Models of Change in the Psychotherapy of Borderline Personality Disorders

Roberto Viviani, Horst Kächele (Ulm, Germany), & Anna Buchheim (Innsbruck, Austria)

Patients suffering from borderline personality disorders are often difficult to treat, and require specific psychotherapeutic techniques. In current neurobiological models of borderline personality disorder, temperamental factors such as increased emotional reactivity and diminished attentional control figure prominently and account for the psychopathology of this disorder. Here, we follow a different approach and ask the question of how a model of this disorder may account for the modifications of psychotherapy technique that have proven effective in this class of patients. The psychotherapy of this disorder emphasizes work on enriching the semantic repertoire of patients in interpreting their own emotion and other people's motivation for their actions. Based on current psychometric research on distinct factors contributing to individual effectiveness in attentional control (working memory capacity), we propose that the organization of semantic memory may constitute an important and neglected aspect of a neurobiological model of this disorder. Impulsivity and emotional dysregulation resemble the long-term developmental effects of habitual strategies to determine response, which cognitive studies have characterized in terms of the interplay of attentional control capacity, cognitive and emotional load, and semantic organization. Rather than attributing an exclusive causal role to either increased emotional reactivity or diminished attentional control, we propose an account of this disorder as emerging from a self-reinforcing developmental history in which both these factors are intertwined. After mapping these notions onto specific psychotherapeutic interventions, we propose a model through which specific technical strategies result, in the long term, in structural change.

Keywords: attention; borderline personality disorder; learning; mentalization; proactive interference; semantic memory

Even if patients suffering from borderline personality disorder (BPD) are often aware of their problem and may be motivated to seek help, the treatment of this disorder is consensually considered by clinicians to be difficult. Recently, several manualized approaches to the treatment of BPD have been developed, whose efficacy has been empirically validated (Bateman & Fonagy, 1999; Clarkin, Levy, Lenzenweger, & Kernberg, 2007; Cottraux et al., 2009; Giesen-Bloo et al., 2006; Doering et al., 2010; Linehan, 1993, 2000; for an overview, see Zanarini, 2009). Although starting from different theoretical premises, all these treatment programs share a pragmatic approach toward what works and does not work in these patients, modifying and specifically adapting existing techniques to the needs of the BPD patient.

Our purpose here is to look at the specific aspects of the psychotherapy of BPD to understand and formulate the nature of both this disorder and the therapeutic process using current models of the mind taken from psychometric approaches and cognitive neuroscience. Relative to existing neurobiological models of BPD, we focus here more on the implications of psychotherapeutic technique than on the psychopathological picture. Is there a model of BPD that accounts not only for its symptoms, but also for the specific modifications of technique that have been found useful in this disorder? One motivation for asking this question is that a model of BPD may be more plausible and accurate if it takes into account what has proven to be effective in the treatment of BPD. Another is that a model explicitly encompassing psychotherapeutic interventions may provide a framework in which empirical research may investigate changes promoted by therapy more directly and may ideally clarify the essential aspect of BPD-specific psychotherapies.

After briefly reviewing some established approaches to the therapy of BPD, we introduce the notions used in

Roberto Viviani: Department of Psychiatry and Psychotherapy III, University of Ulm, Ulm, Germany. Horst Kächele: Department of Psychosomatic Medicine and Psychotherapy, University of Ulm, Ulm, Germany. Anna Buchheim: Institute of Psychology, University of Innsbruck, Innsbruck, Austria.

Correspondence to: Roberto Viviani, Department of Psychiatry and Psychotherapy III, University of Ulm, Leimgrubenweg 12, 89075 Ulm, Germany (email: roberto.viviani@uni-ulm.de).

neurobiological models of BPD and discuss how psychotherapy interventions may map onto these models. Our contention will be that current models, based on notions of attentional control and automatic reactivity, do not fully account for those aspects of treatment that focus on how semantic memory is organized and used in these patients. We discuss how the role of semantic repertoires may be integrated in a revised model of this disorder, impacting on the patient's capacity to implement control strategies in the interpersonal interaction and accounting for the modifications of techniques that have been proposed for the treatment of BPD.

Dialectical behavior therapy

Dialectical behavior therapy (DBT; Linehan, 1993) arose as a modification of existing cognitive-behavioral approaches, which were found to be difficult to apply to this group of patients. In DBT, emotional dysregulation and the tendency of borderline individuals to oscillate between extremes of affect and between idealization and devaluation of others is formulated as a failure of a dialectical process. Dialectics is the reconciliation of opposites in a continual process of synthesis. The same phenomenon may often be observed in the therapeutic team handling difficult patients. Therefore, the overarching aim of therapy is to teach patients to move from polarized to dialectical modes of thinking and feeling.

Also, the therapeutic strategy of DBT finds a formulation in terms of a dialectical process synthesizing the opposites of acceptance and change of the current state. On the side of acceptance is a whole set of interventions collectively referred to as "validation." On the side of change are skills training, exposure, contingency management, and cognitive restructuring.

In validation, the therapist seeks the kernel of truth in the emotional, behavioral, and ideational reactions of the patients in situations of crisis in or outside therapy and expresses this kernel of truth in words. Communication to the patient of the validity of her reaction is the end stage of a preparatory step, named "reflection," in which the patient is helped to "identify, describe, and label her own response patterns" (Linehan, 1993, p. 224). With the progression of therapy, the patient should acquire the capacity to be "self-validating." To this end, validation should be understood as a collaborative process in which the patient is encouraged to play a progressively active role, instead of relying only on the therapist. For this reason, validation entails teaching emotion observation and labeling skills, as well as the capacity to read emotion in oneself and others.

The skills practiced in therapy include a set of meditation techniques that should directly promote a dialectical style of functioning, instead of impulsive reaction and emotional dysregulation, called "mindfulness." Mindfulness entails recruitment of attentional control in everyday functioning, with active observation and description of one's own behavioral responses. In Linehan's account, this is the same kind of attentional control one exerts while learning a new activity, like playing the piano. With increasing practice, demands on attention decrease as good performance is possible based on automatic motor schemes. In "participation without self-consciousness," however, there remains an element of controlled flexibility, even if behavior is mostly based on assimilated automatisms; hence, while mostly automatic, experience and reactions are "mindful."

DBT differs from standard cognitive-behavioral therapies in several respects, but most notably in the attention to the quality of the relationship between the patient on the one hand and the therapist and team on the other and in the emphasis on validation. In Linehan's own account of DBT, the importance of validation is revealed by the notion that without it a standard cognitive-behavioral intervention is invalidating in this class of patients and is therefore potentially damaging. The same view is applied to interventions sponsoring control or urging the patient to exert self-control outside a validating context. However, also in Linehan's dialectical approach, emphasis on unlimited empathy and acceptance may lead to therapeutic failure, because acceptance is not balanced by a tension toward change.

Psychodynamic therapies of BPD

In the psychodynamic school, two important therapeutic models have been proposed for BPD: transference-focused psychotherapy, by Clarkin, Kernberg, and Yeomans (1999); and mentalization-based therapy, by Bateman and Fonagy (2004). These psychotherapies, like others that have emerged in the psychoanalytic tradition and that we do not treat in detail here (Gabbard, 2000; Gunderson, 2001; Meares, 1993; Rudolf, 2008), are characterized by modifications of technique aimed at avoiding the problems experienced in patients suffering from severe personality disorders. Explicitly proscribed are interpretations reconstructing the events of the psychotherapeutic interaction in terms of childhood experiences of the patient (Rudolf, 2008). Instead, emphasis is given to the "here-and-now" of the interaction, with a special sensibility to the level

of sophistication with which aspects of this interaction may be presented to the patient in the intervention. Our aim here is not to be exhaustive, but to focus on some important points raised by these approaches.

Transference-focused psychotherapy

Transference-focused psychotherapy was formulated within the framework of Kernberg's (1967, 1984) psychoanalytic theory of borderline personality. In this account, individuals suffering from BPD are characterized by a general weakness of ego-function. These individuals preferentially adopt primitive defenses based on splitting and projective identification to give coherence to contradictory and intense feelings of hate and love in relationships. The adoption of these primitive defenses may have a multifactorial origin, but an important role is played by a temperament in which high levels of aggression are present (Klein, 1957). When predisposed to respond to frustration with aggression, an individual may also tend to disown or deny this aggression in the relationship with significant others. This tendency favors the establishment of relationship styles in which the significant other is rarely perceived realistically as someone who may be a constant partner, notwithstanding his or her failures, giving rise to polarization between the extremes of idealization and devaluation. Systematic externalization of aggression also opens the way to antisocial tendencies and the justification of exploitation.

The strategic objective of transference-focused psychotherapy is to foster more integrated representations of the significant other, and to tolerate the other's and one's own failures without jeopardizing the relationship (Caligor, Diamond, Yeomans, & Kernberg, 2009). Insofar as the tendency for aggression determines the clinical picture, this objective also involves the capacity to be aware of and own up to one's emotions of hatred. These capacities evolve within the context of the relationship with the therapist. To enable the evolution of these capacities, it is important to define a contractual framework for therapy both to make it resistant to the patient's aggression and to allow it to become a safe place in which the dynamics of defensive maneuvers and underlying motivations are reconstructed. Transference-focused psychotherapy contains a detailed specification of the rules that define the therapeutic contract and the consequences of their infraction.

The core interventions of transference-focused therapy are confrontation and the clarification of internal experiences as they unfold in the relationship with the therapist, and the interpretation of the patient's defenses. Clarification consists in inviting the patient to be explicit about his or her motivation for behavior and experience. Transference-focused therapy maintains an important characteristic of psychoanalytic psychotherapy: focus on the instantiation of typical relational patterns in the transference relation, and its interpretation (Luborsky & Crits-Christoph, 1998). One way of looking at the reasons for the mutative effect of these interventions is the reduction of the distortions of emotional reality in internal experience and in interactions. A crucial function of the therapist is the capacity to be reflective and think about the interaction, instead of being overwhelmed by the mindless emoting introduced by the patient. With this in mind, an important aspect of clarifying and interpreting is given by the implicit reflectiveness on the reality of the interaction communicated to the patient (Levy et al., 2006). This perspective is emphasized even more in mentalization-based psychotherapy, to which we now turn.

Mentalization-based psychotherapy

In their concept of psychotherapy for BPD, Bateman and Fonagy (2004) propose that the hallmark of this disorder is a deficit in a specific cognitive-emotional function termed "mentalizing capacity." Mentalization is the mental process by which one's own and other people's actions are understood as the consequence of intentional mental states such as personal desires, needs, feelings, beliefs. The aim of mentalization-based treatment is not only that of temporarily supplementing the mentalizing deficit of the patient with the therapist's own "ego function," but also that of helping the patient acquire permanent autonomous mentalizing capacities. In this sense, the therapy may be genuinely conducive to structural change and not simply supportive. This claim is substantiated by the empirical evidence for lasting beneficial effects of therapy (Bateman & Fonagy, 2008).

Mentalization-based psychotherapy emphasizes that interventions should be framed as a cooperative attempt to discover the reasons for the patient's experience and behavior (Bateman & Fonagy, 2006). Explicit warnings are issued against the therapist's attempts to directly provide the patient with a reconstruction for his or her impulsive actions. The focus, at least initially, is on helping the patient think about the affect that accompanied action, leaving open what this affect may have been. It may be easier for the patient to start with discussing external events in therapy. With the progression of therapy, the patient should

become able to explore his or her affect in relation to the therapist ("mentalizing the transference") without fearing to be overwhelmed or without fearing a breakdown of the relationship with the therapist. Progressively, therapy explores parallels between the affects and emotional reactions elicited in therapy and those elicited by external relationships. After the patient has accepted as meaningful the exploration of subjective experience as a search of the associated affect, it is possible to offer and explore in therapy alternative accounts of his or her inner experience ("interpretive mentalizing"). Here, the focus is not on having the patient recognize his or her being defensive or understand the reasons for this defensiveness, but on increasing the patient's range of possible subjective experience. Advances in the capacity to formulate and understand reasons for actions are extended to improvements in social competence and capacity for empathy for others in group sessions.

There are some differences to note between mentalization-based psychotherapy and transference-focused therapy. In emphasizing the defensive character of the patient's behavior, transference-focused therapists may attribute agentive thinking to patients where the mentalization-based therapist sees externalizations of aspects of the self that cannot be subjectively experienced because the appraisal required for this experience is missing. Mentalization-based therapy aims to equip the patient with the means of this appraisal, and insight on defenses is not emphasized. Transference-focused therapy is more explicit on the existence of aggressive impulses whose existence is disowned and distorted by the patient, while mentalization-based therapy relies on the effect of improvements in the patient's capacity for empathy to defuse triggers of aggression.

Notwithstanding the different theoretical framework, there are important points of contact between DBT and psychodynamic approaches. In particular, validation techniques occupy within DBT the structural position of mentalization interventions in psychodynamic therapies, in that both are modifications of the standard technique within which the treatment approach originated. Furthermore, both address the perceived need of the borderline patient to improve the capacity to articulate his or her inner experiences. In DBT, validation is presented with a special emphasis on its capacities to foster a good empathic relationship between therapist and patient, while simultaneously fostering the coalescence of a nuclear self of emotions and motivations whose legitimacy is interpersonally acknowledged. To this end, it is especially important that the therapist be able to believe in the patient's strengths.

Etiological models of BPD

At a first reading, there are at least three two models. The first model we describe was formulated jointly by Kernberg, Clarkin, and Posner (Posner et al., 2002, 2003) and was adopted also by Bateman and Fonagy (2004). This model posits the disturbed development of selective attentional and control capacities, such as those required for conflict resolution (distinct from other forms of attention such as orienting and alertness), as the core deficit of borderline personality. The second model, described by Linehan (1993), emphasizes the role of reinforcement and operant conditioning. We will argue, however, that a third model may be described, based on examining what psychotherapists do with BPD patients, and on what implicitly emerges from technical prescriptions. This model focuses on the effect of the organization of semantic memory on learning and control capacities.

Disturbed development of attentional and control capacities

In the version espoused by mentalization theorists, this model is rooted in the formative role of the mother–child relationship, as characterized by attachment theory (Fonagy et al., 1995). In this account, the mother empathically reflects the child's distress by acknowledging it at the preverbal interaction level, and her response constitutes a containment of this distress. In the interaction, the child internalizes the mother's capacity for containment, which constitutes the initial nucleus of the child's capacity to experience and reflect on its own emotions without being overwhelmed by them. In contrast, the neglectful or overwhelmed mother (often accompanied by abusive parenting by the mother herself or her partner; Zanarini et al., 1997) fails to provide the child with this formative experience.

In this model of mentalizing, the core aspect of this function is one of emotional control, and the hallmark of its absence is not only mindless emoting but, more specifically, impulsivity and dysregulation of arousal. Its essential constituent is identified with attentional control. The task of the child is withholding an immediate response based on the physical reality with another based on a second-order internal representation of reality, constituting the mentalization of the mental state of the other (Bateman & Fonagy, 2004, pp. 85–86). Empirical research has demonstrated the coincidental timing of the development of attentional and behavioral control (Posner & Rothbart, 2000). Furthermore, individual differences in executive function

capacity are predictive of psychosocial and behavioral performance in adolescents (Ellis, Rothbart, & Posner, 2004). Insofar as self-reflection is based on the capacity for inward attention (Posner & Rothbart, 1998), then its disruption also accounts for the observed lack of a stable self-representation in BPD patients.

Kernberg and Clarkin endorse a close version of this model of BPD, in which a predisposing condition of enhanced temperamental reactivity to emotional stimuli is combined with an attentional deficit (Posner et al., 2002, 2003). The emotional dysregulation of BPD results from the confluence of increased reactivity to emotional stimuli of bottom-up, automatic processes active during emotional appraisal, and the failure of top-down, controlled attentional processes in selecting the appropriate stimulus for elaboration and response and inhibiting inappropriate inputs.

There is considerable knowledge in cognitive neuroscience about the neurobiological basis of attentional control (Corbetta, Patel, & Shulman, 2008; Jonides, Lacey, & Nee, 2005; Kane & Engle, 2002; Miller & Cohen, 2001) and its development (Bunge & Wright, 2007). Recruitment of executive attention in cognitive tasks is accompanied by recruitment of dorsal prefrontal and parietal areas. In contrast, bottom-up, automatic processing of external stimuli is localized in posterior cortical areas and in the medial temporal lobes (Figure 1). Beside temporal and parietal areas (Frith & Frith, 2003; Saxe, Moran, Scholz, & Gabrieli, 2006), prefrontal areas are also involved in tasks where self-reflective capacity is elicited (Fossati et al., 2003; Lane et al., 1998; Northoff & Bernpohl, 2004). Hence, Bateman and Fonagy (2004) conclude that mentalizing "depends substantially on optimal pre-frontal cortex functioning" (p. 80). Based also on data on the related condition of posttraumatic stress disorder, Posner et al. (2003) tentatively localize the defect of BPD in the medial part of the prefrontal cortex.

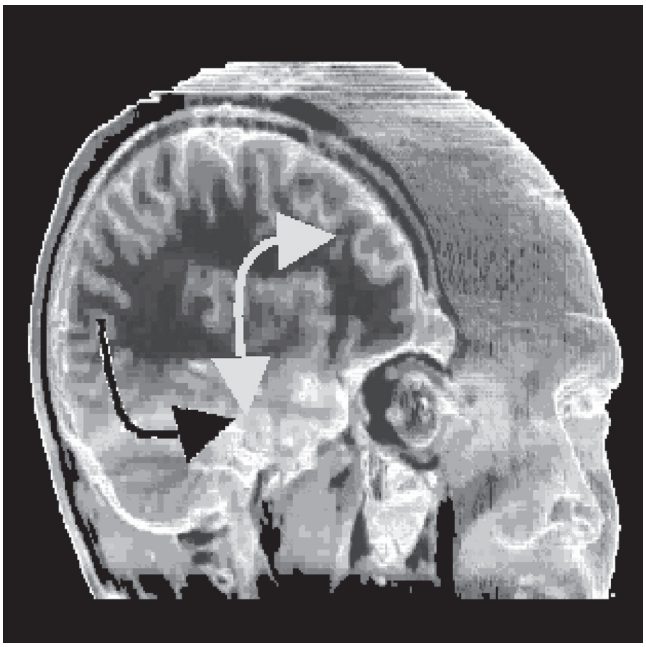

Figure 1. Schematic of the neurobiological basis of attentional control. The black arrow schematically represents the bottom-up flow of external information from occipital and posterior temporoparietal areas toward the semantic areas in the temporal lobe located more anteriorly. The gray arrow represents the interaction with a controlling instance localized in the prefrontal cortex.

Reinforcement of emotional dysregulation and the invalidating environment

Like the attentional model, the behavioral model of BPD (Linehan, 1993) also starts with a temperamental basis of emotional vulnerability combined with inability to regulate emotions of biological origin. Affect dysregulation leads both to deficits in interpersonal relationships and in the experience of a sense self and to cognitive dysregulation. Instead of emphasizing the role of the early mother–infant interaction, however, the behavioral model describes the progression of a vicious reinforcing circle taking place in the interaction between the child and the family at later stages of life. At the origin of this vicious circle is the invalidating environment (which is often a traumatic environment), in which the expression of private experiences by the child is often punished or trivialized. The child's own interpretation of his or her own behavior and motivations is dismissed. Furthermore, this environment may also attribute the child's behavior to socially unacceptable traits, as when confronted with displays of negative affect, instead of acknowledging its possible basis on a realistic limitation of the capacity of the child to cope.

Within an invalidating environment, extreme emotional displays may be required to evoke a helpful response. Alternatively, progressive frustration and punishment of the child leads to increasing negative affective displays. These extreme emotions often succeed in terminating punishment by creating such aversive conditions for the caregivers that they stop any attempt to control the child. As a result, extreme emotional behavior is unwittingly reinforced, while emotionally modulated behavior is extinguished by ignoring its communicational value. It becomes clear why validating interventions address central issues in the functioning of borderline individuals.

The semantic model of BPD

The semantic model of BPD is not formulated systematically by any of these authors; rather, it emerges in several accounts of the problems that the therapy is trying to solve. In the mentalization-based theory of BPD, "in order to be able to think about mental states, say fear, we have to develop concepts that correspond to and integrate the actual internal experiences that constitute that state. The concept of fear is a 'second order representation of fear' that relates physiological, cognitive, and behavioral experiences, just as the concept 'table' labels and thus integrates our actual experiences of tables" (Bateman & Fonagy, 2004, p. 63). In this passage, mentalization is unequivocally characterized as a semantic process and good mentalizing capacities as the possession of a network of sufficiently articulated semantic nodes.[1]

Also, the semantic model of mentalization deficits includes the causal role of a constitutive mother–child interaction. In this account, the child develops a signifier for his own internal experience through the experience of the mother's empathic reaction to it. These signifiers, which interestingly may also be preverbal, originate as "second-order representations" of the repeated experience of the mother's reaction and become the organizers of a self-state.

Also, the behavioral account of BPD includes descriptions of semantic aspects in this disorder. The invalidating environment "does not teach the child to label private experiences, including emotions, in a manner normative in her larger social community." Furthermore, the child is not helped to understand when "to trust her own emotional and cognitive responses as reflections of valid interpretations of individual and situational events" (Linehan, 1993, p. 51).

Concerning BPD's clinical picture, if patients have difficulties in categorizing the other's mental state, then they may have an inadequate appraisal of social interactions. Lacking refinement, the resulting emotions quickly become just bad or good. This gross appraisal may even lead to difficulties in differentiating between one's own and the other's emotions. The extreme oscillation of one's internal and interactional experience sponsors the adoption of defensive strategies based on externalization in order to maintain the coherence of the self—that is, a coherent account of one's own motivations and experience. Thus, also, Kernberg and colleagues (Caligor et al., 2009; Clarkin, Yeomans, & Kernberg, 2006) note that lack of differentiation of internal representations of self and others may be the primary factor leading to emotional instability.

In the semantic account, the problem is not primarily an insufficient controlling instance as, rather, the lack of representations upon which controlling processes may act. The mentalization deficit may not be the lack of a cognitive function specialized in computing the mental state of others, as is the case in current accounts of "theory of mind" deficits (Baron-Cohen, 1995), but may, rather, be the lack of contents with which a theory of the other mind may be filled. The BPD patient does indeed appear to have a theory of mind of the other, but this theory tends to be filled with simplistic and extreme (idealizing or persecutory) images of what the other is doing.

From the perspective of attachment theory as a causal account, there may be little need to differentiate semantic from attentional models of the self-organizing process developing in the mother–child relationship. The same may perhaps be said of the related evidence supporting the existence of an association between mother–child attachment and developmental disturbances. However, for the purpose of the definition of the mentalizing deficit in the adult patient, these two models create an interesting contrast. There is hardly any doubt that semantic elaboration, both of purely cognitive material (Deutsch & Deutsch, 1963) and in emotional appraisal (Lazarus, 1991), is an automatic process that can take its course without recruitment of executive attentional components. In contrast, executive attention—that is, the form of attention that is involved in explicit control and inhibition—is an entirely different process characterized by effortfulness and limited capacity (Baddeley, 2007; Posner & Petersen, 1990). Furthermore, from a neurobiological standpoint, semantic representations are localized in temporal and parietal areas, rather than in the prefrontal cortex (Figure 1).

If one looks at how mentalization-based therapists describe their practice, then it is the semantic deficit model that is the most fitting. In contrast, the attention-based model of impulsivity logically leads to interventional strategies aiming at training the central executive directly (Posner & Rothbart, 2005; Rueda, Rothbart, McCandliss, Saccomanno, & Posner, 2005). Of note in this respect is also that the connection between the practices of Kernberg's transference-focused psychotherapy and the endorsed attentional model of BPD has not been clarified in the original specification of the model (Posner et al., 2002, 2003).

[1] We use the word "semantic" here to refer to the aggregate traces of individual experience, as opposed to processes such as attention, which in principle are not defined in terms of specific experiences or content (e.g., as in Fodor, 1980). It is not our intention to refer to specific forms of memory to the exclusion of others; our notion of "semantic" includes what is known in cognitive science as "semantic memory," but it is less restrictive.

One question facing the semantic account is why the psychopathology of BPD is characterized by impulsivity, which appears to involve directly lack of control and/or enhanced reactivity. Irrespective of the importance that the semantic account may have, there are several good reasons not to lose sight of the possible role of prefrontal circuits/control processes. First, clinical conditions encountered in practice may be characterized by some degree of heterogeneity. The notion that an attentional deficit may lead to difficulties in emotion regulation is a plausible one. Second, and more importantly, both attentional and semantic deficits may interact and enhance each other in producing a comprehensive deficit of emotional regulation and coherence of self-representations. One may wonder about the long-term consequences of insufficient attentional processes on the structure of semantic storage, and conversely about the effects of lack of differentiation of the latter on attentional performance. To clarify this aspect of the theory, we address in the next section the issue of the interaction between semantic and control processes and the role of this interaction in learning.

A process account of BPD

Dual-process accounts of the mind

The attentional account of BPD belongs to a more general class of accounts of normal and pathological functioning, based on the duality of controlled and automatic processes (Barrett, Tugade, & Engle, 2004). When referring to controlled processes, one invokes a specific notion of attention, also variously known as top-down, goal-directed, endogenous, or executive attention. Executive attention processes are required to monitor, maintain, or suppress representations in accordance with the task at hand, especially in the face of conflicting or potent environmental distractors. For example, when listening to a patient, a therapist must remain focused on the patient's account and maintain a model of the interaction, without, say, letting the noises of the recently opened nearby construction work capture her attention. Her success in doing so depends on the one hand on the loudness of the noises, and on the other hand on her own capacity to inhibit irrelevant inputs. Similarly, the attentional account of BPD posits the existence of a temperamental reactivity to emotional stimuli, compounded by a deficit in the capacity to inhibit them. The emotional impulsivity of the BPD patient is modeled as a proneness to be driven by external stimuli, coupled with a general difficulty in inhibiting automatic reactions when elaborating responses.

Several models of controlled processes have been proposed in the literature, but a widely accepted model, sufficient for the present purposes, links executive attention to the executive component of working memory (Baddeley, 2007; Engle, 2002; Engle & Kane, 2004). One may think of working memory as consisting of the activation of memory units coding phonological, visuospatial, or semantic pieces of information, under the supervision of the executive component. The executive component is especially important in the presence of environmental distractors. Loss of goal maintenance and inability to implement control, however, can also be observed in the presence of distracting representations of internal origin or memory traces of stressful events (Klein & Boals, 2001; Wegner, 1994). Hence, dual-process models are applicable not only when the distractor is purely cognitive and external, but also to more general situations where control is lost in the face of internal representations that may be emotionally colored (Wenzlaff, Wegner, & Roper, 1988).

The second class of processes are those characterized as automatic. Among these, there are those that originate in the processing of perceptual stimuli. One refers to bottom-up, stimulus-driven, or exogenous processes. Some theorists, however, emphasize the extent to which the organization of memory nodes—that is, the schematic content of semantic storage—is capable of determining not only the representation of the environment in the input channel, but also response in the absence of controlled processing (Bargh & Ferguson, 2000). This body of empirical research is relevant here because it documents the existence of a mode of functioning in which complex aspects of response are determined without the intervention of attentional processes.

Role of controlled processes in learning

The application of top-down control to representations evoked by environmental stimuli should not be considered as a static process. When regulating the activation of memory units relevant for the task at hand, working memory activity may result in small, gradual, but also lasting influences on the organization of the semantic network and response schemas of long-term memory. The repeated application of top-down control gradually induces a change in the memory traces automatically activated by the stimulus, so that the new semantic representations of the novel stimulus are brought to be consistent with the desired response, even when previously there was conflict (Cohen, Servan-Schreiber, & McClelland, 1992). Automatic responses, therefore,

may be the sediment of previous episodes of learning to respond to an initially novel stimulus (Logan, 1988).

Neuroimaging investigations have provided evidence on the neurobiological substrate of the interaction between controlled and semantic processes. Studies have shown that the activation of specific prefrontal areas in cognitive tasks varies in association with demands for controlled retrieval of appropriate semantic content from memory (Badre, Poldrack, Paré-Blagoev, Insler, & Wagner, 2005; Fletcher, Shallice, & Dolan, 2000) or for memory-encoding processes required to keep online complex information (Rypma, Prabhakaran, Desmond, Glover, & Gabrieli, 1999). One observes recruitment of prefrontal and dorsal areas when faced with a novel task, areas indicative of activation of executive attentional processes. With increasing practice, however, this recruitment progressively decreases, suggesting a transfer of computations from executive to overlearned, automatic processes (Raichle et al., 1994).

In the dual-process framework, therefore, there are two ways in which the quality of semantic storage may not only influence automatic processing, but may also affect the effectiveness of controlled processes through a mechanism of reciprocal interaction. The first is that, insofar as executive attention operates by activating units residing in semantic memory, the level of sophistication of semantic representations may be important in determining the selectiveness of control. The second is that, the more often executive processes are invoked to select and inhibit memory units, the larger the influence of controlled processes on the organization of semantic storage and its degree of sophistication. This will be so to the extent that semantic memory is not simply a passive memory trace of experience, but reflects aspects of the sensory world to which the individual has attended to.

In the psychometric literature, the importance of the interaction between semantic and controlled processes is supported by the notion that individual differences in executive attention capacities load on two main dimensions (Unsworth & Engle, 2007). The first dimension is the individual capacity to inhibit a prepotent representation supported by a salient stimulus in the input channel, and to resolve its conflict with the desired goal. The capacity to disregard the noise from the construction site is an instance where this capacity is particularly important. The failure of attentional resources in BPD posited by the attentional account refers to this kind of individual difference in executive attention capacities. The second dimension concerns the individual capacity to encode the features of representations in sufficiently fine memory codes to be able to efficiently resolve situations in which interference between similar representations is apt to increase conflict. In this category may belong the capacity to distinguish representations that were appropriate in the past but are no longer appropriate in the present (Friedman & Miyake, 2004). Stimulus sets with sufficient similarity to old learned responses may activate semantic storage that is no longer appropriate (proactive interference), and the capacity to institute a new response depends on the capacity to encode the differences between the old and the new. This encoding capacity depends on the intervention of executive processes not only simply to suppress irrelevant representations, but also to organize semantic storage effectively. Hence, this second dimension is also concerned with the operation of controlled processes in the internal environment created by the representational world of the experiencing subject.

Because of the interaction between controlled processes and memory traces, individual differences in working memory capacity create styles of response in which the tendency to resort to top-down control is varying (Barrett, Tugade, & Engle, 2004). In the presence of additional load to controlled processes, or when emotional stress is high, individuals may rely more on automatic responses when memory capacity is low (Unsworth, Heitz, & Engle, 2005). These different types of responses may be seen as different strategies that are chosen according to environmental demands and the tendency of the individual to employ top-down controlled cognition. However, while there may be an element of biological disposition in the individual endowment of working memory capacities, it is also conceivable that a habitual tendency to adopt automatic response strategies creates a reinforcing loop. The use of controlled processes remains or becomes increasingly ineffective and costly, because semantic storage is at a low organization level. Therefore, the existence of individual differences in propensities to select controlled or automatic response strategies may reflect a complex developmental history above and beyond original dispositional differences of biological origin.

A process model of the structural deficit

While the empirical evidence on individual differences in working memory capacity and the role of encoding sophistication has been gathered in the cognitive domain, the mechanism outlined for strategies with low controlled processing may be relevant to understand the effects of low mentalization capacities. A tendency

to avoid reflection on interactional, emotional, and motivational aspects of the relationship may contribute to keeping semantic storage at a primitive level of sophistication, because learning processes shaping semantic memory are not guided by attentional processes. Hence, in an individual whose tendency to adopt reflected, controlled strategies to respond to stimuli is low, episodes in which memory traces of interpersonal interaction are reorganized by reflective thinking are comparatively rare. If interactions are classified wholesale as good or bad, it may become more difficult to resist the implications of frustrating aspects of the relationship while allowing positive aspects to determine response. Hence, the low organization of semantic memory in turn discourages the adoption of more controlled strategies.

The overall tendency to respond impulsively in structural pathology (the "ego weakness") may be more appropriately modeled as an effect of habitual and comprehensive strategies in the use of automatic and controlled processes than as an effect of temperamentally increased bottom-up reactivity compounded by top-down attentional deficits alone. While both these factors may originally be present, alone or in combination, hyperreactivity and lack of control may lead to a self-reinforcing developmental path in which the structure of semantic memory can close the self-reinforcing loop. There are several differences between the present and previous accounts, all fundamentally related to the role of the notion of habitual response strategy in summarizing the long-term impact of controlled processes in the sophistication and structure of semantic storage. Increased reactivity and attentional deficits are generic shortcomings that affect bottom-up and top-down processes indiscriminately—that is, in a wide range of situations. In contrast, the involvement of semantic processes in the model allows formulating the impact of developmental histories for specific pathologies and specific semantic domains. Importantly, the involvement of semantic processes in the account offers a framework in which psychotherapeutic work focusing on specific subjective experience, personal history, and defensive schemas may be accommodated. The problems of low differentiation in the semantics of emotional appraisal are compounded by its being in the service of disguising maneuvers about the responsibility for aggressive impulses, or by encoding the message of the lack of worth of the individual as a whole.

From a neurobiological perspective, neuroimaging studies of BPD have shown increased activity in the amygdala (Beblo et al., 2006; Donegan et al., 2003; Herpertz et al., 2001; Koenigsberg et al., 2009b), a structure of the limbic system that is activated by stimuli of emotional relevance (Morris et al., 1996). Increased reactivity of the amygdala may be viewed as a neurobiological counterpart of emotional dysregulation in BPD due to increased bottom-up reactivity. A study also found that this activity was higher when participants were asked to distance themselves from emotional stimuli, and it was accompanied by reduced prefrontal activation (Koenigsberg et al. 2009a). There are two pathways relaying input to the amygdala. The first is a subcortical pathway bypassing cortical processing entirely (Morris, Öhman, & Dolan, 1998, 1999) and probably processing coarse aspects of the visual scene (Vuilleumier, Armony, Driver, & Dolan, 2003). The second pathway goes through primary and secondary visual areas in the cortex (Adolphs & Spezio, 2006; Davis & Whalen, 2001; Dolan & Vuillemier, 2003) and is sensitive to semantic processes such as contextual modulation (Kim et al., 2004; Ochsner et al., 2009). A recent study shows that emotional cues activate the amygdala according to the social context, which may be interpreted differently in individuals according to their attachment styles (Vrtička, Andersson, Grandjean, Sander, & Vuilleumier, 2008). Therefore, while neuroimaging data suggest that increased amygdalar activation to emotional stimuli may reflect a component of dispositional reactivity and insufficient control, they are also compatible with the possibility that reactivity may be compounded by insufficient semantic elaboration of the stimulus, followed by reduced recruitment of prefrontal control areas.

The semantic account proposed here leads to the prediction that not only limbic areas association with emotional reactivity, or dorsal prefrontal/parietal areas associated with attentional control, but also the temporal, parietal, and medial areas where semantic representations are stored (Binder, Desai, Graves, & Conant, 2009) may be involved in the pathology of BPD. Some studies have provided evidence of reduced perfusion in memory areas when activating autobiographic memory in individuals with BPD, especially in connection with traumatic events (Schmahl et al., 2003). A study using a story production task found the largest differences between BPD participants and controls in the superior temporal gyrus (Buchheim et al., 2008). Differences in superior temporal gyrus activation were also found in borderline participants' relative controls when viewing affective pictures (Koenigsberg et al., 2009a, 2009b). In the semantic account of BPD, memory traces created during traumatic events constitute a form of learning antithetical to learning sponsored by controlled processes, and they therefore contribute to a legacy of semantic representations that are not amenable to control. This would account for

the reduced recruitment of medial prefrontal control areas in participants exposed to accounts of traumatic autobiographical events (Bremner et al., 1999; Shin et al., 1999).

Systematic analyses of existing studies reveal the existence of specific areas involved with semantic storage (Binder et al., 2009). At present, many neuroimaging studies have investigated control functions and their capacity to inhibit distractors and contain reactivity to emotional stimuli in patients, whereas fewer studies have focused specifically on the role of semantic memory areas in the presence of emotional information. A research program focused on the possible role of semantic processes in emotion regulation may systematically investigate modulation of these regions across groups or in association with individual differences in the capacity to mentalize complex emotional material. In such studies, it should be possible to detect individual differences when requiring the processing of emotional information, even in the absence of a task in which this information must be suppressed. Because of the importance of the caregiver–child relationship in BPD, emotional information related to attachment situations should be of special interest (Buchheim & Mergenthaler, 2000; Buchheim et al., 2008).

Discussion

The treatment of BPD integrates elements of classical techniques with innovative solutions. Several of the most traditional aspects of the techniques proposed for the treatment of BPD may be expressed in terms of a process model of the mind. First, we may expect that techniques aimed at increasing the engagement of controlled processes in interactions promote the adoption of a more reflexive cognitive strategy. This may help breaking the vicious circle through which the capacity to analyze and appraise the interaction remains low. Examples of these techniques are aspects of exposure emphasizing effortful control in resisting the urge to act impulsively—"blocking action and expressive tendencies associated with problem emotions" (Linehan, 1993).

Second, reducing reactivity may also promote change by helping the patient not to give up the controlled strategy. In this group belong interventions aimed at desensitizing the patient to situations that are apt to elicit an impulsive response, such as exposure techniques (Linehan, 1993), and psychopharmacological interventions.

Another group of techniques aim at changing appraisal of one's own and the other's intentions and emotional reactions, be it through interpretation or through cognitive restructuring. These techniques act on the schemas of semantic memories—that is, they attempt to modify the semantic nodes guiding automatic analysis of perceptual input and automatic generation of responses in interactions. However, the patient may often be unable to profit from these interventions: the interventions may not be understood, or they may be appraised as invalidating (Bateman & Fonagy, 2008; Linehan, 1993).

Indeed, the history of techniques developed for patients with BPD suggests that none of these well-known interventions is regularly effective in this class of patients. A common element in the modifications of technique that many groups have proposed is the use of interventions focusing on the here-and-now interaction of the patient with significant others—including the therapist—that coach the patient in moving from an automatic to a more controlled response strategy through the progressive refinement of the semantic representations that encode one's inner experience and human interactions. The emphasis is less on hitting the right interpretation than on stopping, thinking about feelings and interactions, and finding words for them. Importantly, the work facing the therapist is not just of substituting one unconscious representation with another, or with restructuring a maladaptive schema. The therapeutic program involves, rather, a change of cognitive strategy and the progressive reorganization of a vast area of semantic nodes representing human feelings and interactions. In this respect, the focus on the reorganization of semantic repertoires to classify feelings and interactions as an essential step to achieve better control may reflect an essential aspect of the BPD-specific modifications of therapy. This has implications for the time required by these treatment programs, which may not be expected to succeed in a few months of treatment alone.

It is important to mention that the procedure followed here, to identify features common to therapies to infer core aspects of pathology, is fraught with the risks always associated with such a reverse-engineering reasoning. Nevertheless, a model that identifies a single, common mechanism of action of different approaches would be logically appealing in its parsimony.

The empirical investigation of the role of semantic processes in control is more arduous than the investigation of classic cognitive control or emotional reactivity, because much less is known about it. One possible relevant set of findings is that related to parts of the prefrontal lobe involved in shaping and controlling internal representations, as opposed to the more often investigated setting where control is exerted against an

external distractor. This distinction corresponds to the existence of separate factors in the individual capacity to resist internal and external distractors, as reported by psychometric studies (Friedman & Miyake, 2004). Studies in which the shaping and control of internal representations have been specifically targeted suggest the involvement of polar areas of the prefrontal cortex and the anterior insula (Bunge, Ochsner, Desmond, Glover, & Gabrieli, 2001; Christoff et al., 2001, 2003; Garavan, Hester, Murphy, Fassbender, & Kelly, 2006; Konishi, Chikazoe, Jimura, Asari, & Miyashita, 2005). It is not known, however, if there is a specific neurobiological correlate of the process involved in the shaping and control of internal representations of an emotional nature. Another relevant set of findings concerns the role of semantic areas, such as those located in the temporal lobe, in processing the input and elaborating the response in the absence of controlled processes. Of particular interest are findings that networks involved in social cognitions overlap with those involved in spatial orienting (Corbetta, Patel, & Shulman, 2008; Mitchell, 2007). Both types of cognitive events involve quick reactions to perceived changes in the environment, which may be overridden by top-down control.

We have proposed that the interaction between memory and controlled processes that these techniques embody has equivalents in the cognitive domain that may help in formalizing the type of psychological processes involved. It may be of interest to formulate the effect of psychotherapeutic interventions directly in terms of these individual processes, instead of monitoring the global psychopathological picture.

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