28 and psychopathology is perhaps borderline personality disorder (BPD). Identity disturbance
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30 is one of the diagnostic criteria for BPD in the 5th edition of the Diagnostic and Statistical
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32 Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013).
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37 The importance of self-concept disturbances to BPD is reflected in a number of
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39 clinical models which see alterations in self-concept as the core, central component of the
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41 disorder. For example, early psychodynamic theories proposed that BPD in part emerges
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43 from a failure to integrate representations of self and other into a coherent view of self during
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45 development This results in the ‘splitting’ of self-concept into ‘black and white’
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47 unidimensional personal judgements in adulthood, leaving the individual with an unstable
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49 view of the self with little clarity (e.g. the object relations account underpinning transference
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51 focused psychotherapy; Kernberg, 1967). These early models emphasised structural
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53 disturbance in self-concept in BPD but were relatively silent about the specific content of
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55 self-concept. More recent clinical models emphasise both structural and content variation in
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1 self-concept in BPD. For example, the ‘schema mode’ model underpinning schema therapy
2 (Young, Klosko, & Weishaar, 2003) proposes that BPD is characterised by multiple and
3 poorly integrated self-schemata each of which lead to co-activation of particular clusters of
4 emotions, cognitions, assumptions, beliefs, behaviours and ways of relating. Similarly, the
5 ‘multiple self-states’ model underpinning cognitive analytic therapy (CAT; Ryle, 1997)
6
7 proposes that BPD is characterised by a small number of dissociated, poorly integrated self-
8 states, each of which is characterised by a particular template of self in relation to other
9 (referred to as a ‘reciprocal role’). These psychodynamic, schema therapy and CAT models
10 have important differences but all share in common the view that self-concept becomes
11 fragmented and unstable in BPD (henceforth referred to as ‘identity fragmentation’ accounts).
12
13 While not all clinical approaches place such an explicit emphasis on identity fragmentation
14 (e.g. dialectical behaviour therapy: Linehan, 1993; cognitive behavioural therapy, Beck &
15 Freeman, 1990; mentalisation based therapy, Bateman & Fonagy, 1999), they still
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17 acknowledge that self-concept is altered in the disorder and building a cohesive sense of self
18 is an important goal for treatment.
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34 Surprisingly, given the centrality of self-disturbance to BPD theory, there has been
35 relatively little empirical evaluation of exactly how self-concept is altered in BPD. One
36 stream of research has relied on client self-report measures to determine the content of self-
37 concept. Individuals with BPD report negative self-concept on the Rosenberg self-esteem
38 scale (RSE; Rosenberg, 1965; Rüsç et al., 2006). Further, there is evidence from the
39 personality disorder belief questionnaire (Dreessen & Arntz, 1995) of negative assumptions
40 and associations with the self (e.g. “I am an evil person and I need to be punished for it”;
41 Arntz, Dietzel, & Dreessen, 1999). A variety of studies using Young’s Schema Mode
42 Inventory (Young et al., 2007) have confirmed that self-concept content in BPD has common
43 themes, including the ‘detached protector’ (emotional detachment from psychological pain),
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45 ‘punitive parent’ (self-criticism), ‘vulnerable child’ (feelings of loneliness and unlovability)
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1 and ‘angry and impulsive child’ (feelings of intense anger; Arntz, Klokman, & Sieswerda,
2 2005; Jovev & Jackson, 2004; Lobbestael, Arntz, & Sieswerda, 2005; Lobbestael, Van
3 Vreeswijk, & Arntz, 2008; Nilsson, Jørgensen, Straarup, & Licht, 2010).

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5 In terms of how this self-concept content is organised, a number of studies using the
6
7 Structured Interview of Personality Organisation (STIPO; Clarkin, Caligor, Stern &
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9 Kernberg, 2003) have found evidence of a lack of structure in the identity of individuals with
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11 BPD. Dammann et al. (2011), for example, found that clients with BPD reported a self-image
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13 that was altruistic and positive, whilst contradictorily experiencing exclusively negative
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15 emotions. Further, these clients used more superficial and meaningless statements to describe
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17 themselves, indicating that they may have had no coherent sense of self to report. In a large
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19 sample of clients with a diagnosis of BPD, an incoherent, inconsistent and unstructured sense
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21 of self (measured using the STIPO) was related to global functioning and cluster b
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23 personality traits (Hörz et al. 2010). Further, Hörz et al. (2009) found that a ‘prototypical’
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25 borderline profile on the STIPO, that included an unstructured sense of self, was related to a
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27 self-report measure of BPD features. Other studies have used self-report questionnaires to
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29 examine self-structure in BPD. Walter et al. (2009) found that, compared to clients with
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31 depression, those with a diagnosis of BPD reported less integrated representations of the self
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33 on the Inventory of Personality Organisation (IPO; Kernberg & Clarkin, 1995). Using the
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35 Identity Style Inventory (Berzonsky, 1992), Jørgensen (2009) found an association between
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37 BPD and a sense of self that was dictated by situational cues rather than a coherent internal
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39 identity. de Bonis, De Boeck, Lida-Pulik & Féline (1995), using a repertory grid approach,
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41 reported that the self-descriptions of clients with BPD contained more contradictory attributes
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43 than those of control participants.
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53 A small number of studies have examined the thesis that identity disturbance in BPD
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55 may be characterised by *fragmentation* – that is a number of internally consistent but poorly
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57 integrated self-concepts. Pollock, Broadbent, Clarke, Dorrian, & Ryle (2001) and Wildgoose,
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Waller, Clarke, & Reid (2000) found that individuals with BPD reported a subjective sense of self-fragmentation on the Personality Structure Questionnaire. Bennett & Ryle (2005) used an adapted form of the repertory grid, termed the ‘States Description Procedure’, to demonstrate that clients with BPD can recognise and describe the content of their multiple self-states. On the other hand, Parker, Boldero, & Bell (2006), using a repertory card-sorting task (Linville, 1985, 1987), found no significant association between BPD and a measure of multiplicity of selves.

This evidence provides some support for clinical models of self-concept in BPD but there is a need for further enquiry. There are a range of methodological issues with the measures of self-concept used in these studies. First, the studies described above (perhaps with the exception of the repertory methods) relied directly on self-report measures that require high levels of insight and emotional intelligence to answer accurately, which may at times be compromised in BPD (Gardner & Qualter, 2009; Leible & Snell, 2004). Second, these self-report measures assess awareness of trait self-concept, even though trait judgements about the self in BPD may be unreliable or invalid. Using an ambulatory-monitoring technique, for example, Ebner-Priemer et al. (2006) found that adults with BPD had a negative recall bias: they underestimated retrospective positive emotions and overestimated retrospective negative emotions. Given that an important feature of BPD is the unstable, fluctuating, volatile nature of the self-concept (Bender & Skodol, 2007; Fuchs, 2007), a more momentary, present-state measure of self-concept may have greater reliability and validity than a global one.

A further limitation of these methods is that they are predominantly restricted to assessing either the content or structure of self-concept, but not both. It is possible that structural and propositional aspects of self-concept may interact with one another. For example, it is conceivable that disturbance in self-concept could vary between positive and negative aspects of the self. This potential *interaction* between the structural and

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propositional aspects of the self-concept has been largely neglected in BPD research. The one exception to this is that Wilkinson-Ryan & Westen (2000) acquired clinician-reports about clients with BPD, while assessing both propositional *and* structural aspects of self-concept. They found disturbances in both content and structure, citing evidence of lack of commitment, absorption in one particular role and a lack of coherence and inconsistency of self that was both subjectively felt and objectively evident. However, clinician-reports, rather than being a true assessment of the client's self-concept, may reflect clinicians' implicit generalisations about the nature of self-concept disturbance in BPD. More work is therefore needed examining the interaction between propositional and structural aspects of the self, using measures that do not rely on clinician self-report.

A critical issue that none of these studies have addressed is whether the pattern of deficits observed is genuinely driven by BPD or reflects underlying axis-I comorbidities. Only a minority of clients seen in the clinic have 'pure' BPD and instead it typically coexists with depression, anxiety and substance abuse (Zanarini et al., 1998). Major depressive disorder is the most ubiquitous comorbidity found in BPD, with estimates of lifetime prevalence of MDD in BPD as high as 83% (Zanarini et al., 1998). This high rate of comorbidity in part reflects the significant degree of symptom overlap between MDD and BPD (Beatson & Rao, 2012), with both disorders being characterised by elevations in negative affectivity. For example, chronic dysphoria seen in BPD is very similar to the sadness and worthlessness experienced in MDD (Abela, Payne & Moussaly, 2003). This high degree of overlap in symptoms means it is hard to establish if patterns of self-concept disturbance in BPD reviewed above reflect depression, BPD or a combination of the two (Cramer, Waldrop, van der Maas & Borsboom, 2010). This issue is particularly pertinent given that depression has been reliably associated with alterations in self-concept in its own right (e.g. Dozois & Dobson, 2001a, see below). In other words, it may be the case that

particular features of BPD self-concept disturbance are specific to BPD, whereas other aspects are instead driven by underlying depression.

The standard approach in the literature to demonstrate specificity between disorders has been to contrast individuals with pure versus comorbid diagnoses (e.g. Dozois & Dobson, 2001b; Connolly, Eberhart, Hammen & Brennan, 2010; Levitan, Rector, Sheldon & Goering, 2003; McGlashan, 1987; Wittchen, Carter, Pfister, Montgomery & Kessler, 2000). For example, individuals with a pure diagnosis of BPD, a pure diagnosis of depression, and dual diagnosis of both conditions can be contrasted. However, given that a large majority of clients with BPD will at some point in the lifespan meet diagnostic criteria for depression, recruiting a ‘pure’ BPD group is both logistically challenging and does not accurately reflect clinical reality. Even in individuals with BPD without a comorbid formal diagnosis of depression, it is highly likely there will be elevations in depression symptoms, which may significantly impact on clinical outcomes (see Shea, Widiger & Klein, 1992) and a diagnostic approach will struggle to take this into account (Cramer et al., 2010).

An alternative way to examine the specificity of self-concept disturbance in BPD would be to adopt a dimensional framework, assessing if BPD symptom severity predicts changes in self-concept when covarying depression symptom severity. Such an approach makes it possible to establish if a particular symptom dimension, over and above general psychopathology severity, is associated with changes in self-concept. Similar methods have been used to distinguish information processing profiles associated with depression versus anxiety. Work using the tripartite model of mood disorders has shown that, for example, depression-specific anhedonic and anxiety-specific anxious arousal symptoms have unique effects on a variety of cognitive processes (Dunn et al., 2010; Dunn, Stefanovitch, Buchan, Lawrence, & Dalgleish, 2009).

While a number of studies have successfully deployed dimensional designs when examining cognitive-affective processing in BPD (Chapman, Leung, & Lynch, 2008;

Chapman, Dixon-Gordon, Layden, & Walters, 2010; Evans et al., 2013; Parker et al., 2006; Shea, Widiger & Klein, 1992; Siever & Davis, 1991; Trull, 1995), as far as we aware no one has used these to look at whether patterns of processing are specific to BPD versus depression. Given previously high correlations found between dimensional measures of BPD and depression (Trull, 1995), it is likely that multicollinearity will lead to significant effects for individual predictors being masked (i.e. work in the opposite direction to specificity predictions). Therefore, this dimensional approach provides a very stringent test of whether particular patterns of self-concept disturbance are unique to BPD symptoms. This approach resolves the issue of having to recruit artificially ‘clean’ groups with a single diagnosis and also make it possible to take into account elevations of symptoms of a particular disorder that would not meet diagnostic threshold¹.

In summary, the profile of self-concept disturbance in BPD has yet to be satisfactorily characterised. It is important to determine in which ways exactly the content and structure of self-concept is disturbed in BPD, so that therapies can be optimised to more precisely formulate and target these alterations. The present study therefore aimed to further characterise the nature of self-concept disturbance in BPD using a dimensional design, in particular establishing if certain patterns of self-concept disturbance are specific to BPD symptoms or are driven by comorbid depressive symptoms. A limitation in dimensional designs can be insufficient sampling of high scorers on the symptom dimension of interest, meaning that the population is not clinically representative. This can significantly limit the generalizability of the results to the clinical domain. In the present study, we therefore made particular efforts to recruit individuals at the high end of the borderline severity spectrum. We confirmed the fact that the sample was clinically representative by using a clinical interview to determine that a significant proportion of individuals fully met DSM-V diagnostic criteria for borderline personality disorder and also by assessing the proportion of individuals who scored above the diagnostic cut-offs on symptom severity measures.

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To address the limitations of previous studies that have examined self-concept in BPD, we sought a more objective measure of momentary self-concept, that could index both structural and propositional aspects simultaneously. Moreover, to provide a stringent test of BPD specificity we looked for a measure of self-concept that has previously been robustly linked to depression. The Psychological Distance Scaling Task (PDST; Dozois & Dobson, 2001b) is one such task, but as far as we are aware has never been used before in BPD.

The PDST was developed as a method for measuring the coherence and interconnectedness of self-concept in depression. In the PDST, participants rate interpersonal adjectives (e.g. “Alone”, “Outgoing”) on a grid of two dimensions: valence (positive to negative) and self-reference (like-me to not like-me), and the average distance is calculated between the adjectives rated as self-referent (mean ‘interstimulus distance’). This is assumed to represent psychological space, such that words placed distantly on the PDST grid by the participant are not closely associated (interconnected) in their self-concept (see Figure One, panel i for a depiction of the task). The interconnectedness index is calculated independently for positive and negative content, reflecting the fact that positive and negative aspects of the self-concept may be structured differently (see Figure One, panel ii; also Woolfolk, Novalany, Gara, Allen, & Polino, 1995) and play different roles in shaping subjective experience (Morgan & Janoff-Bulman, 1994). The PDST has been able to reveal an interaction between structural and propositional aspects of the self-concept in depression, such that positive aspects of the self are diffusely organised, while negative aspects of the self are highly interconnected (Dozois, 2002; Dozois & Dobson, 2001b). This pattern becomes more marked with increasing number of depressive episodes (Dozois & Dobson, 2003).

INSERT FIGURE 1 HERE WITH FOLLOWING CAPTION:

1 Figure 1: The PDST as a measure of self-concept structure. Panel i). For each adjective,
2
3 participants place it on a 2-D grid to indicate its perceived valence and self-reference. Two
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5 adjectives separated by a small interstimulus distance (filled circles) are assumed to be
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7 closely associated (interconnected) in the participant's self-concept. Two adjectives separated
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9 by a large interstimulus distance (open circles) are assumed to be poorly associated
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11 (interconnected) in the participant's self-concept. Panel ii). Structure of self-concept can vary
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13 as a function of content. Here, positive content (open circles) is diffuse (low
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15 interconnectedness), while negative content (filled circles) is coherent (high
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17 interconnectedness). Panel iii). Example A and B both have the same mean interstimulus
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19 distance, but while set A has no clear structure to it (i.e. is globally diffuse), set B is formed
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21 of two distinct clusters of words (i.e. is fragmented). This is not captured by previous analyses
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23 of the PDST.
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1 The validity of the PDST as a structural measure of self-concept organisation has been
2 established across a number of studies. PDST interconnectedness scores converge with other
3 established indicators of self-structure (Dozois & Dobson, 2001a, 2001b) and are
4 significantly related to, but not entirely accounted for by, questionnaire measures of cognitive
5 organisation, indicating “that the PDST provides different information than simply the
6 endorsement of negative thoughts and beliefs” (Dozois, 2002, p.423).
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12 Therefore, the PDST seems well suited to interrogate the interaction between
13 propositional and structural features of identity disturbance in BPD and to clarify whether
14 these are unique to BPD versus depression. However, a number of minor modifications are
15 required to optimise the PDST for this purpose. First, a critical issue with the standard
16 analytic approaches to the PDST is that they are not well suited to detecting patterns of
17 identity fragmentation in BPD. In particular, the same interconnectedness score would be
18 observed for a self-concept that is generally diffuse versus one that is clustered into coherent,
19 distinct but spatially separated clusters (see Figure One, panel iii). Therefore, a novel index of
20 clustering of self-concept – the *standard deviation* of the interstimulus distances – was
21 developed in the present study to make it possible to evaluate fragmentation-
22 conceptualisations of self-concept disturbance in BPD. A larger standard deviation indicates
23 increased clustering, consistent with the multiple self-state and schema mode models of BPD,
24 while a smaller standard deviation indicates a less fragmented self-concept. Second, the
25 standard PDST asks participants to rate trait adjectives, making it vulnerable to confounds
26 around fluctuating self-concept and retrospective memory biases discussed above. Therefore,
27 the PDST was adapted in the present study to measure present-state self-concept, asking
28 participants to rate adjectives in terms of how they felt at the present moment (of testing).
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Third, in addition to the interconnectedness index and novel clustering measure, we also
assessed whether the content of self-concept in BPD is globally positive or negative, counting
the number of positive and negative adjectives rated as ‘like me’.

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Our overarching hypothesis was that general self-concept disturbance in BPD would be largely driven by comorbid depression symptoms (cf Dozois, 2002; Dozois & Dobson, 2001a,b, 2003), while identity *fragmentation* (clustering) would be uniquely driven by BPD symptoms. Therefore, while BPD severity would be associated with an increasingly more negative, less positive self-concept, this would no longer hold when controlling for depression symptom severity (Hypothesis One). Similarly, we predicted that greater BPD symptom severity would be characterised by low levels of interconnectedness of both positive and negative content, but this would no longer be significant when considering the impact of depression symptom severity (Hypothesis Two). In contrast, increasing BPD features would be associated with increased levels of clustering of positive and negative content and this would hold even when controlling for depression symptom severity (Hypothesis Three).

27 Methods

28 Participants

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Participants were 93 (61 female) individuals (18 – 65 years of age; mean age=33.23 years; SD=13.52 years), falling in the normal IQ range (National Adult Reading Test; Nelson, 1982; estimated full scale IQ=112.83, SD=10.69). Participants were sampled to represent a wide range of borderline symptom severity (up to and including a diagnosis of BPD), specifically over-sampling the high end of the range to achieve a normal distribution of BPD features and to ensure that the sample was clinically representative. Given the high comorbidity with depression, we assumed that this would also result in a significant range of depression severity in the sample. Participants were primarily recruited from a community database of individuals willing to participate in research studies. We pre-screened participants on the database for BPD symptoms using the McLean screening instrument (Zanarini et al., 2003; 62 recruited). Moreover, we additionally recruited individuals with elevated BPD features by advertising in local newspapers and student bulletins for individuals experiencing

emotion dysregulation (20 recruited). We also recruited participants from three specialist personality disorder services in the UK National Health Service (NHS; 11 recruited).

Exclusion criteria were a history of psychosis, major history of neurological or neurodegenerative disorders, and current suicidal intentions assessed by a screening interview at the outset of the testing session. Twenty three participants were taking anti-depressant or anti-anxiety medication.

Materials

Self-report and diagnostic measures

The McLean Screening Instrument for BPD (MSI-BPD; Zanarini et al., 2003) was used to screen for BPD features during recruitment (see above). Participants answer yes or no to each of ten items, each of which assesses the presence of one of the DSM-IV criteria for BPD (two questions assess the paranoia/dissociation criterion). There was a broad spread of scores on the MSI-BPD (mean=5.10; SD=3.59; range=0 to 10) with 46 participants scoring 7 or more (the accepted clinical cut off for BPD diagnostic sensitivity; Zanarini et al., 2003).

The Personality Assessment Inventory – Borderline Subscale (PAI-BOR; Morey, 1991) – a continuous measure of BPD features – was used as the primary measure of BPD symptomology. The PAI-BOR is a well-established, validated and sensitive psychometric instrument that has been used in a range of previous continuous studies (Chapman et al., 2008; Evans et al., 2013; Trull, 1995). Therefore, we selected it over less widely applied continuous analytic methods (e.g. diagnostic symptom count approaches). Twenty four items, rated on a four-point scale ('in general': *false, slightly true, mainly true, very true*), assess features characteristic of BPD (affective instability, identity problems, negative relationships and self-harm). There was a broad spread of scores on the PAI-BOR (mean=29.38; SD=14.97; range=1 to 64) with 32 participants scoring >38 (the accepted clinical cut off for BPD diagnostic sensitivity; Trull, 1995). In the present sample, the internal consistency of the PAI-BOR was excellent ($\alpha=.92$).

1 The Beck Depression Inventory – II: Revised Edition (BDI-II; Beck, Steer, & Brown,
2 1996) was used as a measure of depression severity. Each of 21 multiple-choice items (scored
3 0 – 3) reflects experience of different symptoms of depression (e.g. sadness, low energy).
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5 Participants choose the statement that has been most representative of them in the past seven
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7 days. The maximum score on the BDI-II is 63. There was a broad spread of scores
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10 (mean=14.20, SD=13.15; range=0 to 46). 53 participants met criteria for minimal depression
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12 (BDI-II score=0 – 13); 15 for mild depression (BDI-II score=14 – 19); 9 for moderate
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14 depression (BDI-II score=20 – 28); and 16 for severe depression (BDI-II score=29 – 63). In
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16 the present sample, the internal consistency of the BDI was excellent ($\alpha=.91$).
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20 To confirm that our sample was clinically representative (i.e. we were adequately
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22 recruiting from the severe end of the BPD spectrum), BPD diagnostic status was also
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24 assessed using the BPD section of the Structured Clinical Interview for DSM-IV (SCID-II;
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26 First, Spitzer, Gibbon, Williams, & Benjamin, 1994). The SCID-II was administered by
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28 authors DE and MH, who were trained and supervised by the corresponding author (BD).
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30 Inter-rater reliability analyses were precluded by the fact that no one participant was assessed
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32 by both interviewers. Given the primary dimensional focus of the present study, no other
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34 diagnoses were assessed to avoid over-burdening participants and due to time constraints.
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37 Indicating our sample was clinically representative, thirty five individuals met diagnostic
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39 criteria for BPD (five or more criteria met), including eleven recruited from specialist NHS
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41 services. A further ten (total of forty five) reported significant BPD features (four or more
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43 criteria met).
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49 **Psychological Distance Scaling Task**

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51 To measure self-concept organisation, participants completed a current-state version
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53 of the PDST (Dozois & Dobson, 2001b). Participants were shown a square grid (800 x 800
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55 pixels; 23.5 x 23.5 cm²) on a computer screen. The x-axis was a self-descriptiveness scale
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57 and the y-axis a valence scale. The scales were continuous, allowing scores on each scale to
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1 range from -400 (x-axis: “Very much like me”; y-axis: “Very Negative”) to +400 (x-axis:
2 “Not at all like me”; y-axis: “Very Positive”). Participants were asked to rate 30 positive (e.g.
3 “admired”, “communicative”, “outgoing”, “selfless”, “desirable”) and 30 negative (e.g.
4 “criticised”, “bossy”, “demanding”, “lonely”, “resentful”) interpersonal adjectives on the two
5 dimensional grid. The adjectives were displayed at the bottom of the screen, and participants
6 placed each word on the grid using the cursor, until all 60 adjectives were rated. After each
7 trial, participants were given the opportunity to alter their rating before proceeding to the next
8 word. Adjectives were presented in a randomised sequence for each participant to control for
9 any potential order effects. Participants were told to rate the adjectives based on how they felt
10 at that present moment in time, to avoid retrospective memory biases and issues related to
11 unstable self-image. During the task, the prompt: “Remember to rate the words based on how
12 you feel right now at the present moment in time” was given every 15 words. Participants
13 completed 10 practice trials before they started rating the interpersonal adjectives. The
14 coordinates of each adjective rating were stored by the computer (x- and y- axis pixel values).
15 The adjectives used in the PDST were based on those used by Dozois & Dobson (2001b),
16 with five words changed (e.g. “Gossiper”, “Gifted”) as they were felt to reflect global as
17 opposed to current-state self-concept². Several measures were extracted from participants’
18 PDST ratings. Only the words rated on the “Like me” side of the grid were included (to
19 ensure items reflect idiographic self-concept).

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44 As a content measure, the number of positive and negative words endorsed as “like
45 me” were counted (i.e. valence of self-concept). As a measure of the structural cohesiveness
46 of self-concept, interconnectedness was calculated following Dozois & Dobson (2001b). This
47 is the *mean* Euclidean distance between adjective ratings in the two dimensional grid-space.
48 A *smaller* mean interstimulus distance indicates a *greater* degree of interconnectedness. A
49 separate score was generated for positive and negative content. The calculation used for this
50 measure is:
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$$\frac{\sum_{k=1}^{k=n-1} \sum_{i=k+1}^{i=n} \left(\sqrt{(x_k - x_i)^2 + (y_k - y_i)^2} \right)}{\frac{n(n-1)}{2}}$$

where n=number of adjectives rated as self-descriptive, x=x co-ordinate of adjective and y=y co-ordinate of adjective. These variables were positively skewed and were therefore log transformed prior to analysis.

‘Clustering’ was computed as a novel measure of the fragmentation of self-concept. Understood as the *standard deviation* of the interstimulus distances, this was calculated ideographically using distances between each participant’s self-endorsed adjectives, separately for positive and negative content. The calculation for the standard deviation of the Euclidian distances between adjective ratings is:

$$\sqrt{\frac{\sum_{k=1}^{k=n-1} \sum_{i=k+1}^{i=n} \left(\left(\sqrt{(x_k - x_i)^2 + (y_k - y_i)^2} \right) - a \right)^2}{\frac{n(n-1)}{2} - 1}}$$

where a=

$$\frac{\sum_{k=1}^{k=n-1} \sum_{i=k+1}^{i=n} \left(\sqrt{(x_k - x_i)^2 + (y_k - y_i)^2} \right)}{\frac{n(n-1)}{2}}$$

where n=number of adjectives rated as self-descriptive, x=x co-ordinate of adjective and y=y co-ordinate of adjective. These variables were positively skewed and were therefore log transformed prior to analysis.

Standard deviation values are likely to be confounded by set-size, which was therefore controlled for in the clustering analysis. Residuals were computed by regressing the log-transformed standard deviation measure on the number of items used to calculate that

measure. A more positive value of this measure indicates increasing clustering of self-concept.

Procedure

All participants gave written informed consent. Ethical approval for the study was obtained from Cambridge Psychology Research Ethics Committee (CPREC) and Cambridgeshire 2 NHS Research Ethics Committee. Participants were given an honorarium of £6 per hour for their time and a £3 contribution was made towards their travel expenses.

The study took place in one laboratory session, as part of a larger testing battery across three weekly sessions (including other measures not reported here not related to the present study). Participants' data from these other measures have been published elsewhere (e.g. Evans et al., 2013) or are being prepared for submission. After consent, screening and the SCID-II interview, participants' IQ was estimated using the NART, after which the PDST was administered. The PAI-BOR and BDI-II were completed afterwards. The PDST was programmed in Microsoft Visual Basic 2008 and presented on a PC.

Results

Alpha was set at .05 and the results of two-tailed analyses are reported throughout. PAI-BOR scores were not significantly related to age, gender, or IQ (see Table One). Medication status (coded 0 for not taking psychotropic medication and 1 for taking

Table 1

Correlation matrix of study variables

Variable	1	2	3	4	5	6	7	8	9	10	11
1. PAI-BOR score											
2. BDI score	.661**										
<i>Demographic variables</i>											
3. Age	.077	.092									
4. Estimated IQ	.016	.055	.213*								
5. Gender	-.038	.027	.103	.009							
6. Medication Status	.379**	.463**	.395**	.146	.096						
<i>PDST variables</i>											
<i>Content</i>											
7. Positive	-.236*	-.383**	.068	-.197†	.079	-.063					
8. Negative	.589**	.645**	.233*	.150	-.041	.312**	-.326**				
<i>Interconnectedness</i>											
9. Positive	.268**	.290**	-.054	.046	.051	.011	-.814**	.248*			
10. Negative	-.422**	-.438**	-.179	-.199†	-.063	-.183†	.369**	-.810**	-.285**		
<i>Clustering</i>											
11. Positive	.175†	.051	.124	-.165	.216*	.020	.000	.025	.441**	.084	
12. Negative	.374**	.238*	.147	-.008	.213†	.180	.031	.000	.088	.358**	.300**

† p < .1, * p < .05, ** p < .01

1 psychotropic medication) was associated with greater BPD features, $r=.38$, $p<.01$. Age was
2 significantly associated with a higher number of self-rated negative adjectives, while gender
3 was significantly associated with greater clustering of negative material (see Table One).
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5 Consequently, analyses were repeated controlling for age (in content analyses), and gender
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7 (in clustering analyses), to assess whether these variables confounded any significant effects
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9 of BPD. As expected based on previous findings of high comorbidity between depression and
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11 BPD, borderline severity was positively associated with depression symptoms, $r=.66$, $p<.01$.
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13 This degree of correlation implies a high but not prohibitive level of multicollinearity in these
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15 two variables.
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19 Means and standard deviations of PDST self-schema indices are reported in Table
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21 Two. To test the study hypotheses, separate ANCOVAs were estimated for the content and
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23 structural indices, with word valence (positive, negative) as a within-subjects factor and PAI-
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25 BOR score as a between-subjects continuous covariate (mean-centred to reduce the statistical
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27 problem of multicollinearity; Aiken & West, 1991). Any significant effects or interactions
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29 were resolved using (Pearson's) zero order correlations. To examine the unique contributions
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31 of BPD to self-structure, the above analyses were repeated, additionally entering depression
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33 as a mean-centred continuous covariate.
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Table 2

Means and standard deviations of PDST self-concept measures.

PDST variables	Positive words	Negative words
Content (number of words rated as self-referential)	19.55 (5.80)	9.19 (6.79)
Interconnectedness (log transformed mean interstimulus distance)	2.92 (.48)	3.81 (.79)
Clustering^a (log transformed standard deviation of interstimulus distances)	4.71 (.33)	4.75 (.48)

Note: Data are means (standard deviations in parentheses).

^a Although in the analyses, the clustering variable was residualised, this data is not presented in this table, as the mean of a set of residuals is always 0, and therefore meaningless.

In the content analysis, there was a significant main effect of Valence, $F(1,91)=129.31, p<.001, \eta^2=.51$, and PAI-BOR score, $F(1,91)=13.392, p<.001, \eta^2=.13$, which were qualified by a significant interaction of Valence and PAI-BOR score, $F(1,91)=34.26, p<.001, \eta^2=.13$. More positive than negative words were rated as self-referent. Increasing borderline symptoms were associated with more words being rated as self-referent, but this pattern varied with word valence. Zero-order correlations demonstrated that increasing borderline symptom severity was associated with a greater number of negative adjectives,

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$r=.59, p<.001$, and a smaller number of positive adjectives, $r=-.24, p=.02$, rated as being self-referential³.

We repeated this analysis when additionally entering depression severity. The main effect of PAI-BOR score remained significant, $F(1,90)=4.95, p=.03, \eta^2=.05$, but the PAI-BOR by valence interaction no longer held, $F<1$. In contrast, there was no main effect of BDI-II, $F<1$, but there was a significant Valence by BDI-II interaction, $F(1,90)=24.74, p<.001, \eta^2=.09$. This significant interaction was resolved using partial correlations (i.e. relationship with depression when covarying BPD). Depression severity was uniquely associated with a smaller number of positive adjectives, $r_p=-.31, p<.01$, and a greater number of negative adjectives, $r_p=.42, p<.001$, being rated as self-referential. In summary, while a more negative, less positive self-concept was associated with depression, BPD was associated with a general tendency to rate more words as self-referent regardless of valence.

In the interconnectedness analysis, ten participants were excluded as they did not rate at least two positive or negative adjectives as self-referent (precluding calculation of the interconnectedness index). There was a significant main effect of Valence, $F(1,81)=99.02, p<.001, \eta^2=.48$ and of PAI-BOR score, $F(1,81)=4.42, p=.04, \eta^2=.05$, again qualified by a significant interaction of Valence and PAI-BOR score, $F(1,81)=26.13, p<.001, \eta^2=.13$. The interconnectedness index was greater for negative than positive words (i.e. negative content was more diffuse). Zero-order correlations demonstrated that increasing borderline symptoms were associated with greater interconnectedness of negative self-referent adjectives (i.e. smaller interstimulus distances, $r=-.42, p<.001$), and lesser interconnectedness of positive self-referent adjectives, (i.e. greater interstimulus distances) $r=.27, p=.01$).

When repeating this analyses when additionally entering depression severity, the main effect of PAI-BOR no longer held, $F<1$, but the interaction between Valence and PAI-BOR remained significant, $F(1,80)=5.29, p=.02, \eta^2=.03$. Partial correlations (relationship with BPD when covarying depression) revealed that BPD features were not uniquely significantly

associated with interconnectedness of positive words, $r_p=.17$, $p=.13$, but was trend significantly associated with greater interconnectedness of negative words, $r_p=-.21$, $p=.06$.

There was no unique main effect of BDI-II score, $F(1,80)=1.02$, $p=.32$, $\eta^2=.01$, but there was a significant Valence by BDI-II score interaction, $F(1,80)=8.25$, $p<.01$, $\eta^2=.04$. When covarying BPD, depression severity was uniquely significantly associated with lesser interconnectedness of positive words, $r_p=.24$, $p=.04$, and greater interconnectedness of negative words, $r_p=-.24$, $p=.03$. In summary, a more diffuse positive self-concept was uniquely associated with depression symptoms, while a more coherent negative self-concept was shared across both depression and BPD symptom dimensions.

In the clustering analysis, nineteen participants were excluded as they did not rate at least three positive or negative adjectives as self-referent (precluding calculation of the clustering index). There was no significant main effect of Valence, $F(1,72)=.50$, $p=.48$, $\eta^2=.01$, nor any significant interaction of Valence and PAI-BOR score, $F(1,72)=1.91$, $p=.17$, $\eta^2=.03$. There was a significant main effect of PAI-BOR score, $F(1,72)=16.52$, $p<.001$, $\eta^2=.19$. To examine this main effect, the mean of the two clustering indices was calculated; this measure was significantly positively associated with PAI-BOR score, $r=.43$, $p<.001$. When additionally entering depression severity, the main effect of PAI-BOR score remained significant, $F(1,71)=12.48$, $p=.001$, $\eta^2=.15$, and the interaction between PAI-BOR and valence remained non-significant, $F<1$. There were no main or interaction effects of BDI severity, $F_s<1$. In summary, increased levels of clustering in the self-concept were uniquely associated with BPD⁴.

An identical pattern of results emerged when entering medication status, age and gender as additional covariates. This implies that these variables did not significantly bias the results.

Discussion

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A number of clinical models of BPD propose identity disturbance is central to BPD but there has been limited empirical work characterising the exact nature of this disturbance to date. The present study explored how BPD severity impacts on self-concept, adapting a previously validated indirect measure of self-structure (the PDST) that can model potential interactions between content and structure of self-concept. In addition, we looked at whether associations found with the PDST were unique to BPD or were driven by comorbid depression symptoms.

Consistent with Hypothesis One, increasing BPD severity was associated with a more negative and less positive self-concept. However, also as predicted, when controlling for comorbid depression symptoms these relationships with BPD were no longer significant. Partially supporting Hypothesis Two, increasing BPD severity was associated with less interconnected positive self-concept (i.e. greater positive structural diffusion) and more interconnected negative self-concept (i.e. less negative structural diffusion). The positive interconnectedness association with BPD no longer held when controlling for depression symptoms, but BPD symptoms still trend significantly predicted greater negative interconnectedness when controlling for depression. As predicted in Hypothesis Three, increasing BPD severity was related to increased structural fragmentation of both positive and negative content and this held even when controlling for depression symptom severity.

These findings have a number of implications for the prevailing clinical models of self-concept in BPD. A more negative, less positive sense of self in BPD (indicated by more negative words and fewer positive words endorsed as self-referential) is broadly consistent with the emphasis on a negative cognitive bias in cognitive therapy accounts of the disorder (e.g. Arntz et al., 1999). However, the present findings suggest that this may be due to co-occurring depressive symptoms, consistent with the findings of Abela et al. (2003) that individuals with BPD may have greater cognitive vulnerability to depression, including low

self-esteem. This is further evidenced by the fact that, in the present study, an incoherent positive self-concept in BPD was also accounted for by underlying depressive symptoms.

A feature that the present findings suggest is shared by both depression and BPD is a well interconnected, coherent negative self-concept. This is consistent with the depression literature (Dozois, 2002; Dozois & Dobson, 2001a, 2001b, 2003), but potentially conflicts with previous findings of overall identity diffusion in BPD from self-report questionnaire (e.g. Jørgensen, 2009) and clinician report (Wilkinson-Ryan & Westen, 2000). While the BPD association was only trend significant, this may have been due to inflated Type II error associated with the collinearity of participants' PAI-BOR and BDI scores. Regardless, this inconsistency demonstrates the importance of measuring self-structure using a variety of approaches and examining the interaction of structural and propositional aspects of the self-concept, something that has not been considered in previous studies. Future studies need to simultaneously take explicit client/clinician questionnaire measures and indirect measures of self-structure on the same sample to validate the present findings.

Unique to BPD was the finding of increased clustering of the self-concept in BPD. This is consistent with clinical models of BPD that emphasise identity disturbance (e.g. Kernberg, 1967; Ryle, 1997; Young et al., 2003), in particular the notion that self-structure is fragmented in BPD into largely dissociated self-concepts. This replicates explicit self-report data of fragmented self found in previous self-report studies (e.g. Bennett & Ryle, 2005; Pollock et al., 2001; Wildgoose et al., 2000) for the first time using a robust experimental measure.

These findings if replicated and extended are of potential relevance in the clinic. First, if identity disturbance in BPD is indeed characterised by structural fragmentation, this suggests a particular role for clinical approaches that emphasise the importance of helping clients identify and then integrate disconnected aspects of their self-concept (e.g. TFP, SFT and CAT). Secondly, they suggest that when treating clients with a BPD presentation who

are also presenting with elevated depression symptoms, it may be useful to attend to weakening negative self-concept (reducing negative content and weakening negative interconnectedness) and strengthening positive self-concept (increasing positive content and bolstering positive interconnectedness). This is a central goal of cognitive therapy (Beck & Freeman, 1990) and classic cognitive techniques may be helpful here.

Conversely, the present results also suggest that interventions for depression should consider the impact of co-occurring BPD symptoms on sense of self. For example, identity *fragmentation* may be an important factor to consider in the formulation of depressed clients with marked BPD symptoms. Classic cognitive behavioural formulation and intervention approaches may not be effective for addressing such identity disturbance, which could partly account for why clients with comorbid personality disorders do less well in depression CBT trials (Fournier et al., 2008). It may therefore be useful to adapt classic CBT formulation approaches to more richly model the dynamic, unstable nature of self-concept in BPD.

The present study further validates the PDST as a sensitive measure of self-concept in understanding psychopathology, including for the first time an axis II condition like BPD. A particular strength of the PDST relative to previous client and clinician self-report measures used in the BPD literature (e.g. Jørgensen, 2009; Pollock et al., 2001; Young et al., 2007) is that it measures self-structure in an indirect fashion, meaning that it does not rely on (potentially unreliable) insight into self-structure. A further strength of this task is that the interpersonal nature of the adjectives used reflects the idea that multiple self-states in BPD may be rooted in an interpersonal context (Cohen & Gara, 1992). Moreover, we have introduced a novel index on the PDST (a measure of self-fragmentation) and also adapted it to a present state rather than trait form, which broadens potential applications of this paradigm for future psychopathology research. The clustering PDST index increases the task's discriminant validity by making it possible to differentiate between providing a more nuanced alternative to the more standard interconnectedness index. The present novel

1 extension of the PDST requires that this new index needs further evaluation to establish its
2 construct and convergent validity, particularly with theory-specific constructs such as schema
3 modes and reciprocal roles.
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5 The present study also supports the view that a dimensional approach can be useful
6 for examining specificity of cognitive-affective processes in commonly co-occurring
7 psychopathologies (see Dunn et al., 2009, 2010). Here, we have been able to identify
8 theoretically meaningful unique effects of both BPD and depression symptom severity,
9 despite a high (though not statistically problematic) degree of collinearity between the two
10 symptom dimensions. As far as we are aware this is one of the first studies to demonstrate
11 such an approach can be used in the axis-II domain. This is interesting given that previous
12 attempts to show disorder specific profiles on the PDST using diagnostic rather than
13 dimensional approaches were not successful. For example, individuals with social phobia and
14 major depressive disorder showed statistically equivalent patterns on all indices of cognitive
15 organisation on the PDST (Dozois & Frewen, 2006). This raises the possibility that
16 dimensional approaches may be particularly sensitive for identifying unique patterns of
17 information processing in clinically heterogeneous samples (see Dunn et al., 2009, 2010). To
18 test this possibility, what is now needed are studies directly comparing dimensional versus
19 categorical analyses within the same sample.
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41 While the present results establish that a dimensional approach can reveal unique
42 patterns of information processing linked to BPD versus depression, a significant limitation
43 of this methodology is that it focuses solely on current symptom severity. It has long been
44 argued that psychopathology leads to lasting changes in information processing that persists
45 even after recovery and confers vulnerability to relapse (e.g. differential activation hypothesis
46 of depression; Lau, Segal & Williams, 2004; Teasdale, 1988). A focus on current symptom
47 severity does not take into account the ‘scarring’ in information processing that can come
48 about from previous mental health difficulties. Diagnostic frameworks also struggle in this
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1 regard, because it becomes even more difficult (and even less of a reflection of clinical
2 reality) to find ‘pure’ exemplars to a particular psychiatric diagnosis if past in addition to
3 current diagnostic status needs to be taken into account. Moreover, diagnostic frameworks
4 cannot capture the potential scarring effects of previous elevations in symptoms that did not
5 meet diagnostic threshold. There is a need to develop methodological approaches that can
6 properly model the impact of past mental health on current functioning.
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12 There are several other potential limitations to the present study that also need to be
13 evaluated. Firstly, it is important to consider whether the PDST genuinely measures self-
14 concept or rather whether it indexes mood state. In our view, it is likely that the PDST is a
15 valid measure of self-structure and is not simply a proxy for mood state. As discussed
16 previously, the PDST has convergent validity with a number of other established measures of
17 self-structure (cf. Dozois & Dobson, 2001a, 2001b, Dozois, 2002). Further, the adjectives
18 used in the PDST were of an interpersonal nature and were not simply mood terms (e.g.
19 “Generous”, “Selfless”, “Bossy”).
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32 Secondly, because the PDST indices were calculated ideographically, the number of
33 self-referent adjectives differed between participants. If participants endorsed very few items,
34 then it became more difficult to accurately assess clustering. We minimised this confound by
35 initially excluding participants with too few self-referent adjectives (20% of sample) and then
36 by controlling for number of self-referent adjectives during subsequent calculation of the
37 clustering measures in the remaining sample.
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46 Thirdly, an important claim of identity fragmentation accounts of BPD is that self-
47 concept, in addition to being more clustered, is also inherently unstable. The present results
48 cannot speak to this central issue. Future work is needed that looks at the stability of self-
49 concept in BPD across time to test this claim. Clinical theory would predict that BPD severity
50 would be linked to greater instability in the self-concept indices outlined in the present study
51 (i.e. a less stable sense of self).
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Fourthly, we examined the specificity of findings to BPD in relation to depressive symptoms only. This makes sense given that depression is the most ubiquitous comorbidity with BPD (Zanarini et al., 1998). However, it will be important for future research to examine if these effects are specific to BPD when controlling for symptom severity of other comorbid conditions, including anxiety, substance abuse and other axis-II conditions.

Finally, while thirty five of the sample met diagnostic criteria for BPD, only eleven of these individuals were recruited directly from specialist personality disorder services. While this represents a clinical reality – that personality disorder often goes unrecognised and undiagnosed (Morgan & Zimmerman, 2015) – it also limits the generalisability of the present results to a clinical, treatment-receiving populations. For this reason, the clinical implications raised above should be viewed as preliminary until these effects have been replicated in a sample of individuals more representative of individuals offered personality disorder treatments in health care settings.

Conclusion

In summary, BPD severity was associated with a less positive and more negative content of self-concept, more diffuse positive and less diffuse negative structure of self-concept. However, these disturbances in self-concept were largely driven by comorbid depression symptoms. In contrast, BPD was uniquely related to greater structural clustering of self-concept, even after controlling for depression severity. These findings support clinical models of BPD that emphasise identity disturbance (e.g. Kernberg, 1967; Ryle, 1997; Young et al., 2003). This study adds weight to the notion that helping build a coherent, integrated self-concept should be a focus of clinical interventions for BPD and highlights the potential of dimensional analyses for revealing unique and shared patterns of cognitive-affective processing in psychopathology.

Footnotes

1. While we feel that dimensional designs are particularly well suited to answering questions of specificity, we are not intending to make any strong claims here as whether dimensional designs are superior to diagnostic ones in general. This issues remains contentious in the field. In our view, categorical and dimensional models and design can happily co-exist alongside one another (see Arntz, 1999). Each approach brings with it particular theoretical and clinical pros and cons (e.g. see Paris, Silk, Gunderson, Links & Zanarini, 2009) and researchers and clinicians should choose the framework that most suits their particular purpose.
2. List of words used in the PDST available from the corresponding author.
3. To examine convergent validity of the continuous BPD measure, we repeated this analysis with BPD diagnostic status as a between-groups factor rather than PAI-BOR score as a continuous covariate. An identical pattern of results emerged. This was also true for the interconnectedness and clustering analyses. See Online Resource 1.
4. To validate our clustering measure as a sensitive and unique measure of self-concept disturbance in BPD, we conducted some additional exploratory analyses to see if clustering was most clearly related to the identity disturbance factor of the PAI-BOR. As expected, greater identity disturbance was associated with greater clustering, $r=.42$, $p<.001$, and this held when controlling for depression severity, $r_p=.37$, $P=.001$. However, in both zero-order and partial correlation analyses (controlling for depression) the other factors of the PAI-BOR were also related to clustering: affect instability, $r=.34$, $p<.01$, $r_p=.28$, $P=.02$; negative relationships, $r=.39$, $P=.001$, $r_p=.34$, $P<.01$; and self-harm, $r=.26$, $P=.02$, $r_p=.19$, $P=.11$. Next, we examined if these associations for each PAI-BOR factor held when also controlling for the other PAI-BOR factors (and depression severity). There

remained a trend significant relationship for identity disturbance, $r_p=.22$, $P=.07$, but the affect instability, $r_p=.6$, $P=.64$, negative relationships, $r_p=.15$, $P=.21$, and self-harm, $r_p=.01$, $P=.96$, were no longer significant. These pattern of findings show that the identity disturbance factor of the PAI-BOR is most clearly related to clustering on the PDST as expected, validating this index as a useful additional outcome measure for future PDST studies. Effectively, these analyses move beyond a latent variable approach (where a single “BPD” dimension is driving results) to an overlapping network systems approach (where particular symptom clusters within the BPD construct are driving results; see Cramer et al., 2010).

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Disclosures

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9
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12 Howard and Barnaby D Dunn declare they have no conflict of interest. The data presented in
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14 this study were collected as part of Davy Evans's doctoral thesis, and have not been presented
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16 elsewhere.
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21 All procedures involving human participants performed in the study were in accordance with
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23 the ethical standards of the Cambridge Psychology Research Ethics Committee (CPREC), the
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25 Cambridgeshire 2 NHS Research Ethics Committee and with the 1964 Helsinki declaration
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27 and its later amendments or comparable ethical standards. This article does not contain any
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29 studies with animals performed by any of the authors. Informed consent was obtained from
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31 all individual participants included in the study.
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Supplemental materials for: Examining the shared and unique features of self-concept content
and structure in borderline personality disorder and depression

Journal: Cognitive Therapy and Research

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The primary analyses in the paper conceptualised borderline personality disorder (BPD) as a continuous dimension. While some authors favour the dimensional approach (e.g. Widiger & Trull, 2007), others believe that a diagnostic approach is preferable (e.g. Paris, Silk, Gunderson, Links & Zanarini, 2009). In order to establish convergent validity of the dimensional measure with the diagnostic construct of BPD, and to examine whether the same pattern of findings emerged from both perspectives, the primary continuous analyses in the paper were repeated modelling BPD as a categorical diagnostic indicator.

Methods

Participants

The thirty-five participants meeting diagnostic criteria for BPD on the SCID-II interview were included in the BPD group. Fifty-one participants who did not meet diagnostic status for BPD, and who also scored lower than 38 on the PAI-BOR questionnaire, were included in the control group. A score of 38 on this measure is regarded as sensitive and specific for detecting clinically significant levels of BPD features (Trull, 1995). Excluding participants from the control group based on this score strengthened the reliability of the diagnostic criterion.

Data analysis

ANOVA models were estimated for content and structural indices, with word valence (positive, negative) as a within-subjects factor and BPD group as a between-subjects factor.

Any significant effects or interactions were resolved using independent samples t-tests.

Results

Means and standard deviations of the PDST variables for the two groups are presented in Table S1.

Table S1

Means and standard deviations of PDST self-schema measures broken down by BPD diagnosis.

PDST variables	Positive words		Negative words	
	BPD	Control	BPD	Control
Content	17.80 (5.41)	20.88 (5.68)	13.40 (7.30)	5.90 (4.72)
Interconnectedness	3.05 (.41)	2.83 (.49)	3.44 (.62)	4.15 (.80)
Clustering	.07 (.41)	-.05 (.22)	.09 (.35)	-.08 (.55)

Propositional aspects of BPD self-concept

In the content analysis, there was a significant main effect of Valence, $F(1,84)=95.91$, $p<.001$, $\eta^2=.46$, and BPD diagnosis, $F(1,84)=8.01$, $p<.01$, $\eta^2=.09$, which were qualified by a significant interaction of Valence and BPD diagnosis, $F(1,84)=28.59$, $p<.001$, $\eta^2=.14$.

Independent samples t-tests showed that the BPD group rated significantly fewer positive words ($t(84)=2.52$, $p=.01$, $d=.56$) and significantly more negative words ($t(84)=5.79$, $p<.001$, $d=1.22$) as self-referent. In sum, participants with a diagnosis of BPD reported a more negative self-concept.

Structural aspects of BPD self-concept

1
2 In the interconnectedness analysis, there was a significant main effect of Valence,
3
4 $F(1,74)=72.77, p<.001, \eta^2=.43$ and of BPD diagnosis, $F(1,74)=6.16, p=.02, \eta^2=.08$, again
5
6 qualified by a significant interaction of Valence and BPD diagnosis, $F(1,74)=22.65, p<.001,$
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8 $\eta^2=.13$. Independent samples t-tests showed that, for the BPD group, positive content was
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10 less interconnected ($t(74)=2.16, p=.03, d=.49$), while negative content was more
11
12 interconnected ($t(74)=4.18, p<.001, d=.99$). While reduced interconnectedness for positive
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14 content was observed in participants with a diagnosis of BPD, negative content was actually
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16 more interconnected for participants with a diagnosis of BPD.
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22 In the clustering analysis, there was no significant main effect of Valence,
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24 $F(1,65)=.12, p=.73, \eta^2<.01$, nor any significant interaction of Valence and BPD diagnosis,
25
26 $F(1,65)=.13, p=.72, \eta^2<.01$. There was a significant main effect of BPD diagnosis,
27
28 $F(1,65)=7.41, p<.01, \eta^2=.10$. To examine this main effect, the mean of the two clustering
29
30 indices was calculated; this measure was significantly larger in the BPD group (mean = .12,
31
32 SD = .29) than the control group (mean = -.08, SD = .29, $t(65)=2.72, p<.01, d=.69$). In
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34 summary, BPD diagnosis was associated with elevated 'clustering' of self-concept.
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Discussion

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41 Compared to modelling BPD as a continuous dimension (see primary analysis in
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43 paper), an identical pattern of findings emerged when conceptualising BPD as a categorical
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45 diagnostic indicator. Convergent findings from both continuous and between-groups analyses
46
47 increase our conviction in the findings that BPD is characterised by a negatively biased self-
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49 concept that is more fragmented, and the negative aspects of which is more interconnected.
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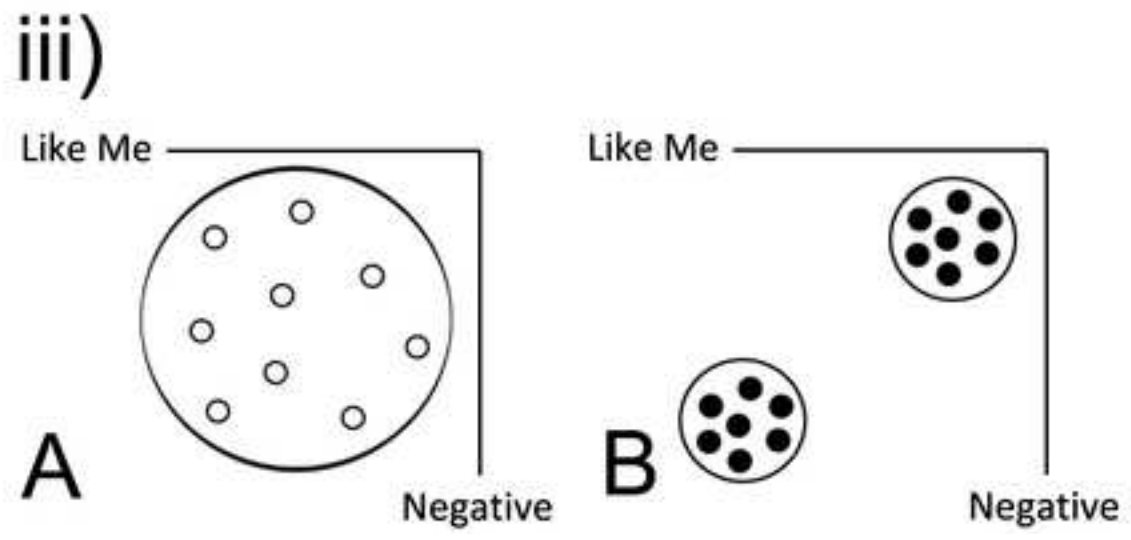
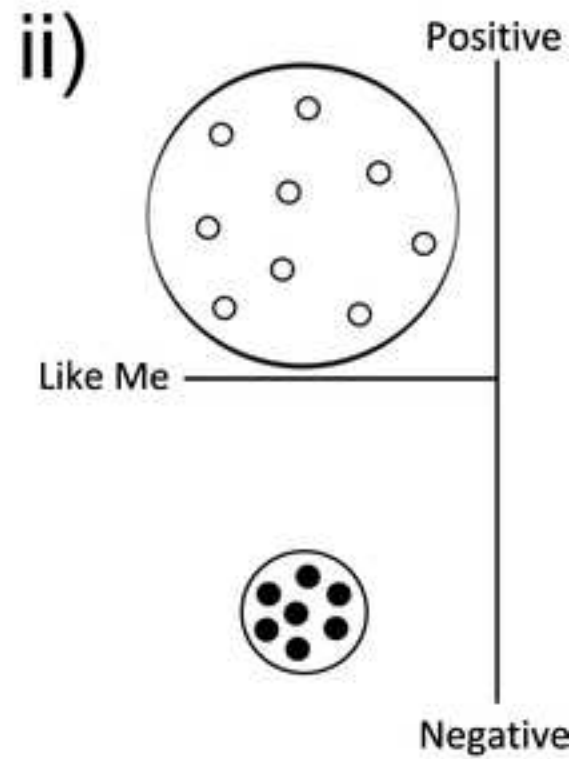
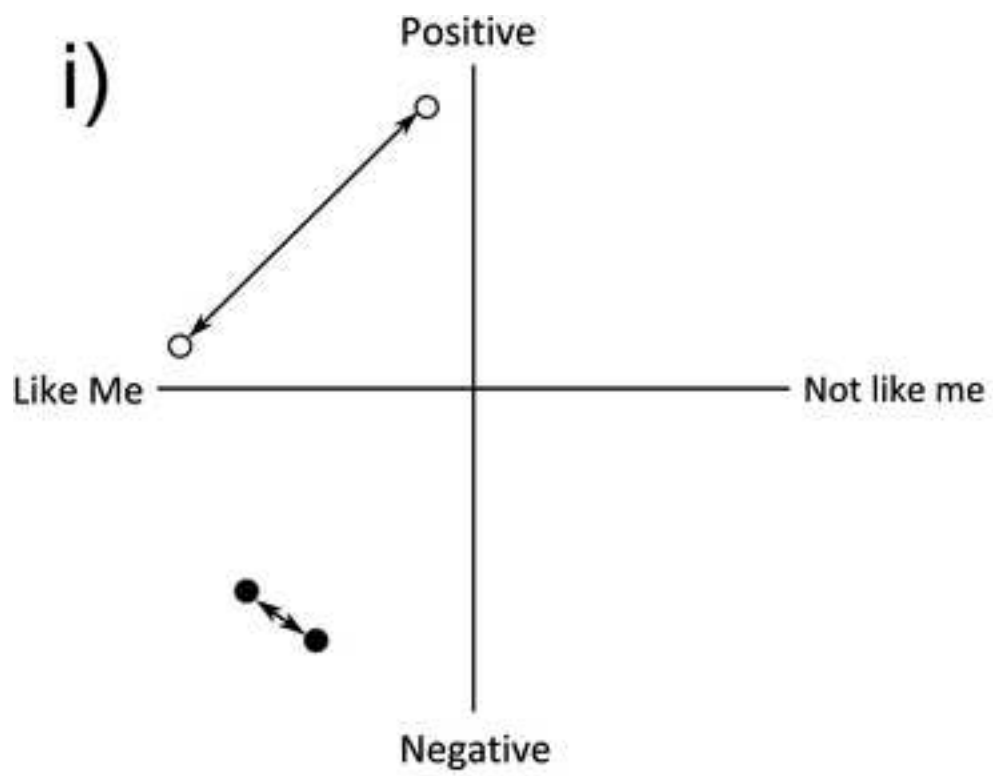
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Figure



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