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Understanding expressive language disturbance in borderline personality disorder

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**Understanding Expressive Language Disturbance in Borderline
Personality Disorder**

**A thesis submitted in partial fulfilment of the requirements for the award of the
degree**

Doctor of Psychology (Clinical)

from

University of Wollongong

by

Phoebe Carter

School of Psychology

2011

Thesis Certification

I, Phoebe Carter, declare that this thesis, submitted in partial fulfilment of the requirements for the award of Doctor of Psychology, in the school of psychology, University of Wollongong, is wholly my own work unless otherwise referenced or acknowledged. The document has not been submitted for qualifications at any other academic institution.

A handwritten signature in black ink, appearing to read 'Phoebe Carter', with a stylized, cursive script.

Phoebe Carter

November, 2011

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I dedicate this thesis to my husband, Brendan, who has stood alongside me from the moment we met, encouraged me to pursue my dreams, and tirelessly listened to me every step of the way along this challenging path. You are a true friend and this entire experience was all the more rich because I was able to share it with you.

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Abstract

Rationale. Borderline Personality Disorder (BPD) patients present with expressive language disturbances in the clinical setting. This context may serve as an activating interpersonal cue to these patients' trauma-memory systems. However, there are no known controlled studies investigating this phenomenon. *Aims.* 1) To examine BPD expressive language disturbances in response to a clinically relevant trauma-salient stimulus, the Adult Attachment Interview (AAI) (Study 1). 2) To further validate use of this methodology in an additional BPD sample and delineate expressive language disturbances using a neutral comparative condition and pause analysis (Study 2). 3) To investigate whether specific psychosocial factors influence expressive language (Study 2). *Methods.* a) Study 1: 20 BPD participants and 20 matched controls were administered the AAI. Transcripts were analysed to evaluate overall impairment and lexical, syntactic and semantic impairment. Study 2: 12 additional BPD participants and 12 matched controls were administered the AAI and a neutral stimulus. Pause profiles, expressive language deficits and relationships to trauma history were investigated. *Results.* Compared to controls, BPD participants evidenced greater overall language impairment and reduced syntactic and lexical, but not semantic complexity. BPD participants utilised higher proportions of pauses across both conditions, but particularly when generating adjectives related to describing early relationships with their mother. Significantly, physical abuse history and Post-traumatic Stress Disorder related to some expressive language deficits. *Conclusion.* These linguistic profile deficits are consistent with neuroimaging and neuropsychiatric findings. Future research may discover changes in these linguistic profiles to be indices of therapeutic change.

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**List of Publications and Presentations at Scientific Meetings Arising from this
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Introduction

“Those who do not have power over the story that dominates their lives, power to retell it, to rethink it, deconstruct it, joke about it, and change it as times change, truly are powerless, because they cannot think new thoughts” - **Salman Rushdie**

1.1 Clinical Descriptions of Expressive Language Disturbance in Borderline Personality Disorder

The clinical literature on Borderline Personality Disorder (BPD) is replete with examples of impaired memory, regulation of emotion and expressive language deficits in the therapeutic setting (Blatt & Levy, 2003; Prunetti, et al., 2008). Specifically, Bateman and Fonagy (2004a) note that a key to understanding BPD “is the inhibition of mentalisation, perhaps prototypically in response to trauma” referring to impaired memory related to “dissociation in the wake of trauma”, “less adaptive emotion regulation skills”, and a “limited capacity to speak about mental states in themselves and others”. Mentalisation is understood to be the capacity to perceive and understand oneself and others in terms of mental states (i.e. feelings, beliefs and intentions). Mentalisation deficits are therefore considered to be a key characteristic of BPD (Bateman & Fonagy, 2004b; Fischer-Kern, et al., 2010). Research indicates that the therapeutic relationship serves to activate BPD patients’ attachment system, resulting in emotional dysregulation, reduced capacity to reflect upon their own mental states and disorganised narrative, which in turn appears to negatively impact upon therapeutic progress (Prunetti, et al., 2008).

An important part of therapeutic work is developing a coherent autobiographical narrative (Bucci, 2001; Gullestad & Wilberg, 2011; Music, 2011b). Busch and colleagues (2001) note the significance of developing a coherent autobiographical narrative for one patient: “The focused exploration of her difficulties captivated her with the sense of coherence it brought to her experience”. Certainly, psychotherapy usually involves “putting together a story that will explain and organise major life events causing an individual distress” (Pennebaker & Seagal, 1999). Furthermore, Fertuck et al.’s (2004) study of treatment resistant young adults demonstrated that improvements in symptoms and social behavior during treatment were associated with increases in

abstract, symbolic verbal representations and with improvements in self-awareness. Yet, there has been little empirical investigation of the specific expressive language deficits that BPD patients present with, and thus minimal understanding as to what influences a BPD patients' capacity to produce coherent narratives in the therapeutic context (Judd, 2005). The focus of this thesis is to elucidate the precise nature of BPD expressive language deficits in response to clinically relevant emotionally salient stimuli.

1.2 Defining Borderline Personality Disorder

BPD is a mental disorder characterised by affective instability, impulsivity, and interpersonal difficulties (Leichsenring, Leibing, Kruse, New, & Leweke, 2011). The original BPD category developed out of the medical diagnosis hysteria, dating back to the 1800s. Clients diagnosed in this category were commonly identified as being on the border between neurotic and psychotic which resulted in the emergence of the term "borderline" (Beck & Freeman, 1990). It is estimated that BPD affects between 0.5% and 5.9% of the general population (Grant, et al., 2008; Lenzenweger, Lane, Loranger, & Kessler, 2007). In clinical populations BPD is the most common personality disorder, accounting for 10% of all psychiatric outpatients, and between 15% to 25% of inpatients (Gunderson, 2009).

Despite significant growth in BPD research, controversy continues to surround BPD diagnosis. It has been argued that the recent rise in diagnostic rates of BPD is directly related to the revision of the American Psychiatric Association's (APA) Diagnostic and Statistical Manual of Mental Disorders (DSM) categories (Hodges, 2003). It has also been contended that the increased rate of BPD diagnosis is related to indiscriminate use by clinicians (Gunderson & Sabo, 1993). The current definition of BPD has evolved in such a way that diagnostic criteria such as mood lability and dysphoria closely resemble Axis I affective disorders (Hodges, 2003). Additionally, BPD as a single diagnostic entity, has been criticised due to the heterogeneity of symptoms exhibited in individuals with a BPD diagnosis (Maffei, 2005). There has also been considerable discussion regarding the phenomenological and conceptual similarities between BPD and Post-traumatic Stress Disorder (PTSD) (Lewis & Grenyer, 2009). The fact that both disorders are viewed in terms of their relationship to external stressors has led to debate over whether the two disorders are separate and distinct (Hodges, 2003). Yet, the view that BPD is a complex form of PTSD remains

questionable given PTSD is common but not universal in patients with BPD (Gunderson & Sabo, 1993; Lewis & Grenyer, 2009).

Importantly, there are core differentiating criteria which define the BPD diagnostic profile (Hodges, 2003). Notably, Gunderson (1996) argues that the criteria that best discriminates BPD from a range of other disorders is the presence of intense fears of abandonment. Further, despite the complexity and various manifestations of BPD, several studies have been conducted supporting the coherence of BPD as a diagnostic entity (Clifton & Pilkonis, 2007; Fossati, Maffei, et al., 1999; Sanislow, et al., 2002).

1.3 The Development of Borderline Personality Disorder

Evidence suggests that the presence of certain expressive language and memory deficits in BPD patients appear to be the consequence of early-life trauma (Meares, Stevenson, & Gordon, 1999). Stern's (1938) original description of BPD, notes that "actual cruelty, neglect and brutality by the parents of many years duration are factors found in these patients." Data indicates that in a typical cohort of BPD patients, 60-80% will have a history of abuse or neglect of some kind (Herman, Perry, & van der Kolk, 1989; Ogata, et al., 1990; Zanarini, et al., 1997). A number of additional psychosocial factors supposed to be related to the aetiology of BPD have been investigated. In a comprehensive review of these factors Zanarini and Frankenburg (1997) found prolonged early separations and losses, disturbed parental involvement, histories of childhood abuse or neglect, and a high prevalence of affective disorders in first-degree relatives were common in the histories of individuals with BPD (Zanarini, 2000; Zanarini & Frankenburg, 1997). There are methodological problems associated with all of the above areas of study including biases from retrospective accounts, uncertain diagnostic criteria, and lack of blindness to diagnosis in judgements of adversity (Zanarini, 2000; Zanarini & Frankenburg, 1997). However, overall the most empirically robust aspects of psychosocial aetiology of BPD appear to be childhood trauma or abuse, alongside family history of psychopathology (Zanarini, 2000; Zanarini & Frankenburg, 1997).

Yet, notably the existence of a single risk factor, such as trauma, is neither necessary nor sufficient to explain the origin of BPD (Lewis & Grenyer, 2009). A

recent meta-analysis on the relationship between BPD and childhood abuse reported only a small to moderate effect size for the association between childhood abuse and the later development of BPD (Fossati, Madeddu, & Maffei, 1999). The hypothesis that trauma is the primary cause of BPD rather than one risk factor among many, appears to ignore important known contributing biological, social and psychological factors (Lewis & Grenyer, 2009). Several studies have implicated a biological involvement in the development of BPD by demonstrating BPD individuals are more likely to have a first degree relative with BPD (Distel, et al., 2008). Twin studies have also revealed that genetic influences explain 42% of the variance in BPD symptoms (Distel, et al., 2008). Famularo et al. (1991) assert that traumatic experiences suffered in childhood play a role in the development of borderline psychopathology by disrupting affect regulation and impairing cognitive and interpersonal capacities. Such studies therefore demonstrate an interaction of heritable, biological and environmental processes in the development of BPD.

Judd & McGlashan's (2002) integrated developmental model of BPD identifies cognitive and language impairment as a key underlying vulnerability. That is, the neurobehavioural vulnerability of cognitive impairment (arising from cerebral insult or genetic inheritance) may interact with the child's developmental pathway, thus potentially amplifying or increasing vulnerability to poor affective fit or maltreatment (Judd, 2005). BPD individuals may possess an impaired ability to process or integrate emotional and sensory information into their interpersonal memory systems which in turn impacts upon meta-cognitive capacity (Judd, 2005). For this reason it is thought that an interaction between biological (e.g. temperamental) and psychosocial factors (e.g. early adverse events, attachment experiences and psychological factors) probably best explains how BPD and its associated expressive language and/or cognitive deficits develop over time (Gabbard, 2005).

1.4 Psychotherapeutic Treatment of Borderline Personality Disorder

Theoretical and clinical literatures consider BPD to be one of the most challenging psychiatric disorders to treat (Bateman & Fonagy, 2004b; Gunderson, 2009; Kernberg, 1968; Linehan, 1993; Schwartz & Welding, 2003). BPD is commonly associated with high rates of co-morbid mental disorders (including mood, anxiety and substance misuse disorders), severe functional impairment and intensive use of

treatment (Bender, et al., 2001; Lieb, Zanarini, Schmahl, Linehan, & Bohus, 2004; Skodol, et al., 2002).

To date, there is no clear evidence pointing to the superiority of one specific form of psychotherapy for BPD over another (Leichsenring, et al., 2011). Yet, preliminary research suggests that different treatment approaches may be suitable for addressing specific BPD symptoms. For example, Clarkin et al. (2007) compared transference focussed psychotherapy (TFP), dialectic behavioural therapy (DBT), and psychodynamically-oriented supportive therapy over a one-year period and found significant improvements in depression, anxiety, social functioning and global functioning across all treatment groups. With regard to key psychodynamic-oriented symptoms, only the TFP group revealed more secure attachment and greater reflective capacity following psychotherapeutic intervention (Levy, et al., 2006). It has been argued that BPD symptoms that are acute in nature (e.g. parasuicidal and impulsive behaviours) may be demarcated from those that are temperamental in nature (e.g. fears of abandonment) (Zanarini, et al., 2007). There may be different routes to symptom change for different patients with BPD (Vermote, et al., 2009), yet further research is necessary to examine the precise mechanisms through which treatment improvements occur. Systematic studies of BPD patients' expressive language capacity in the clinical context are therefore of primary relevance to psychotherapists. The current thesis is designed to investigate the content and form of BPD patients' narratives. This research may contribute to the development of linguistic profiles as indices of therapeutic change and provide insight into the factors which impact upon BPD patients' capacity to benefit from psychotherapy and interpersonal relationships. The current research also expands the field by utilising innovative computerised language analysis programs in a novel patient population BPD, and consequently may offer an efficient and feasible alternative method for investigating expressive language deficits in the clinical context.

1.5 Factors Related to Expressive Language Disturbance in Borderline Personality Disorder

1.5.1 Early Life Experience

According to the developmental model of BPD, language serves as the primary medium for integration and structure in human mental life. In normal development,

sensorimotor schemas become increasingly symbolic, abstract, and integrated during the evolving linguistic dialogue between parent and child (Judd & McGlashan, 2002). Throughout development, children engage in verbal dialogue with parents and emotions become increasingly more complex, differentiated and inextricably linked to cognition. Such dialogue ultimately fosters cognitive and language development, a sense of self and integrated representations of self and other (Judd & McGlashan, 2002). Judd & McGlashan (2002) hypothesise that the borderline child experiences significant difficulty learning how and when to use language to meet their needs due to impoverished, contradictory and/or confused, verbal and nonverbal parental messages. In support, studies of maltreated children have revealed deficits in productivity, content, complexity and use of pragmatic language such as discourse skills, questions and descriptive utterances (Coster, Gersten, Beeghly, & Cicchetti, 1989). That is, receptive language appears to remain intact whereas expressive language is disturbed (Beeghly & Cicchetti, 1994). In particular, such children produce less words referring to internal states resulting in an impaired emotive state vocabulary and fewer dyadic interactions regarding feelings (i.e. mentalisation deficits) (Beeghly & Cicchetti, 1994). The lack of capacity to mentalise distressing experiences arguably intensifies the impact of trauma whilst also rendering borderline children vulnerable to subsequent trauma or later maltreatment (Bateman & Fonagy, 2004b). The expressive language deficits reported in the adult BPD clinical literature seems to mirror the above deficits, yet research is required in order to understand the linguistic profile of the adult BPD patient in the clinical context.

1.5.2 Affect Regulation

BPD patients tend to present in psychotherapy with an impaired ability to process or integrate emotional and sensory information which in turn appears to impact upon expressive language capacity (Bateman & Fonagy, 2004a). However, due to a dearth of empirical research concerning BPD expressive language, little is currently known regarding the BPD patient's language deficits in the clinical context.

Object relations theory (Jacobson, 1964; Kernberg, 1980; Klein, 1957) proposes that an essential principle of personality organisation is that both subjective experience and behaviour are organised by an internal psychic structure (Clarkin, Lezenweger, Yeomans, Levy, & Kernberg, 2007). This psychic structure is composed of a

representation of self, a representation of the other in relation to self, and an affect linking the two. According to object relations theory, this structure serves as the organiser of motivation and behaviour (Clarkin, Lezenweger, et al., 2007). Object relations theory (Jacobson, 1964; Kernberg, 1980; Klein, 1957) offers insight into the link between affect regulation and expressive language disturbance in BPD. Individuals with normal personality organisation show an integrated concept of self and other, a broad range of affective experience and possess an internalised value system that reflects coherence (Clarkin, Lezenweger, et al., 2007). In contrast, BPD patients are characterised by an inability to create, maintain, and use integrated images of self and others, which leads to emotional instability and chaotic interpersonal relationships. Specifically, object relations theory also offers explanation for the apparent disruption BPD patients' exhibit in their capacity to verbally express personal narrative (Bender & Skodol, 2007; Judd, 2005).

Stern's (1985) influential synthesis of the literature provides a theory of the relationship between childhood development factors and linguistic and emotional development. Although the evidential basis in this area is small, there are some influential studies providing preliminary conclusions about the status of this field (Beeghly & Cicchetti, 1994; Coster, et al., 1989). These studies appear to support Schore's (1994) proposal that the caregiver acts as the regulator of the child's affective experience, facilitating the creation of a coherent narrative.

Luria's (1973), theory of higher cortical functioning also posits that the functions of the brain develop during the early period of communication between child and adult. The mother's lack of emotional availability impairs the development of the right-hemispheric early narrative thought, which in turn, impacts upon the child's ability to effectively self-regulate affect. The lack of early affective involvement produces a growth-inhibiting environment that disrupts right temporal-frontal and frontal sub-cortical connectivity necessary for integrated right hemisphere functioning (Bressler & Menon, 2010; Iacoboni, 2005; Music, 2011a). The right hemisphere is known to provide a key role for supporting verbal communication and is pivotal in the storage of self-and-other images and autobiographical memory (Schore, 1994). Thus, it appears that the degree to which BPD patients are able to produce detailed emotion descriptive narrative is contingent upon the capacity to process emotive states in an integrated manner. Given that a core problem of BPD is emotional dysregulation (Clarkin, Hull, &

Hurt, 1993; Linehan, 1993), many of the erratic behaviours, including expressive language disturbance exhibited by BPD patients may therefore be understood as symptoms of emotional dysregulation (Donegan, et al., 2003). Yet, to date, no known studies have delineated the precise expressive language deficits that emerge when BPD patients are exposed to personally salient emotive autobiographical stimuli.

1.5.3 Autobiographical Memory & Trauma

When investigating expressive language disturbance in BPD in response to emotional autobiographical stimuli, it is important to consider the impact of trauma on autobiographical memory. Autobiographical memory is defined as a memory of a personally experienced event that comes with a sense of recollection or reliving (Greenberg & Rubin, 2003). Studies of individuals' subjective reports of personally significant events generally find that memories are unusually accurate and stable over time. However, whilst studies have shown that memories of emotionally salient events, such as witnessing murder, are detailed, accurate and persistent (Yuille & Cutshall, 1986), it is also well known that exposure to trauma or affectively dysregulating environments can impact upon autobiographical memory. That is, the accuracy of the autobiographical memory appears to be influenced by the emotional valence of the memory (van der Kolk, 2002).

The effect of chronic trauma on the memory system is well reported in the PTSD literature. Several studies have shown that those with PTSD have difficulty retrieving specific, detailed autobiographical memories (McNally, Lasko, Macklin, & Pitman, 1995; Sutherland & Bryant, 2008). In particular, a replicated study of Vietnam combat veterans found that those suffering PTSD were more likely to retrieve overgeneral memories when compared to healthy controls (McNally, et al., 1995). This result was also supported in a study of survivors of motor vehicle accidents, which demonstrated that those with Acute Stress Disorder (ASD) also retrieved significantly fewer specific memories than the non-ASD participants. Interestingly, this result was found for both the constrained condition, which required participants to retrieve memories from the period of their trauma, and in an unconstrained condition, which allowed recall from any period (Harvey, Bryant, & Dang, 1998).

LeDoux (1991) asserts that input from the thalamus arrives at the amygdala before information from the neocortex, and that this earlier arrived sensory input from the thalamus “prepares” the amygdala to process the later arriving information from the cortex (LeDoux, Romanski, & Xagoraris, 1991). Consequently, emotional evaluation of sensory input precedes conscious experience and individuals become autonomically and hormonally activated before making a conscious appraisal of what they are reacting to (Bucci, 2000, 2001). High levels of amygdala activation and related structures can generate emotional responses and sensory impressions that are based on fragments of information, rather than complete perceptions of objects and events. Once the amygdala has assigned emotional significance to sensory input, it passes this evaluation on to other brain structures, including the hippocampus. The hippocampus then begins organising and categorising this information with previously existing information about similar sensory input. The strength of the hippocampal activation is affected by the intensity of input from the amygdala. The more significance assigned by the amygdala, the stronger the input will be attended to and the memory retained. However, overly high levels of stimulation of the amygdala begin to interfere with hippocampal function (van der Kolk, 2002). When this occurs sensory imprints are stored as fragments in the memory because the hippocampus is prevented from performing its integrative function. The experience is thus consolidated, and later retrieved, as isolated images, bodily sensations, smells and sounds that seem separate from other life experiences (van der Kolk & Fisler, 1995). Additionally, the hippocampus does not appear to play its usual role in helping to localise the incoming information in time and space (van der Kolk, 2002). One consequence of this is that memory is split off from consciousness, that is dissociated, as the memory can not be integrated into a neutral narrative.

In support, accounts from traumatised patients consistently mention that emotional and perceptual elements tend to be more prominent than declarative components (van der Kolk, 2002). It is plausible that for those with BPD, the trauma-salient memory may have no verbal component, rather, the memory is organised on a perceptual level without an accompanying narrative (van der Kolk, 2002). There is a current scarcity of empirical BPD research in this area. However, recent neuroimaging studies of individuals with PTSD support this clinical observation. For example, one study showed that during provocation of traumatic memories there is a decrease in activation of Broca’s area, which is centrally involved in the transformation of

subjective experience into speech (Rauch, et al., 1996). Other recent brain imaging studies have shown abnormal lateralization and decreased Broca's area activity when PTSD patients re-experience the trauma (Shin, et al., 1997; Shin, et al., 1999). Van der Kolk & Fisler (1995) examined how traumatic and non-traumatic memories were retrieved differently and found that those remembering traumatic memories initially reported the trauma in terms of somatosensory experience rather than narrative. Over time, more sensory modalities were activated and the capacity to verbalise events surrounding the trauma emerged. This study demonstrated a delay in the capacity to verbalise the trauma related memory (van der Kolk & Fisler, 1995). Such studies reveal the importance of considering the impact of trauma salient stimuli on autobiographical recall and the generation of coherent narratives.

1.5.4 Autobiographical Memory, Trauma & Affect Regulation Combined

It is generally established that the memory system is made up of networks of related information. High states of arousal appear to selectively promote retrieval of traumatic memories, sensory information, or behaviours associated with prior traumatic experience. That is, activation of one aspect facilitates the retrieval of associated memories.

Importantly, clinicians have long observed heightened arousal when BPD patients articulate personal histories, a notion which has been partially supported empirically by recent BPD brain imaging studies which have shown significant limbic system abnormalities, specifically amygdala hyperactivity, associated with BPD patients' negative mood states (Donegan, et al., 2003; Herpertz, et al., 2001). Exposure to specific emotional or sensory triggers therefore appears to serve as a cue for the retrieval of personally relevant, trauma salient memories.

1.5.5 Co-morbidity

Post-Traumatic Stress Disorder. Approximately one third of patients with BPD also fulfil criteria for PTSD (Gunderson & Sabo, 1993). Consequently it is important to consider the potential impact of co-morbid PTSD on BPD patients' expressive language disturbance.

As previously mentioned evidence clearly demonstrates that individuals with PTSD have difficulty retrieving specific autobiographical memories (McNally, et al., 1995; Sutherland & Bryant, 2008). Across several empirical studies, McNally and colleagues have reported that Vietnam veterans with PTSD demonstrate deficits in retrieving specific memories relative to those without PTSD (McNally, et al., 1995; McNally, Litz, Prassas, Shin, & Weathers, 1994). McNally et al. (1995) also revealed that those Vietnam veterans who appeared to maintain a strong military oriented self-identity, were more likely to retrieve memories associated with military experiences (McNally, 2003). Similarly, a study of cancer patients with PTSD demonstrated that these patients retrieved more illness-oriented autobiographical memories compared to cancer patients without PTSD (Kangas, Henry, & Bryant, 2005). That is, the content of memory retrieval seems to be influenced by the nature of one's personal past trauma as linked to self-identity (Conway & Pleydell-Pearce, 2000).

The plethora of studies reporting on the above phenomena indicates that the impact of PTSD on the memory and language system has been well investigated and reported. However, the precise nature and form of expressive language utilised when verbalising trauma salient memories in both PTSD and BPD remains understudied. No known studies have previously investigated the emergence of specific expressive language deficits in BPD in response to clinically relevant emotionally salient autobiographical stimuli. This is evidence that the precise influence of co-morbid PTSD on BPD patients' expressive language disturbance remains to be understood in the context of exposure to clinically relevant trauma salient stimuli.

Dissociative Symptomatology. Evidence demonstrates the tendency for BPD patients to become disorganised and dysregulated and produce disorganised speech, in the context of recalling past trauma or early adverse experiences (Fonagy, 2002; Levy, et al., 2006; Zanarini, Gunderson, & Frankenburg, 1990). The presence of dissociative symptomatology may therefore play a significant role in the emergence of BPD expressive language deficits.

Dissociation refers to disruptions in the normal integration of memories, perceptions and identity (American Psychiatric Association, 2000). Its main features include disturbance of memory, depersonalisation, derealisation, a discontinuity of personal existence, and hallucinatory phenomena (Waller, Putnam, & Carlson, 1996).

Research has shown that dissociation begins when experiences are initially stored in memory as sensory fragments without a coherent semantic component (Jones, et al., 1999). Severe or pathological dissociation is one of the DSM-IV-TR diagnostic criteria for BPD. However, BPD patients can experience dissociative symptoms on a continuum, ranging from daydreaming and transient lapses of attention, to pathological failures to integrate memory, affect, behaviour, sensation and identity into a coherent sense of consciousness (Zanarini, et al., 1990). At the more severe end, dissociation involves dissociative fugue and psychogenic amnesia, which suggest failures in autobiographical recall (Jones, et al., 1999). It is therefore important to consider the impact of dissociation on expressive language disturbance when recalling emotive autobiographical material.

Studies conducted in the clinical population have demonstrated that high rates of childhood abuse and/or neglect are central to both BPD and dissociative disorder (Sar, Akyuz, Kugu, Ozturk, & Ertem-Vehid, 2006). More specifically, studies of female BPD inpatients have found that childhood sexual abuse is a significant risk factor for the development of dissociative symptomatology (Brodsky, Cloitre, & Dulit, 1995; Shearer, 1994). A positive correlation between emotional neglect and dissociative symptomatology has also been demonstrated (Simeon, Nelson, Elias, Greenberg, & Hollander, 2003).

Historically dissociation has been viewed as a defensive coping strategy that protects one from the overwhelming emotion provoked by traumatic or aversive events (Bryant, 2007). BPD patients tend to indicate the highest symptom scores for depersonalisation, and dissociative amnesia. This suggests that persistent efforts to suppress unpleasant thoughts may be a regulation strategy underlying the relationship between intense negative emotions and BPD. The combination of depersonalisation and amnesia may also reflect the ongoing alternation between approaching (which evokes depersonalisation feelings) and avoiding (which maintains amnesia) aversive mental content as a further adaptation or coping process (Sar, et al., 2006).

At times of low stress BPD patients report feelings of mild disconnection and reduced awareness of their emotional life. At more stressful times BPD patients report high degrees of interference with the processing of arousing information (Judd, 2005). This is corroborated by a study showing that BPD patients were unable to respond to negative cues on significantly more occasions and provided significantly more general

responses on a trauma-related autobiographical memory test as compared to controls (Jones, et al., 1999). Additional studies provide further support for this notion by demonstrating an association between dissociative symptoms and the retrieval of over-general trauma related memories (Cloitre, Cancienne, Brodsky, Dulit, & Perry, 1996; Sutherland & Bryant, 2008). Dissociation has also been found to be related to memory fragmentation (Kindt & Van den Hout, 2003). Investigation of the impact of dissociative phenomena on BPD patients' expressive language is therefore warranted.

Depression. The presence of depressive symptomatology may contribute to expressive language disturbance in BPD patients. There exists convergent evidence that depressed patients present with the tendency to retrieve overgeneral autobiographical memories (Kuyken & Brewin, 1995). Additionally, neuropsychological studies of depressed patients have demonstrated deficits in information processing, memory and executive functioning (Austin, Mitchell, & Goodwin, 2001; Austin, et al., 1999; Elliot, et al., 1997), which persist after recovery (Austin, et al., 2001). However, results have varied (Austin, et al., 1999). This has led to an emphasis on the importance of differentiating between depressive subtypes in order to elucidate why some depressed patients exhibit considerable cognitive and language deficits, while others do not (Naismith, et al., 2003).

Phenomenological differences between non-borderline depression and aspects of depression in BPD have been revealed (Gunderson & Phillips, 1991; Levy, Edell, & McGlashan, 2007; Rogers, Widiger, & Krupp, 1995). The differences appear to be mostly in the quality; i.e., the patient's experience of the depressive mood or affective state. Major depression, whether melancholic or non-melancholic, has been thought to be a sad, guilty depression, whilst the depression in BPD has often been described as a depression closely linked to anger and hostile behavior (Wilson, et al., 2007). The BPD patient experiences their mood as being related to the thought that s/he is fundamentally a bad person (De Bonis, De Boeck, Lida-Pulik, Hourtane, & Feline, 1998). Westen and colleagues (1992) found that the depression in BPD, even while controlling for severity, is characterized primarily by loneliness, emptiness and feelings of desperation in relation to the absence of significant others (Gunderson, 1996; Klonsky, 2008). Further, BPD depression was found to be labile, pervasive and to have significant levels of negative affectivity attached to it (Westen, et al., 1992).

More specifically, cognitive and language deficits in BPD patients with depression appear to be characterised by mood reactivity and an inability to regulate emotion, which is exacerbated in the clinical context (Jackson, Malmstadt, Larson, & Davidson, 2000; Linehan, 1993). Affect dysregulation associated with depressive symptomatology may therefore be a key factor contributing to expressive language deficits in BPD (Jackson, et al., 2000). The current research thus contributes to the literature by examining the precise effect of depressive symptomatology on expressive language.

1.6 Borderline Personality Disorder & Clinically Relevant Trauma Salient Stimuli

By exposing BPD patients to personally salient stressful memories, past neuroimaging studies have demonstrated activation of key brain regions (Donegan, et al., 2003; Minzenberg, Fan, New, Tang, & Siever, 2008). Overall, BPD neuroimaging studies have shown bilateral activation of the amygdala (Donegan, et al., 2003; Herpertz, et al., 2001) and decreased responsiveness of the anterior cingulate cortex (Minzenberg, et al., 2008; Schmahl, Vermetten, Elzinga, & Bremner, 2004; Swirsky-Sacchetti, et al., 1993), hippocampus (Juengling, et al., 2003), medial cortex, orbitofrontal cortex (Schmahl, Vermetten, et al., 2004; Soloff, et al., 2003), and dorsolateral prefrontal cortex (Schmahl, et al., 2003; Schmahl, Vermetten, et al., 2004). Specifically, exposure to autobiographical memory scripts of abandonment in positron emission tomography studies has revealed reduced orbitofrontal and anterior cingulate cortex activity (Schmahl, Vermetten, et al., 2004). One study also found that when “neutral” faces were visually presented to BPD patients, their left amygdala activated abnormally and BPD patients reported greater sensitivity (i.e. negative interpretations) towards neutral stimuli (Donegan, et al., 2003). Such studies suggest BPD patients tend to respond in an emotionally dysregulated way to stimuli associated with interpersonal relationship. It is therefore generally established that exposure to specific salient emotional triggers activates the traumatic memory system of BPD patients. Furthermore, despite BPD sharing some phenomenological features with other trauma-associated disorders (e.g. PTSD), neuroimaging studies demonstrate activation of key differentiating neural networks, specific to BPD patients (Donegan, et al., 2003; Driessen, et al., 2004). Such studies emphasise the value of further investigation into the specific ways BPD patients react to salient emotional stimuli. The current research

therefore examines BPD participants' speech in response to a clinically relevant emotive stimulus (the Adult Attachment Interview).

1.7 Utilising the Adult Attachment Interview

Attachment is defined as a behavioural control system that maintains the infant's safety and ensures survival through access to parental care, and protection (Bowlby, 1988). This system functions to regulate infant safety, is activated by stress and has reduction of arousal and restoration of a sense of security as its goal. As a result of repeated interpersonal interactions that have been encoded into memory as prototypic, the attachment model developed in infancy is thought to have long-lasting effects that tend to be expressed in all subsequent close relationships (including therapeutic interactions) (Hesse, 1999). It is reasoned that the BPD patient's ability to maintain coherence, quality and relevance of expressive language related to these early experiences provides a window into his or her mode of relating with the world which has important implications for therapeutic outcomes (Bouchard, et al., 2008; Diamond, Stovall-McClough, Clarkin, & Levy, 2003; Hesse, 1999).

The Adult Attachment Interview (AAI) was specifically designed to explore mental representations concerning early attachment relationships through expressive language, during autobiographical recall of childhood experiences (George, Kaplan, & Main, 1984/1985/1996). Importantly, the AAI requires an individual to detail childhood and current experiences regarding their relationship with their parents, in addition to, specific supportive or contradictory memories (George, et al., 1984/1985/1996). The questions and probes are designed to explore early attachment relationships and elicit an account of such experiences as separation, physical and psychological hurt, rejection, and trauma (Main, 1995). The AAI is particularly relevant for BPD patients given their developmental histories (Zlotnick, et al., 2003), and challenges their capacity to integrate the emotion generated by the interview and produce a coherent, organised narrative. This process arguably mirrors the therapeutic interaction. It is therefore anticipated that verbalising personal histories (in response to the AAI) will represent a significant personal stressor for BPD patients and activate the traumatic memory system. Previous studies have validated the use of the AAI in BPD (Buchheim, et al., 2008; Levy, et al., 2006).

1.8 *Limitations of Previous Research*

Past studies have utilised traditional neuropsychological tests to assess expressive language disturbance, which have relevance to the problems BPD patients typically present with in the clinical context. Observed patterns of speech dysfluency and impairment appear to support temporal and/or frontal lobe deficits in BPD patients (Sprock, Radar, Kendall, & Yoder, 2000). Yet, results from studies utilising neuropsychological tests have been heterogeneous. Some studies have demonstrated executive functioning deficits in BPD patients (Beblo, et al., 2006; Lenzenweger, Clarkin, Fertuck, & Kernberg, 2004; Swirsky-Sacchetti, et al., 1993; van Reekum, Conway, Gansler, White, & Bachman, 1993), while others have not (Dinn, et al., 2004). Additionally, verbal memory impairments have been observed (Monarch, Saykin, & Flashman, 2004; O'Leary, Brouwers, Gardner, & Cowdry, 1991) and disputed (Kunert, Druecke, Sass, & Herpertz, 2003; Sprock, et al., 2000), despite the use of numerous targeted verbal memory and verbal fluency tasks (e.g. Auditory Verbal Learning Tests, FAS task) across studies (Spren & Strauss, 1998). Traditional neuropsychological testing methods therefore appear to be limited in their capacity to identify the individualised expressive language disturbances that BPD patients present with in the clinical setting (Ruocco, 2005).

Past attempts have been made to assess cognitive deficits in BPD patients by utilising emotive content within neuropsychological test paradigms (e.g. the emotional Stroop test, for review see Williams & Mathews, 1996). This strategy is in line with the large body of evidence suggesting reduced inhibitory functions in several clinical populations when processing emotionally relevant information (MacLeod & Mathews, 1988; Mathews, MacLeod, & 1994). Several neuropsychological studies have used the emotional Stroop task to assess inhibitory dysfunction in BPD patients (Arntz, Appels, & Sieswerda, 2000; Domes, et al., 2006; Sprock, et al., 2000; Wingenfeld, et al., 2009). However, results of these studies are mixed. Some studies have been unable to detect differential interference effects for emotionally laden versus neutral stimuli (Domes, et al., 2006; Sprock, et al., 2000). Other BPD studies have shown enhanced interference on the emotional Stroop test when specific schema related negative cues are applied (Sieswerda & Arntz, 2007; Sieswerda, Arntz, Mertens, & Vertommen, 2006), though this effect appears to be non-specific to BPD patients (Arntz, et al., 2000). Arguably,

this heterogeneity may reflect the fact that no known previous studies have specifically designed the emotive conditions using trauma salient material that is of specific relevance to BPD psychopathology. Importantly, studies of PTSD patients have consistently shown that adapted versions of the emotional Stroop test which include individualised and relevant trauma related words show increased reaction times and overall interference scores (Cassiday, McNally, & Zeitlin, 1992; Kaspi, McNally, & Amir, 1995; McNally, English, & Lipke, 1993). However, such methods are difficult to apply to the BPD population as multiple interpersonal traumas are often evident and appear to occur most frequently in childhood or early adolescence.

Alternative research methods that focus on studying verbal samples as a direct means of accessing disturbances in expressive language have a long history in psychiatry and offer promise (Covington, et al., 2005; Gottschalk, Eckardt, Pautler, Wolf, & Terman, 1983). Changes in expressive language have been shown to reflect a variety of cognitive impairments (Gottschalk & Bechtel, 1995; Gottschalk, et al., 2000). To date, prior studies have focussed on patients with psychosis and dementia. Specifically, studies have established the value of idea and verb density (i.e. semantic deviances) as measures of impairment (Druks, 2002; Snowdon, et al., 1996). Schizophrenia studies consistently support the relationship between language impairment, syntactic simplification, reduced idea density and lexical irregularities (Covington, et al., 2005; DeLisi, 2001; Thomas, et al., 1996). Furthermore, Snowdon et al. (1996) and Kemper et al. (2001) found that low scores on grammatical complexity (i.e. syntactic simplification) and reduced idea density, predict progression to Alzheimer's disease. Despite this, no known studies have utilised verbal samples to access these impairments in BPD patients. Consequently, little is currently known about the specific linguistic deviances that emerge in BPD patients in response to salient emotive stimuli.

1.9 Overview and Rationale for the Current Research

Systematic studies of BPD patients' ability to produce personal narratives when exposed to clinically relevant emotional stimuli are of primary relevance to psychotherapists. Research designed to investigate the linguistic characteristics and form of BPD patients' expressive language will enable the development of linguistic profiles as indices of therapeutic change. The current research will also provide insight

into the factors which impact upon expressive language and therefore BPD patients' capacity to benefit from psychotherapy and interpersonal relationships.

The Adult Attachment Interview (AAI) is the salient emotive stimulus of choice in the current research. The rationale for use of the AAI in the current research is that verbalising personal histories will represent a significant personal stressor for BPD patients and therefore activate the traumatic memory system. This links to the literature regarding the impact of past trauma and/or early aversive experiences on BPD patients' ability to formulate coherent narratives (Schoore, 1994). The literature also supports the notion that early traumas appear to leave long lasting traces in the brain which result in hypersensitivity to later stressors evocative of the original trauma (Gunderson & Sabo, 1993). Consequently, it is argued that the production of completed personal narratives, such as those required in the AAI, may represent such a stressor. Importantly, this research does not simply rely on cues for traumatic memories. Rather, a strength of this research is the analysis of narratives taken directly from the clinically relevant AAI.

Chapter Two

Study 1: Expressive Language Disturbance in Borderline Personality Disorder in Response to Emotional Autobiographical Stimuli

There is an abundance of clinical literature on Borderline Personality Disorder (BPD) that details examples of expressive language disturbance in the therapeutic setting (Blatt & Levy, 2003; Prunetti, et al., 2008). In particular, adult studies have shown that BPD patients present with impoverished narratives and an inability to recall detailed autobiographical memories which impacts upon psychiatric history-taking and therapeutic progress. This appears to be consistent with the current PTSD literature, which clearly demonstrates that activation of the traumatic memory system of patients with PTSD is linked to recall of overgeneral autobiographical trauma memories (Harvey, et al., 1998; Kangas, et al., 2005; McNally, et al., 1995). Authors such as Fonagy (2002) and Prunetti (2008) refer to the clinical interaction as activating BPD patients' traumatic memory system, resulting in emotional dysregulation and disorganised expressive language. However, there is a current dearth of studies investigating this phenomenon empirically in BPD and no studies that have accurately classified the precise nature of the linguistic difficulties in relation to contemporary theories of psychological and neuropsychiatric functioning.

By exposing BPD participants to stressful memories past neuroimaging studies have demonstrated activation and inhibition of key brain regions associated with the traumatic memory system i.e. reduced activation of the prefrontal cortex or anterior cingulate cortex and increased bilateral activation of the amygdala (Donegan, et al., 2003; Herpertz, et al., 2001; Juengling, et al., 2003; Minzenberg, et al., 2008; Schmahl, Bernet, et al., 2004; Swirsky-Sacchetti, et al., 1993). Yet, to date, imaging technologies mostly require that an individual does not speak whilst in the scanner. Consequently, current imaging paradigms have been limited in their capacity to replicate the affectively charged therapeutic environment and/or activate the traumatic memory system beyond paradigms such as pictorial angry faces stimuli. Past studies have also utilised traditional neuropsychological tests to assess disturbances in expressive language, which have had limited relevance to the problems BPD patients typically present with in the clinical context.

Alternative research methods that examine verbal samples as a direct means of accessing disturbances in expressive language therefore offer promise (Covington, et

al., 2005; Gottschalk, et al., 1983). Past schizophrenia and dementia studies have demonstrated the relationship between language impairment, syntactic simplification, reduced idea density and lexical irregularities (Covington, et al., 2005; DeLisi, 2001; Kemper, et al., 2001; Snowdon, et al., 1996; Thomas, et al., 1996). However, no known studies have utilised verbal samples to access these impairments in BPD patients. Consequently, little is currently known about the specific linguistic deviances that emerge in response to salient emotive stimuli.

Study 1 utilises the AAI as the salient emotive stimulus due to its particular relevance for BPD patients given their developmental histories (Zlotnick, et al., 2003). The rationale for use of the AAI in Study 1 is that the AAI will activate the traumatic memory system in BPD patients. This links to the literature regarding the impact of past trauma and/or early adverse experiences on BPD patients' ability to formulate coherent narratives (LeDoux, 2000; Schore, 2009; van der Kolk, 2002).

Due to the large body of clinical literature supporting the notion that BPD patients present with disturbances in expressive language in the clinical context, it was anticipated that BPD participants would evidence enhanced overall impairment in expressive language compared to controls. In addition, it was hypothesised that BPD participants would evidence reduced semantic, syntactic and lexical complexity scores compared to controls.

2.1 Methods

2.1.1 Participants

Study 1 included 20 participants with BPD and 20 age, sex and gender matched healthy controls. All participants were fluent in English. All BPD participants were recruited through the Affect Regulation Disorder Clinic, a health service and university collaborative clinical program focused on personality disorder treatment. BPD participants were excluded if there was evidence of current substance abuse, schizophrenia, schizoaffective disorder, bipolar disorder, major depressive disorder with psychotic symptoms or a history suggestive of organic complications (head injury, neurological disorder etc.). None of the control participants met DSM-IV-TR (American Psychiatric Association, 2000) criteria for a current psychiatric disorder. The control sample was recruited through the university and local community using a snowball method to ensure diversity (Biernacki & Waldorf, 1981). The snowball method uses recommendations and previous acquaintances to find appropriate participants. Study 1 was approved by the Institutional Review Board and written consent was obtained from all participants.

2.1.2 Clinical and Diagnostic Assessments

Diagnoses were established using the structured clinical interviews for DSM-IV SCID-I (First, Spitzer, Gibbon, & Williams, 1996) and SCID-II (First, Gibbon, Spitzer, Williams, & Benjamin, 1994). The SCID-I and II are widely published instruments designed to assess axis I and II disorders. Diagnostic assessment was very thorough, initially being conducted by two trained doctoral-level clinical psychologists, with one conducting the structured face-to-face diagnostic interview and the other observing, and asking further questions where clarification was necessary. Derived diagnoses between the two interviewers were compared, and then taken to a senior clinician for review at the time. Additional questions and clarification with the patient on the same day was then used to derive provisional diagnoses. Final diagnoses were then confirmed following a review of the interview and collateral sources. The SCID-I-RV/NP (non-patient edition), designed to assess participants not identified as psychiatric patients, was used to screen healthy control participants.

2.1.3 Demographic Questionnaire

All participants completed a demographic questionnaire that asked for information on age, gender, years of education, ethnicity, occupation, and relationship status.

2.1.4 Premorbid IQ

Study 1 used Vocabulary Analyzer (He, Weinstein, & Covington, 2007; Vetterli & Furedy, 1997), a computerised measure of word rarity, as an alternative approach for estimating premorbid IQ in the 20 BPD and 20 control participants. Utilisation of Vocabulary Analyzer provided a comparable estimate of premorbid IQ across both samples. Vocabulary Analyser allows for the measurement of premorbid IQ where direct assessment using more traditional measures of premorbid IQ such as the NART is impracticable. Past studies have shown that computerised word-rarity measures, such as Vocabulary Analyzer, are highly correlated with other established IQ measures (i.e. the Cooperative School & College Ability Test; (Vetterli & Furedy, 1997). Vocabulary Analyzer is a content analysis program which analyses the lexical content of language samples and computes the rarity of the speaker's vocabulary (He, et al., 2007). Vocabulary rarity is defined against word frequency. The less frequently a word is used by the general public the more rare the word is. Vocabulary Analyzer uses the 6000-word cutting point, that is, anything outside the 6000 most common English words is considered rare. Hoover (2005) presents findings that support the validity of this 6000-word cut point approach.

2.1.5 Acquisition of Speech Samples

Narrative speech samples were obtained and audiotaped for all 20 BPD and 20 control participants. The Adult Attachment Interview (AAI; (George, et al., 1984/1985/1996) was the emotive stimulus of choice for the current research. Participants were asked 15 questions from the AAI in a set order, with standardised probes (George, et al., 1984/1985/1996). The AAI captures the current mental representation of childhood experiences and provides information with regard to the form in which autobiographical memory is presented (George, et al., 1984/1985/1996). In particular the questions and probes are designed to explore early attachment

relationships and elicit an account of separation experiences, physical and psychological hurt and trauma. Individuals vary in their ability to describe freely their attachment story, and in the extent to which their stories reveal unity or coherence among the network of attachment memories (Main, 1995).

All subjects' speech samples were audiotaped and transcribed by a typist blind to the purposes of the study. Each transcript was produced according to the Psychotherapy Transcription Standards by Mergenthaler and Stinson (1992). The transcripts were used in conjunction with the audio recordings for data analysis.

2.1.6 *Transcript Analysis*

All participants' speech samples were analysed utilising the following software: PCAD3 (overall expressive language impairment), Linguistic Enquiry and Word Count (lexical complexity), Idea Density Rater (semantic complexity) and Shallow Syntactic Complexity Rater (syntactic complexity).

Lexical complexity refers to the number of varied words that the speaker utilises within particular predetermined categories. For example, an individual who demonstrates less lexical complexity, may use less quantifiers (e.g. few, much, many) in their descriptions, whilst another individual whom demonstrates increased lexical complexity may use a variety of quantifiers throughout their verbalisations resulting in more detailed descriptions (e.g. 'he was much too loud' is more lexically complex compared to 'he was loud').

Semantic complexity refers to the number of independent ideas/propositions in a particular sentence that provide meaning. An example of a less semantically complex sentence is 'I prefer teaching music to any other profession', versus a more complex sentence such as 'The happiest days of my life so far was my first teaching day, which was in June 1980, and then when I was promoted exactly four years later in the same month'.

Syntactic complexity refers to the grammatical complexity of a sentence. An example of a simple sentence structure is 'the children played' and an example of a more complex syntactic structure is 'they will play if it does not rain'.

2.1.7 PCAD3

PCAD3, a computerised version of the Cognitive and Intellectual Impairment (CI) Scale was used to measure overall expressive language impairment in participants' speech samples. The CI scale employs the Gottschalk-Gleser Content Analysis method which uses natural language as its raw data (Gottschalk, 1994). Empirical research has established the validity and reliability of the CI Scale across a range of psychological states (Gottschalk, 1994; Gottschalk, et al., 2000). The CI scale positively correlates with a number of traditional neuropsychological test measures (Gottschalk, et al., 2000). Furthermore, the CI scale reliably and validly measures impairment across a range of drug induced states (Gottschalk, 1994). Prior qualitative research has been limited due to the time consuming nature of training coders and manually scoring transcripts. The PCAD3 software addresses these previous limitations by improving accuracy and speed of scoring (PCAD3; (Gottschalk, et al., 2000). Interscorer reliability between automated and human scoring has been shown to be over 0.80 (Gottschalk, et al., 2000).

2.1.8 LIWC2007

The Linguistic Inquiry and Word Count (LIWC2007; (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007) is a content analysis system that maps a range of psychological and basic linguistic characteristics of text materials and was developed to analyse texts on a word-by-word basis (counts words within given categories). The English version of LIWC2007 has been validated across a range of studies (Pennebaker & Chung, 2008; Pennebaker, et al., 2007; Pennebaker & Francis, 1996). The LIWC2007 dictionary consists of 66 thematic categories, which are part of four broader dimensions: standard linguistic processes, psychological processes, personal concerns, and spoken categories. Three of the above dimensions were utilised for the purpose of this study: linguistic processes (i.e. function words, personal pronouns, qualifiers etc.), psychological dimensions (i.e. social, cognitive and affective process words) and spoken categories (i.e. assents, nonfluencies and fillers).

2.1.9 Idea Density Rater

This research utilised a computerised version of idea density rater known as CPIDR3, to determine the semantic complexity of the participants speech samples

(Brown, Snodgrass, Kemper, Herman, & Covington, 2007). Idea density is a well-defined measure for semantic complexity in speech and is defined as the number of ideas (or propositions) divided by the number of total words. Studies have demonstrated that idea density is central to semantic complexity (Kintsch & Keenan, 1973), because they are central to argument structure (Jackendoff, 2002).

2.1.10 Shallow Syntactic Complexity Rater

In this research, syntactic complexity was determined using the Shallow Syntactic Complexity Rater (ShaC) which compares text strings to templates following the modified Developmental Level Scale (D-Level Scale; (Covington, He, & Brown, 2006). The scale is ranked according to the age at which children acquire syntactic structures. Later structures have higher rankings that reflect greater complexity. D-Level has been shown to reliably detect cognitive impairment, including early symptoms of Alzheimer's disease, as well as general syntactic simplification in older adults (Kemper, et al., 2001; Snowdon, et al., 1996). The Shallow Syntactic Complexity Rater (ShaC) correlates highly with D-Level and is a reliable and efficient method for estimating syntactic complexity (Voss, 2005).

2.1.11 Statistical Analysis

Statistical analysis was performed with the significance level threshold set at $p=0.05$. Chi-squared tests were used to examine for possible differences in categorical variables (i.e. gender), and ANOVAs were used to evaluate the differences between BPD participants and healthy controls regarding expressive language variables.

2.2 Results

The sample consisted of twenty BPD participants, with a mean age of 33.3 (SD = 9.78), and twenty control participants, with a mean age of 33.7 (SD = 10.46); the difference was not significant ($t = 0.13$, d.f. = 1, 38, $P = 0.90$). The percentage of women was 90% in the BPD participant group and 85% in the control group; the difference was not statistically significant ($\chi^2 = 0.23$, $P = 0.63$). The years of education difference between BPD participants (Mean = 12.9, S.D = 2.72) and controls (Mean = 14.2, S.D = 2.13) was also not significant ($t = 1.69$, d.f. = 1, 38, $P = 0.10$). None of these variables were significantly related to any of the expressive language variables of interest in the current study.

Many BPD participants (90.0%) met criteria for at least three additional axis I diagnoses (M= 5.6 diagnoses, SD = 2.0, range: 2 – 8), and 55% of the BPD sample had at least one additional axis II diagnosis (M = 0.9 additional axis II diagnoses, SD = 1.1, range: 0 - 4) (for further detail see Table 1 and Table 2 below). Many (i.e. 80%) of the BPD participants were in receipt of regular medication.

Table 1

Frequencies of Comorbid Axis I Diagnoses (N=20)

	n
Major Depression	18
Dysthymia	9
Mania	4
Eating Disorder	4
PTSD	10
Panic Disorder	14
Panic Disorder with Agoraphobia	5
Social Phobia	10
Specific Phobia	3
Obsessive Compulsive Disorder	6
Generalised Anxiety Disorder	12

Table 2

Frequencies of Comorbid Axis II Diagnoses (N=20)

	n
Avoidant	5
Dependent	2
Obsessive Compulsive	3
Passive Aggressive	0
Schizotypal	1
Paranoid	4
Schizoid	0
Histrionic	0
Narcissistic	1

2.2.1 Analysis of Overall Impairment in Expressive Language

The BPD participants ($M = 0.12$, $SD = 0.02$) did not differ significantly from the control participant group ($M = 0.12$, $SD = 0.01$), with respect to percentage of rare words utilised ($F(1,38) = 1.05$, $p = 0.31$). Compared with healthy controls ($M = 1.45$, $SD = 0.55$), participants with BPD ($M = 2.4$, $SD = 0.99$) demonstrated significantly more overall impairment as measured by PCAD3 ($F(1,38) = 14.02$, $p = 0.001$).

2.2.2 Analysis of Lexical Complexity

Differences in lexical complexity scores between BPD participants and controls are presented in Table 3.

Table 3

Lexical Variables of Speech: Differences Between BPD Participants (n=20) and Controls (n=20)

	Mean (SD)		F	p
	BPD participants	Controls		
N	20	20		

Words > 6 letters	10.5 (1.4)	11.2 (1.2)	2.636	0.113
Function Words				
Total function words (not including common verbs past, present, future)	63.5 (1.9)	65.2 (2.3)	6.387	0.016*
<i>Personal Pronouns</i>				
1 st person singular e.g. I, me, mine	9.02 (1.5)	8.1 (1.4)	3.663	0.063
1 st person plural e.g. we, us, our	1.0 (0.6)	1.4 (0.5)	4.564	0.039*
2 nd person e.g. you, your	0.67 (0.4)	1.2 (0.6)	10.273	0.003*
3 rd person singular e.g. she, her, him	4.7 (1.5)	3.7 (0.9)	7.007	0.012*
3 rd person plural e.g. they, their, they'd	0.8 (0.4)	0.7 (0.3)	0.572	0.454
Impersonal Pronouns e.g. it, it's, those	5.6 (1.0)	6.6 (1.1)	7.581	0.009*
<i>Verbs</i>				
Auxiliary Verbs e.g. am, will, have	11.2 (1.2)	11.4 (1.0)	0.410	0.526
Past Tense e.g. went, ran, had	8.7 (1.4)	7.3 (1.1)	12.604	0.001*
Present Tense e.g. is, does, hear	7.1 (1.4)	7.9 (1.6)	3.197	0.082
Future Tense e.g. will, gonna	0.7 (0.3)	1.1 (0.3)	16.181	0.00*
Adverb e.g. very, really, quickly	6.3 (1.0)	7.6 (0.8)	20.013	0.00*
Prepositions e.g. to, above, with	10.3 (1.0)	9.8 (1.0)	2.910	0.096
Conjunctions e.g. and, but, whereas	8.6 (1.2)	9.4 (1.0)	4.950	0.032*
Quantifiers e.g. few, much, many	2.2 (0.5)	2.5 (0.6)	5.219	0.028*
Swear Words	0.15 (0.2)	0.03 (0.1)	8.063	0.007*
<i>Spoken Categories</i>				
Assent e.g. agree, ok, yes	1.3 (0.6)	1.5 (0.8)	0.953	0.335
Non-fluencies e.g. mm, er, um	3.2 (1.4)	3.3 (1.1)	0.26	0.873
Fillers e.g. blah, I mean, you know	2.4 (1.3)	2.1 (1.4)	0.473	0.496
<i>Cognitive Processes e.g. cause, ought, know</i>	19.1 (3.1)	22.4 (1.4)	17.812	0.00*
Insight e.g. think, know, consider	2.6 (1.1)	3.3 (0.7)	5.672	0.022*
Causation e.g. because, effect, hence	2.0 (0.4)	1.5 (0.3)	20.056	0.00*
Discrepancy e.g. should, would, could	1.5 (0.6)	1.87 (0.4)	5.620	0.023*
Tentative e.g. maybe, perhaps, guess	2.7 (0.9)	3.7 (0.8)	10.605	0.002*
Certainty e.g. always, never	1.6 (0.6)	1.8 (0.4)	1.894	0.177
Inhibition e.g. block, constrain	0.3 (0.2)	0.3 (0.2)	0.625	0.434
Inclusive e.g. and, with, include	6.2 (1.1)	6.8 (1.3)	2.137	0.152
Exclusive e.g. but, without, exclude	3.4 (1.2)	4.4 (1.2)	7.404	0.01*

Affective Processes

Positive emotions e.g. love, nice, sweet	2.5 (0.7)	3.3 (0.6)	17.408	0.00*
Negative emotions e.g. worry, fearful	2.0 (0.6)	1.2 (0.4)	23.789	0.00*
Anger e.g. hate, kill	0.9 (0.4)	0.4 (0.2)	22.181	0.00*

n = number, SD = standard deviation P = probability value, F = statistic for One-way Analysis of Variance, * $p \leq 0.05$.

2.2.3 Analysis of Syntactic & Semantic Complexity

With regard to syntactic complexity, compared with BPD participants (M = 94.55, SD = 46.0), healthy controls (M = 144.45, SD = 53.87) utilised significantly more complex level 5 sentences as measured by ShaC (F (1,38) = 9.93, p = 0.003).

Data revealed no significant differences between healthy controls (M = 0.52, SD = 0.13), and participants with BPD (M = 0.51, SD = 0.15) with respect to semantic complexity scores as measured by CPIDR (F (1,38) = 0.40, p = 0.53).

2.3 Study 1 Discussion

To our knowledge Study 1 represents the first comparison of BPD participants and healthy controls expressive language whilst utilising a clinically relevant emotionally salient stimulus. In accordance with expectations, BPD participants demonstrated significantly more overall disturbance in expressive language. This finding is consistent with clinical research substantiating the relationship between affectively charged environments and the emergence of disturbances in expressive language in BPD patients (Judd, 2005; Prunetti, et al., 2008). Specifically, the current studies utilisation of a clinically relevant emotionally salient stimulus (the AAI), appears to simulate the clinical context, and in turn, provides preliminary empirical support for the observation that the clinical interaction probably activates BPD patients' trauma memory system, and results in emotional dysregulation and/or disorganised expressive language when discussing early core conflictual relationship memories concerning the family scene and parenting.

Emotional dysregulation and disturbances in expressive language may negatively impact therapeutic progress, especially given the importance of expressive language in the creation of interpersonal relationships (including with the therapist). Recent research has demonstrated that therapists respond differently to patients with BPD, and that patients with BPD are perceived to respond more disharmoniously to the therapist. Specifically, research has demonstrated that such interactions impact upon therapist confidence and result in a tendency for therapists to experience negative feelings and withdraw more in sessions with BPD patients, despite attempts to remain consistently empathic (Bourke & Grenyer, 2010). It is plausible that the BPD patients' lack of capacity to accurately explain events or verbalise their own internal states may exacerbate these responses in their clinicians. Certainly, it has been shown that BPD patients present with a higher proportion of immature defenses which in turn evoke more oppositional responses in the therapeutic context (de Roten, Drapeau, Stigle, & Despland, 2004), and it is plausible that these factors are further exacerbated by the patient's expressive language deficits. Recognition of the BPD patient's expressive language limitations may therefore be a crucial factor for clinicians to acknowledge and consider before embarking on treatment.

Contemporary work in neuropsychiatry and psychophysiology (LeDoux, 2000; Schore, 2009; van der Kolk, 2002) has been instrumental in understanding the effects on

the brain of being affectively charged and/or traumatised. However, to date, imaging technologies have been somewhat limited due to the requirement that an individual does not speak whilst in the scanner. Consequently, current imaging paradigms have been limited in their capacity to replicate the affectively charged environment and/or activate the traumatic memory system. Our data suggests an association between evoking the emotive environment and the emergence of disturbances in expressive language in BPD participants and may therefore offer a promising alternative paradigm for activation of limbico-cortical pathways during recall of autobiographical memories.

The inclusion of a lexical content analysis program (LIWC2007) in Study 1 importantly allows for the study of particles/function words (i.e. pronouns, articles, prepositions, conjunctives, and auxiliary words). This is of relevance given few prior studies have included analyses of function words, despite the fact that they account for over half of the words we use in spoken language (Pennebaker, Mehl, & Niederhoffer, 2003). In this study, BPD participants utilised significantly less function words compared to healthy controls. Specifically, BPD participants used less first person plural, second person and impersonal pronouns and more third person singular pronouns. Prior studies reveal that less first person plural and impersonal pronoun use relates to less emotional distancing (Pennebaker & Lay, 2002). This suggests that, compared to controls, BPD participants were less able to remain emotionally distant when recalling the autobiographical material. BPD participants also used more negative emotion (e.g. fear, worry etc.) and anger (e.g. hate, kill) words. Whereas, control participants utilised significantly more positive emotion words such as love, nice, and sweet. Although such results are not surprising given BPD patients' developmental histories, it is important to note that the central measures in Study 1 are independent of emotional tone. Interestingly, a recent investigation also revealed that severity of BPD symptoms were related to lower levels of verbal elaboration of sadness and higher frequency of hostility directed against others (Lecours & Bouchard, 2011).

Prior studies of expressive language indicate that use of verbs, emotion words, and cognitive process words (i.e. content words) subtly change in response to personal or shared traumatic experience (Pennebaker & Lay, 2002; Stone & Pennebaker, 2002). Analysis of content words revealed that BPD participants use more past tense verbs and swear words. In contrast, control participants utilised significantly more future tense verbs. Healthy controls used more cognitive process words overall, and BPD

participants utilised less insight (think, know, consider), discrepancy (e.g. should, would, could) and tentative (e.g. maybe, perhaps, guess) cognitive process words, in addition to more causation related words (e.g. because, hence, effect). There were no differences between BPD participants and controls with regard to the use of spoken categories such as assents (e.g. agree, ok, yes), non-fluencies (e.g. mm, er, um), and fillers (e.g. blah, you know, I mean). Interestingly, prior studies have documented similar changes with regard to expressed emotion and exhibited cognitive complexity in written texts following traumatic experience (Pennebaker & Lay, 2002).

The linguistic literature also outlines the importance of the use of adverbs, conjunctions and quantifiers in intensifying detail and enhancing understanding in spoken language (Campbell & Pennebaker, 2002; Pennebaker & Lay, 2002). Overall, BPD participants were found to use less adverbs, conjunctions and quantifiers in response to the emotive autobiographical stimulus. It is proposed that the absence of descriptive adverbs, conjunctions and quantifiers in BPD verbal samples is related to their inability to remain emotionally distant from the highly charged emotive stimulus, resulting in a less linguistically detailed narrative. For example, the absence of linguistic detail is evident in this BPD patient's description of an early memory: "My earliest memory, when my mum rubbed my nose in the sheets when I wet the bed." As compared to the control participant's description of an early memory: "For some reason it stands out... my dad was having an affair but I didn't know what that was back then, so I must have just said whatever the person's name was, was with us at the pool or something, and she said and what, what for and what happened, always questioning me and I just remember talking... she wanted information but she sort of wanted to ask well did you think anything happened, she was concerned and I was just not really interested." Another BPD patient described an upsetting early memory in the following way: "Just little flashes of when I was teased at school, that sort of thing. But they're just, they're just flashes and there is nothing very clear". Again the difference in linguistic detail is evident when compared to the control participant's description: "I was the type if I'd get upset I was very on my own, I would go to my room and stay. I'd just get upset with myself and not tell anyone. I've always wondered though whether part of that is just like you're hoping someone will see you and say 'what is up with you?' I think that is what a bit of it is, but I was still, even if someone did ask, I'd draw out and say nothing". In accordance with expectations, healthy controls also utilised

more complex sentence structures compared to BPD participants. More recent functional imaging work of the processing of complex versus simple sentences reveals that reading (for review see Kaan & Swaab, 2002), and the production of complex sentences (Kircher, Brammer, Levelt, Bartels, & McGuire, 2004; Kircher, Oh, Brammer, & McGuire, 2005) are associated with enhanced activation of Broca's area, alongside additional activation in the left or bilateral superior and middle temporal gyri, angular/supramarginal gyri and the cingulate gyus (Kaan & Swaab, 2002). Furthermore, neuroimaging studies have demonstrated that syntactic processing recruits a network of areas including Broca's area and anterior, middle, and superior areas of the temporal lobes, of which none are syntactic specific (Kaan & Swaab, 2002). To date, no other known studies have investigated the impact of a salient emotive stimulus on the production of syntactically complex sentences. It is possible that when exposed to emotionally salient stimuli, BPD participants experience difficulty regulating the required additional fronto-temporal structures due to limbico-cortical dysregulation, and thus are unable to produce syntactically complex sentences under such conditions.

There were no differences between BPD participants and controls on semantic complexity scores. Prior studies focussed on patients with psychosis and dementia have established the value of idea and verb density (i.e. semantic deviances) as measures of expressive language impairment (Druks, 2002; Snowden, et al., 1996). However, none of the above studies focused on impairment in response to a clinically relevant emotionally salient stimulus. Thus, whilst additional studies are required to further validate this finding, it is plausible that semantic complexity remains relatively intact when BPD participants are exposed to emotionally salient stimuli. In support of this notion, studies have revealed that there are separate fronto-temporal circuits for the processing of syntactic and semantic information in the left hemisphere (Friederici & Kotz, 2003). Thus it is possible that for BPD participants, the fronto-temporal networks involved in the processing of semantic information, in contrast to syntactic information, remain relatively unaffected by salient emotive stimuli.

In summary, prior neuroimaging studies of BPD patients have revealed reduced activation of the prefrontal cortex or anterior cingulate (Minzenberg, et al., 2008; Schmahl, Vermetten, et al., 2004), in addition to increased bilateral activation of the amygdala (Donegan, et al., 2003), during symptom provocation. Such studies provide some support to explain the findings of Study 1. That is, it is plausible that the

disturbances in expressive language as exhibited here in BPD patients when recalling emotive memories, may relate to dysregulation in both the prefrontal cortex and connected brain regions such as the amygdala and hippocampus.

Accordingly, in the context of these findings, this thesis will now turn its focus to delineating the specific expressive language deficits that appear to emerge in response to emotive stimuli versus those that appear to be present regardless of affective condition (i.e. those expressive language deficits also present when BPD patients produce narrative in response to a neutral stimulus). Further, this thesis will now also focus on an investigation of pause profile, across both emotive and non-emotive conditions, in order to further examine changes in form of expressive language in response to emotive stimuli. Lastly, a number of key psychosocial factors (i.e. early childhood trauma, PTSD, dissociation and depression) and their impact upon expressive language will be examined.

Chapter Three

Study 2: The Effect of Trauma on Expressive Language Impairment in Borderline Personality Disorder

It is thought that the clinical interaction serves as an activating interpersonal cue to BPD patients' traumatic memory system (Fonagy, 2002). However, systematic investigations designed to explore the impact of affective arousal on BPD patients' expressive language form are required (Leichsenring, et al., 2011). Study 2 is designed to systematically examine BPD patients' expressive language by utilising emotive and non-emotive stimuli. Study 2 is also designed to clarify the precise form of BPD patients' expressive language impairments by analysing pause profile and investigating the contribution of pertinent psychosocial factors, namely, childhood trauma, PTSD, dissociation and depression.

There is an accumulating literature pointing to the separability of an amygdala-based and a hippocampal-based memory system. The amygdala-based trauma memory system is stimulus-driven, fragmentary and highly emotional. Whereas the hippocampal-based system is cognitively complex, informationally neutral, integrated and represented by well-elaborated narratives (Metcalf & Jacobs, 1996). High states of arousal appear to be critical cues for the retrieval of information along the amygdala-driven traumatic memory pathways and play a major role in determining what memories will be activated and how they will be verbalised (van der Kolk, 2002). This notion is clearly supported by recent neuroimaging studies demonstrating the activation and inhibition of key brain regions when BPD participants are exposed to salient stressful memories (Donegan, et al., 2003; Minzenberg, et al., 2008). Exposure to relevant emotional material therefore seems to act as a cue for activation of the traumatic memory system in BPD. However, systematic investigations exploring the specific impact of affective arousal on BPD participants' expressive language form are required to determine whether such deficits are reflective of affective state or longer-term underlying brain deficits specific to BPD developmental histories.

Certainly, according to child development research, early life experience and the quality of the primary caregivers verbal communications appears to play a crucial role in regular brain development and the acquisition of essential language skills (Beeghly & Cicchetti, 1994; Zanarini, et al., 1997). Specifically, research has revealed that the mother's lack of emotional availability interferes with the child's capacity to regulate

affective experience and learn emotionally descriptive language (Schoore, 2002). Furthermore, a constellation of brain abnormalities relevant to the memory and language systems have been linked to adverse and/or traumatic childhood environments, including diminished left hippocampal volumes, reduced corpus callosum size, and attenuated activity in the cerebellar vermis (Bremner, Randall, & Vermetten, 1997; Ito, Teicher, Glod, & Ackerman, 1998).

Additional psychological factors such as depression, PTSD and dissociation may also play a role in BPD patients' expressive language deficits. Cognitive deficits in BPD patients with depression tend to be characterised by mood reactivity or inability to regulate emotion, which may be exacerbated when exposed to emotive conditions (Jackson, et al., 2000; Linehan, 1993). Studies have also demonstrated an association between both PTSD and dissociative symptoms, and the delayed retrieval of over-general trauma memories (Cloitre, et al., 1996; Sutherland & Bryant, 2008).

Due to the literature that highlights impaired capacity for expressive language in BPD in the clinical context and supporting preliminary evidence for the presence of specific language impairments (Carter & Grenyer, In Press), it was hypothesised that BPD participants would evidence enhanced overall impairment in expressive language compared to healthy controls when exposed to the emotive but not the neutral stimulus. In addition, it was also hypothesised that BPD participants would evidence reduced semantic and syntactic complexity scores compared to controls when completing the emotive but not the neutral stimulus.

The current study also sought to investigate specific differences in the proportion of pauses utilised by both BPD and control participants across the emotive and neutral stimulus conditions. In line with the evidence suggestive of verbal delays when retrieving traumatic memories (van der Kolk, 2002) it was hypothesised that BPD participants would evidence greater proportions of pauses during the emotive but not the neutral stimulus condition. Lastly, it was anticipated that childhood trauma, and/or the presence of PTSD, depression or dissociation would contribute to overall expressive language impairment, syntactic and semantic complexity scores.

3.1 Methods

3.1.1 Participants

The sample comprised of 12 additional participants with BPD and 12 healthy controls matched for age, sex, gender & years of education. BPD participants were recruited through a specialist personality disorder service in a university and health service collaborative clinic. BPD participants were screened and excluded if there was evidence of schizophrenia, schizoaffective disorder, bipolar disorder, major depressive disorder with psychotic symptoms, current substance abuse, or a history indicating organic complications. None of the control participants met DSM-IV-TR (American Psychiatric Association, 2000) for a current psychiatric disorder. The control sample was recruited through the university and local community using a snowball method to ensure diversity within a matched control design (Biernacki & Waldorf, 1981). The snowball method uses recommendations and previous acquaintances to find appropriate participants. The study was approved by the Institutional Review Board and written consent obtained.

3.1.2 Demographic Questionnaire

Participants completed a demographic questionnaire designed to identify the participants for age, gender and years of education matching across the two groups.

3.1.3 Assessment

Diagnoses were obtained using the structured clinical interviews for DSM-IV SCID-I (First, et al., 1996) and SCID-II (First, et al., 1994). All diagnostic assessments were conducted in a systematic manner, with one clinician conducting the structured face-to-face diagnostic interview and the other observing, and asking further clarifying questions. Diagnoses between the two interviewers were compared, and then reviewed by a senior clinician. Final diagnoses were then confirmed following review of the interview and collateral sources. The SCID-I-RV/NP (non-patient edition) was used to screen healthy control participants.

3.1.4 Pre-morbid IQ

All participants also completed the National Adult Reading Test (Nelson, 1982), a 50-word reading test that is in widespread use, as a measure of pre-morbid IQ.

3.1.5 Self-Report Measures

Beck Depression Inventory (BDI; Beck, Steer, & Brown, 1996). Depressive symptomatology was measured using the BDI. The BDI is a widely-used brief and reliable 21-item instrument with good convergent and predictive validity and internal consistency (Beck, Steer, Ball, & Ranieri, 1996).

Dissociative Experiences Scale (DES; Carlson & Putnam, 1993). The degree to which participants experience dissociation was measured using an updated version of the DES. The updated DES has been shown to have a Pearson correlation of 0.95 with the original version indicating good convergent validity (Ellason, Ross, Mayran, & Sainton, 1994).

Childhood Trauma Questionnaire (CTQ; Bernstein & Fink, 1998). The CTQ was used as a brief, reliable measure of childhood trauma. The CTQ asks about emotional, physical, and sexual abuse, and physical and emotional neglect.

Screen for Posttraumatic Stress Symptoms (SPTSS; Carlson, 2001). PTSD symptomatology was assessed using the SPTSS. The SPTSS is a brief 17-item measure and can be used with persons who report single, multiple or no traumatic events. The SPTSS has been shown to have good concurrent and construct validity and good internal consistency (Carlson, 2001).

3.1.6 Acquisition of Speech Samples

All participants' speech samples were audiotaped and transcribed by a typist blind to the purposes of the study. Each transcript was prepared according to the Psychotherapy Transcription Standards by Mergenthaler and Stinson (1992). The transcripts were used in conjunction with the audio recordings for data analysis. The neutral speech sample was collected prior to the emotive speech sample to avoid any stimulus cross-contamination.

3.1.7 Neutral Stimulus

Neutral samples of speech were collected using the Script Generation method (Grafman, et al., 1991). In this task all participants were asked the following: “Describe what you did this morning before you left the house” (Grafman, et al., 1991). During this condition participants were made aware that there was no time limit. All participants’ verbalisations were audiotaped to allow for transcription and later analysis of audio segments. Following generation of each script the participant was asked to provide an emotionality rating on a 7-point likert scale as follows: 1= extremely unpleasant, 2= moderately unpleasant, 3= slightly unpleasant, 4= neither pleasant nor unpleasant, 5= slightly pleasant, 6= moderately pleasant and 7= extremely pleasant. All scripts rated between three and five were assigned a neutral code and included in the current study.

3.1.8 Emotive Stimulus

As in Study 1, the Adult Attachment Interview (AAI; (George, et al., 1984/1985/1996) was utilised as the emotive stimulus for Study 2. For further detail see Study 1.

3.1.9 Analysis of Transcripts

All speech samples were analysed using the following software: PCAD3 (overall impairment), Idea Density Rater (semantic complexity), and Shallow Syntactic Complexity Rater (syntactic complexity). All three programs control for narrative length.

PCAD3

PCAD3, a computerised version of the Cognitive and Intellectual Impairment (CI) Scale was utilised to measure overall expressive language impairment in speech samples. The CI scale employs the Gottschalk-Gleser Content Analysis method which uses natural language as its raw data, focuses on each grammatical clause as the smallest unit of communication, and derives a score for each dimension measured per 100 words spoken (Gottschalk, 1994).

Idea Density Rater

We used a computerised measure of Idea Density Rater, CPIDR3, to determine the semantic complexity of all subjects speech samples (Brown, et al., 2007). CPIDR 3 is a program that determines the complexity of language at the semantic level (Brown, et al., 2007). Idea density is a well-defined measure for semantic complexity in speech and is defined as the number of ideas (or propositions) divided by the total number of words. CPIDR has been tested against human raters, and shown to have good reliability (Brown, et al., 2007).

Shallow Syntactic Complexity Rater

In this study we determined syntactic complexity by using the Shallow Syntactic Complexity Rater (ShaC). ShaC compares text strings to templates following the modified Developmental Level Scale (D-Level Scale) (Covington, et al., 2006). The D-Level Scale is ranked from one to five according to the age at which children acquire syntactic structures. Later structures have higher rankings and reflect greater complexity. A strength of ShaC is that it distinguishes between types of clausal embedding which results in rich output regarding the syntactic make-up of a transcript (Cheung & Kemper, 1992).

For further detail of validity studies see Study 1.

3.1.10 Analysis of Audio Files for Pauses

We used Adobe Audition 3, a commercially available software package to identify participants' pause profiles. Pauses were defined as the absence of speech output. The software package was used to filter out background noise and non-word fillers (e.g. ah, um, mm etc.) to ensure better audibility of the speech samples and accuracy of pause duration. Pause duration was measured from the first point of silence following each question to the last point of silence before speech commenced (between clause pauses), and from the first point of silence within each response to the last point of silence before speech recommenced (within clause pauses). Total duration of pauses was computed by summing together within and between clause pauses for each participant (Kircher, et al., 2004).

First, total duration of pauses divided by total duration of each AAI audio recording was analysed (Kircher, et al., 2004).

Second, the following two specific questions were extracted from the AAI and analysed separately: “Now, I’d like you to choose 5 adjectives that describe your relationship with your mother when you were young” and “Now, I’d like you to choose 5 adjectives that describe your relationship with your father when you were young”. These items are a key component of the AAI and were chosen due to their capacity to cue into specific early autobiographical memories connected to the participants’ relationship with their primary caregivers. These items were of specific interest because of the likelihood that they would generate longer pauses and thus enable investigation of possible BPD and control participant differences. Tasks associated with longer pause duration due to longer processing times are associated with greater cerebral demand (Kircher, et al., 2004). Once again, total duration of pauses divided by total duration of each relevant audio segment was analysed (Kircher, et al., 2004).

3.1.11 Statistical Analysis

Statistical analyses were performed with the significance level threshold set at $p=0.05$. Chi-squared tests and t-tests were used to examine for potential differences in demographic variables between BPD and control participants. Multivariate Analysis of Variance (MANOVA) was used to examine the differences between BPD participants and healthy controls regarding expressive language variables and proportion of pause duration across both emotive and neutral conditions. The contribution of prevalent BPD related psychological variables (i.e. childhood trauma, PTSD, depression and dissociative symptomatology) to expressive language impairment was analysed by general linear modelling using regression analyses.

3.2 Results

The sample comprised of twelve BPD participants, with a mean age of 30.67 (SD = 10.15), and twelve control participants, with a mean age of 26.58 (SD = 9.22); the difference was not significant ($t = 1.032$, $d.f. = 1, 22$, $P = 0.31$). Eleven of the twelve participants (92%) in both the BPD and control group were women. The years of education difference between BPD participants (Mean = 12.65, S.D = 2.47) and controls (Mean = 13.92, S.D = 1.68) was also not significant ($t = 1.47$, $d.f. = 1, 22$, $P = 0.16$).

Further, the BPD participants ($M = 108.08$, $SD = 4.52$) did not differ significantly from the controls ($M = 109.92$, $SD = 2.68$), with respect to full-scale IQ ($t = 1.21$, $d.f. = 1, 22$, $P = 0.24$). Also, BPD participants ($M = 107.42$, $SD = 4.93$) did not differ significantly from the controls ($M = 109.42$, $SD = 3.12$), regarding verbal IQ scores ($t = 1.20$, $d.f. = 1, 22$, $P = 0.25$). None of the above variables were significantly related to the variables of interest in the current study.

Many BPD participants (83.3%) met criteria for at least two additional axis I diagnoses ($M = 2.25$ diagnoses, $SD = 0.87$, range: 1 – 4), and 42% of the BPD sample had at least one additional axis II diagnosis ($M = 0.42$ additional axis II diagnoses, $SD = 0.51$, range: 0 - 1) (for further detail see Table 4 and Table 5 below). Eighty-three percent of the BPD participants were in receipt of regular medication.

Table 4

Frequencies of Comorbid Axis I Diagnoses (N=12)

	n
Major Depression	6
Dysthymia	5
Mania	2
Eating Disorder	0
PTSD	5
Panic Disorder	1
Panic Disorder with Agoraphobia	1
Social Phobia	3
Specific Phobia	2
Obsessive Compulsive Disorder	0

Generalised Anxiety Disorder	3
------------------------------	---

Table 5

Frequencies of Comorbid Axis II Diagnoses (N=12)

	n
Avoidant	2
Dependent	0
Obsessive Compulsive	0
Passive Aggressive	1
Schizotypal	1
Paranoid	0
Schizoid	0
Histrionic	1
Narcissistic	0

3.2.1 Expressive Language Impairment

Emotive Condition. BPD participants ($M = 5.16$, $SD = 2.05$) demonstrated significantly more overall impairment compared with controls ($M = 1.60$, $SD = 0.82$), as measured by PCAD3 ($F(1,22) = 31.10$, $p = 0.00$). Analysis of syntactic complexity scores revealed that BPD participants ($M = 74.00$, $SD = 19.95$) compared to controls ($M = 136.58$, $SD = 62.55$) demonstrated lower syntactic complexity scores ($F(1,22) = 10.90$, $p = 0.003$). With regard to semantic complexity, analysis revealed no significant differences between controls ($M = 0.54$, $SD = 0.02$), and BPD participants ($M = 0.54$, $SD = 0.02$) as measured by CPIDR ($F(1,22) = 0.001$, $p = 0.98$).

Neutral Stimulus Condition. Analysis demonstrated no significant differences between BPD participants ($M = 1.36$, $SD = 1.6$) and controls ($M = -0.23$, $SD = 2.29$) regarding overall impairment scores on the neutral stimulus as measured by PCAD3 ($F(1,22) = 3.39$, $p = 0.06$). No significant differences were found between BPD participants ($M = 6.33$, $SD = 12.89$) and controls ($M = 4.00$, $SD = 4.49$) with regard to syntactic complexity scores in the neutral condition, as measured by ShaC ($F(1,22) = 0.35$, $p = 0.56$). Furthermore, no significant differences were found between BPD

participants (M = 0.73, SD = 0.23) and controls (M = 0.67, SD = 0.06) on semantic complexity in the neutral condition, as measured by CPIDR ($F(1,22) = 3.89, p = 0.40$).

3.2.2 Analysis of Pauses

Differences in proportion of pause duration scores between BPD participants and controls across both the emotive and neutral condition are presented in Table 6.

Table 6

Proportion of Pause Duration: Differences between BPD Participants (n=12) and Controls (n=12)

	Mean (SD)		F	p
	BPD participants	Controls		
<i>Emotive Stimulus Condition</i>				
Proportion of pauses during emotive stimulus (secs)	0.38 (0.08)	0.28 (0.10)	6.97	0.015*
Proportion of pauses during ‘mother’ section of emotive stimulus (secs)	0.90 (0.03)	0.84 (0.10)	4.52	0.045*
Proportion of pauses during ‘father’ section of emotive stimulus (secs)	0.91 (0.05)	0.86 (0.13)	1.45	0.242
<i>Neutral Stimulus Condition</i>				
Proportion of pauses during neutral stimulus (secs)	0.39 (0.18)	0.26 (0.08)	5.20	0.033*

n = number, SD = standard deviation, P = probability value, F = statistic for Analysis of Variance, secs= seconds, * $p \leq 0.05$.

3.2.3 Psychosocial Variables and Expressive Language Impairment

The final focus of Study 2 was on the phenomena (expressive language) itself and investigating the below relationships allowed us to look at the influence of a number of pertinent BPD associated issues on expressive language.

The following psychosocial variables were investigated in a general linear model in order to ascertain contribution to expressive language impairment: childhood trauma, which was analysed according to subcategories emotional abuse, physical abuse, sexual

abuse, emotional neglect and physical neglect; dissociation; depression; and PTSD symptomatology.

Overall, findings showed that there was no significant effect of depression ($F(3,13) = 0.06, p = 0.98, \text{partial } \eta^2 = 0.99$), PTSD ($F(3,13) = 2.89, p = 0.08, \text{partial } \eta^2 = 0.60$), or dissociation ($F(3,13) = 1.42, p = 0.28, \text{partial } \eta^2 = 0.75$) on expressive language impairment. In terms of childhood trauma, physical abuse ($F(3,13) = 3.80, p = 0.04, \text{partial } \eta^2 = 0.53$) not emotional abuse ($F(3,13) = 1.13, p = 0.37, \text{partial } \eta^2 = 0.79$), sexual abuse ($F(3,13) = 1.38, p = 0.29, \text{partial } \eta^2 = 0.76$), emotional neglect ($F(3,13) = 0.36, p = 0.78, \text{partial } \eta^2 = 0.92$) or physical neglect ($F(3,13) = 0.15, p = 0.93, \text{partial } \eta^2 = 0.97$) significantly contributed to expressive language impairment overall.

Results from individual analyses demonstrating the relationship of the above psychosocial variables to the expressive language variables of interest (i.e. overall impairment, semantic complexity and syntactic complexity) are presented in Table 7. Additional analyses were also conducted testing for the effects of group using general linear modelling, to ensure that results were robust and independent of group membership, which was confirmed after accounting for type I error.

Table 7

Relationship between Psychosocial Variables and Expressive Language Impairment

		β	Std Error	t	p
Emotional Abuse	Overall impairment	-0.680	0.134	-0.509	0.672
	Semantic Complexity	0.002	0.001	1.491	0.17
	Syntactic Complexity	-3.65	4.24	-0.861	0.50
Physical Abuse	Overall impairment	0.167	0.216	0.774	0.42
	Semantic Complexity	-0.005	0.002	-2.194	0.044*
	Syntactic Complexity	-15.125	6.816	2.219	0.042*

Sexual Abuse	Overall impairment	0.053	0.138	0.384	0.69
	Semantic Complexity	0.002	0.002	1.471	0.18
	Syntactic Complexity	-4.576	4.373	-1.047	0.30
Emotional Neglect	Overall impairment	0.094	0.139	0.674	0.51
	Semantic Complexity	-0.002	0.002	-0.998	0.35
	Syntactic Complexity	-0.347	4.385	-0.079	0.93
Physical Neglect	Overall impairment	0.032	0.094	0.347	0.64
	Semantic Complexity	0.00	0.001	0.427	0.73
	Syntactic Complexity	1.374	2.955	0.465	0.84
Dissociation	Overall impairment	-0.855	0.615	-1.391	0.26
	Semantic Complexity	-0.007	0.007	-0.997	0.35
	Syntactic Complexity	16.566	19.418	0.853	0.57
Depression	Overall impairment	0.003	0.070	0.047	0.80
	Semantic Complexity	0.000	0.001	-0.271	0.89
	Syntactic Complexity				0.50
PTSD Symptomatology	Overall impairment	0.939	0.370	2.539	0.02*
	Semantic Complexity	0.002	0.004	0.566	0.64
	Syntactic Complexity				

Syntactic Complexity	-15.965	11.687	-1.366	0.14
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β = parameter estimate, Std Error = standard error, P = probability value, t = t- statistic,
* $p \leq 0.05$.

3.3 Study 2 Discussion

No prior known studies have attempted to further delineate the precise form of BPD participants' expressive language deficits by utilising a clinically relevant personalised trauma salient stimulus in addition to a neutral comparative condition. As expected, BPD participants demonstrated greater overall deficits in expressive language compared to controls, during completion of the AAI, but not the neutral condition. This finding supports the literature reporting an association between the emotive clinical context and the presence of deficits in expressive language in BPD patients (Blatt & Levy, 2003; Judd, 2005; Prunetti, et al., 2008).

Disturbances in expressive language may negatively influence therapeutic progress given expressive language is important for the formation of effective therapeutic relationships. Research has revealed that therapists respond differently to patients with BPD, and that patients with BPD seem to respond more discordantly to the therapist (Bourke & Grenyer, 2010). Further, it is also known that many patients have to learn to use verbal communication as a therapeutic tool in order to work through therapeutic issues (Mergenthaler, 1996). It is thus possible that BPD patients' lack of capacity to verbalise their own internal states may significantly impair therapeutic process due to the effect on the relationship. Preliminary research also suggests that different treatment approaches may be more beneficial for different BPD symptom profiles (Clarkin, Levy, et al., 2007; Zanarini, 2009). Recognition of the BPD patients' expressive language limitations may therefore be a crucial factor for clinicians to consider before commencement of treatment. Clinicians have long observed heightened arousal when BPD patients articulate personal histories. Recent BPD brain imaging studies have revealed the impact of inducing highly aroused, trauma-like states on specific components of neuropsychiatric functioning (Leichsenring, et al., 2011). However, BPD studies designed to access the BPD patient's trauma memory system by including emotional stimuli that are relevant to specific BPD psychopathology have proved difficult to apply due to the complex nature of BPD patients' interpersonal trauma histories. These results suggest a direct association between the emotive AAI and materialisation of expressive language impairment in BPD patients. The affect-laden interpersonal nature of the content within the AAI therefore appears to effectively cue activation of BPD patients' limbico-cortical pathway. Support for this notion is evidenced in prior BPD imaging studies demonstrating limbico-cortical activation in

response to interpersonal cues (Donegan, et al., 2003).

As expected, BPD participants utilised less complex sentence structures compared to controls when responding to the AAI, but not the neutral condition. The production of complex sentences has been linked to enhanced activation of Broca's area, along with activation in the left or bilateral superior and middle temporal gyri and the cingulate gyus (Kaan & Swaab, 2002; Kircher, et al., 2005). This study demonstrates an association between the production of syntactically simplified sentences and affective state in BPD. It therefore seems plausible that limbico-cortical dysregulation interferes with regulation of the fronto-temporal structures required to produce syntactically complex sentences. BPD neuroimaging findings demonstrating reduced activation of the prefrontal cortex or anterior cingulate (Minzenberg, et al., 2008; Schmahl, Vermetten, et al., 2004), alongside increased bilateral activation of the amygdala (Donegan, et al., 2003), during exposure to trauma salient stimuli, appear to complement this hypothesis.

There were no differences between BPD participants and controls on semantic complexity scores in either the emotive or neutral condition. Neuroimaging studies demonstrate the existence of separate fronto-temporal circuits for the processing of syntactic and semantic information in the left hemisphere (Friederici & Kotz, 2003). Additional studies focused on expressive language impairment in response to emotive and neutral stimuli are required, however it is plausible that semantic networks are intact in BPD patients, regardless of affective arousal.

Importantly, no previous known studies have investigated pause profile differences across emotive and neutral conditions in order to further understand changes in BPD expressive language form. This study found that BPD participants' utilised significantly greater pause proportions when completing both the AAI and neutral condition, compared to controls. A relatively direct relationship has been established between the demands on planning during speech and the amount of pausing (Kircher, Brammer, Tous-Andreu, Williams, & McGuire, 2001). It has been proposed that such delays are associated with lexical retrieval and/or sentence planning. Specifically, left superior gyri activation has been associated with pausing during continuous speech production (Kircher, et al., 2004). These results suggest that the timely generation of words and the underlying associated brain networks may not be sensitive to affective arousal in BPD. Rather, the greater proportion of BPD pauses may be reflective of

developmental disruptions to underlying associated brain networks. In support, early psychological trauma is known to effect corpus callosum development resulting in less efficient neuronal communication between the two hemispheres (Giedd, 2003). Individuals with a history of abuse have been shown to primarily utilise their right hemisphere when recalling early disturbing memories, and their left hemisphere when recounting neutral memories (Teicher, Glod, Surrey, & Swett, 1993). Given the high level of cognitive capacity required, it is plausible that accessing autobiographical material relies heavily upon inter-hemispheric transfer of information, and that deficient corpus callosum functioning dating back to early childhood may in part be responsible for the evidenced higher proportion of BPD pauses across conditions.

This study also revealed that BPD participants utilised significantly greater proportions of pauses compared to controls when generating adjectives related to early relationship with mother. No such differences were found when generating adjectives related to early relationship with father. Longer pauses of the duration observed during completion of the above task are associated with activation of the right inferior frontal gyrus (Kircher, et al., 2004), which is thought to reflect higher cortical functions including memory retrieval and complex search processes. Notably, lack of early affective involvement (involvement often primarily provided by a maternal figure) has been shown to disrupt right temporal-frontal and frontal sub-cortical connectivity necessary for emotion descriptive verbal communication and integrated right hemisphere functioning (Schore, 1994). In line with contemporary views of brain function and connectivity (Bressler & Menon, 2010), it is plausible that the brain networks and/or neuronal pathways involved in the generation of words encapsulating early memories with mother may be less functional and/or interconnected which results in the observed delays (Bressler & Menon, 2010; Iacoboni, 2005; Music, 2011a).

The notion that maternal connection or involvement is fundamental to development is not new. Bowlby's observations of the pervasive disruptive consequences of maternal deprivation in children temporarily separated from their primary caregiver (usually mother) during World War II led him to suggest that: "the young child's hunger for his mother's love and presence is as great as his hunger for food", and that her absence inevitably generates "a powerful sense of loss" (Bowlby, 1969, p. xiii).

Though speculative, it can be argued that experiences of abuse, neglect or inappropriate care by mother, may have a specific effect on BPD brain and/or expressive language development. Several clinical studies have examined aspects of the mother-child relationship in the pathogenesis of BPD (Arkema, 1988; Paris, Frank, Buonvino & Bond 1991; Goldberg, 1985; Gunderson, 1980; Walsh, 1977; Zweig-Frank, 1991). Despite methodological limitations such as lack of control groups (Arkema, 1988; Walsh, 1977), reliance on retrospective recall (Goldberg, Mann, Wise, & Segall, 1985; Paris, Frank, Buonvino, & Bond, 1991; Zweig-Frank & Paris, 1991), and small sample sizes (Gunderson & Kern, 1980; Walsh, 1977), past BPD research seems to consistently demonstrate higher rates of maternal abuse, inconsistency or neglect and over-involvement (Bezirgianian, Cohen, & Brook, 1993; Heffernan & Cloitre, 2000). BPD mothers have also been shown to respond to their infants with less empathy and differentiation, and view their children in “need gratifying” ways (Golomb, et al., 1994). Taken together, the pause profile deficits demonstrated for mother specifically, may be reflective of the impact of BPD patients’ mother-infant experiences on early brain and/or expressive language development.

Lastly, this is the first known study to analyse a number of pertinent psychosocial variables such as early life trauma, PTSD, depression and dissociation that may contribute to expressive language deficits. Study 2 demonstrated a relationship between childhood physical abuse and reduced syntactic and semantic complexity but not overall impairment when completing the AAI. No relationship was found between expressive language deficits and emotional abuse, sexual abuse, emotional neglect or physical neglect. High levels of stress, such as those induced in physically abusive environments, have been shown to permanently alter an individuals hormonal response to stress. Specifically, higher levels of cortisol have been demonstrated in children exposed to ongoing trauma and anxiety (Music, 2011a). Cortisol has a number of pernicious effects on the hippocampus (McAuley, et al., 2009) and may provide some explanation for the above observed relationship between physical abuse and expressive language deficits.

PTSD symptomatology was associated with overall expressive language impairment, but not semantic or syntactic deficits in the current sample. Though further investigations are needed, this result suggests an association between overall language

impairment and the well-documented over-general memory retrieval deficits observed in PTSD (McNally, et al., 1995).

Depression and dissociative phenomena were not related to expressive language impairments in this sample. Though caution in interpreting these results is warranted given the preliminary nature of the current study, past studies of major depressive disorder (MDD) and BPD with co-morbid MDD, reveal comparable neurocognitive performance profiles despite BPD participants demonstrating higher levels of affective arousal (Fertuck, et al., 2006). Past studies suggest a relationship between dissociation and avoidance/suppression of negative memories (Cloitre, et al., 1996), which may impact upon the association between expressive language and dissociation. However, further larger-scale investigations of depression and dissociation in BPD utilising the above methodology are required before definitive conclusions can be made.

Importantly, the current study offers additional data validating use of the AAI as a clinically relevant emotive stimulus for BPD patients, helps to clarify the specific form of expressive language deficits that are present in BPD by examining pause profile, and provides preliminary evidence for the impact of pertinent psychosocial factors such as early life trauma, PTSD, depression and dissociation, on expressive language impairment.

Chapter Four

General Discussion

The aims of this thesis were threefold:

- 1) To examine BPD expressive language disturbances in response to a clinically relevant emotional stimulus, the Adult Attachment Interview (AAI) (Study 1)
- 2) To further validate use of the above methodology in an additional BPD sample and delineate expressive language impairments utilising a neutral comparative condition and pause analysis (Study 2).
- 3) To investigate whether psychosocial factors of specific relevance to BPD influence expressive language impairment (Study 2).

4.1 Integration of Findings

Study 1 found that BPD participants demonstrated significantly more overall disturbance in expressive language. This finding is consistent with clinical research supporting the relationship between affectively charged environments and the emergence of disturbances in expressive language in BPD patients (Blatt & Levy, 2003; Judd, 2005; Prunetti, et al., 2008). With regard to lexical variables, BPD participants utilised significantly less function words compared to healthy controls. Specifically, BPD participants used less first person plural, second person and impersonal pronouns and more third person singular pronouns. This suggests that, compared to controls, BPD participants were less able to remain emotionally distant when recalling the emotive autobiographical material. As anticipated, BPD participants were found to use significantly more negative emotion (e.g. fear, worry etc.) and anger (e.g. hate, kill) words, and significantly less positive emotion words such as love, nice, and sweet compared to controls.

In concert with previous findings regarding expressed emotion and exhibited cognitive complexity in written texts following traumatic experience (Pennebaker & Lay, 2002), analysis of content words also revealed that BPD participants use more past tense verbs and swear words. In contrast, control participants utilised significantly more future tense verbs. Healthy controls used more cognitive process words overall, and

BPD participants utilised less insight (e.g. think, know, consider), discrepancy (e.g. should, would, could) and tentative (e.g. maybe, perhaps, guess) cognitive process words, in addition to more causation related words (e.g. because, hence, effect). BPD participants were also found to use less adverbs, conjunctions and quantifiers in response to the emotive autobiographical stimulus. There were no differences between BPD participants and controls with regard to the use of spoken categories such as assents (e.g. agree, ok, yes), non-fluencies (e.g. mm, er, um), and fillers (e.g. blah, you know, I mean).

Study 1 also revealed that healthy controls utilised more complex sentence structures compared to BPD participants. No significant differences were found between BPD participants and controls on semantic complexity scores. In support, studies have revealed that there are separate fronto-temporal circuits for the processing of syntactic and semantic information in the left hemisphere (Friederici & Kotz, 2003). Thus, it is possible that for BPD participants the fronto-temporal networks involved in the processing of semantic information, in contrast to syntactic information, remain relatively unaffected by salient emotive stimuli.

Study 2 demonstrated that BPD participants evidenced greater overall deficits in expressive language compared to controls, during completion of the AAI, but not the neutral condition. BPD participants also utilised less complex sentence structures compared to controls when responding to the AAI, but not the neutral condition. These results lend support for a direct association between the emotive clinical context and the presence of such expressive language impairment in BPD patients (Prunetti, et al., 2008). Study 2 also replicated the results from Study 1 with regard to semantic complexity. That is, no differences were demonstrated between BPD participants and controls on semantic complexity scores in either the emotive or neutral condition, which as previously mentioned, appears to support prior neuroimaging research demonstrating the existence of discrete fronto-temporal circuits for the processing of syntactic and semantic information in the left hemisphere (Friederici & Kotz, 2003).

Study 2 revealed that BPD participants utilised significantly greater pause proportions when completing both the AAI and neutral condition, compared to controls. These results suggest that the timely generation of words and the underlying associated brain networks may not be sensitive to affective arousal in BPD. Rather, the greater proportion of BPD pauses may be reflective of developmental disruptions to underlying

associated brain networks. Study 2 also found that BPD participants used significantly greater proportions of pauses compared to controls when generating adjectives related to early relationship with mother. No such differences were found when generating adjectives related to early relationship with father.

Study 2 revealed an association between childhood physical abuse and reduced syntactic and semantic complexity but not overall impairment when completing the AAI. No relationship was found between expressive language impairment and emotional abuse, sexual abuse, emotional neglect or physical neglect. PTSD symptomatology was associated with overall expressive language impairment, but not semantic or syntactic deficits. Though further BPD investigations are required, these results appear to be in line with the well-documented over-general memory retrieval deficits observed in PTSD (McNally, et al., 1995). Depression and dissociative phenomena were not associated with expressive language impairments in this sample.

Results from both studies suggest an association between the emotive environment and the emergence of disturbances in expressive language in BPD participants with regard to overall impairment, lexical and syntactic deficits, but not disturbances in pause profile. The methodology utilised in the current thesis may therefore offer a promising alternative paradigm for activation of limbico-cortical pathways during recall of autobiographical memories. Certainly, prior neuroimaging studies of BPD patients have revealed reduced activation of the prefrontal cortex or anterior cingulate (Minzenberg, et al., 2008; Schmahl, Vermetten, et al., 2004), in addition to increased bilateral activation of the amygdala (Donegan, et al., 2003) during symptom provocation. Such studies provide some support to explain the current research findings. That is, it is plausible that the disturbances in expressive language with regard to overall impairment, syntactic and lexical deficits, as demonstrated here in BPD patients when recalling emotive memories, may relate to dysregulation in both the prefrontal cortex and connected brain regions such as the amygdala and hippocampus. In contrast, delays in speech, as shown by BPD participants use of a higher proportion of pauses in both the neutral and emotive condition, appear to be unaffected by affective arousal. This suggests that delayed expressive language may represent a trait-like deficit in BPD that reflects developmental disruptions to underlying associated brain networks.

BPD participants utilised significantly greater proportions of pauses compared to controls when generating adjectives related to early relationship with mother. No such

differences were found when generating adjectives related to early relationship with father. It seems plausible that the neuronal pathways and/or brain regions implicated in the generation of words encapsulating early memories with mother may be less functional and/or interconnected, which results in the above observed delays specific to mother. In further support of this notion, the current research also demonstrated a relationship between childhood physical abuse and reduced syntactic and semantic complexity when completing the AAI. High levels of stress induced by physically abusive environments have been shown to permanently alter an individual's hormonal response to stress and impact upon the brain. Specifically, higher levels of cortisol have been shown to have a harmful effect on the hippocampus (McAuley, et al., 2009). Lastly, PTSD symptomatology was associated with overall expressive language impairment, but not semantic or syntactic deficits. Depression and dissociative phenomena were not related to expressive language impairments. This suggests that future research focused on trauma related psychosocial variables may offer promise with regard to improving understanding of the factors that contribute to BPD expressive language impairments.

In sum:

- BPD participants evidenced greater overall expressive language impairment, alongside syntactic and lexical simplification in response to the clinically relevant emotionally salient AAI (Study 1)
- Following the inclusion of a neutral comparator condition, overall expressive language impairment and syntactic simplification were specifically demonstrated to be sensitive to affective arousal (Study 2)
- BPD participants utilisation of significantly higher proportions of pauses does not appear to be specific to affective arousal (i.e. delayed speech was evident across both conditions for BPD participants) (Study 2)
- Interestingly, BPD participants utilised significantly higher proportions of pauses compared to controls when speaking about their early relationship with mother, but not father (Study 2)
- Childhood physical abuse was specifically associated with reduced syntactic and semantic complexity on the AAI (Study 2)

- PTSD symptomatology was associated with overall expressive language impairment, but not semantic or syntactic deficits on the AAI (Study 2)

4.2 Limitations

Several factors should be considered in evaluating the findings of the present research:

Chronicity of Sample. The BPD sample was obtained through a university - health service collaborative clinic based on publicly funded mental health services. Because the BPD patient sample was recruited through the public health sector, it is likely to be representative of more chronic and highly symptomatic cases compared to those BPD patients who seek treatment through other highly supported private mental health sectors. Given BPD patients from the private sector are representative of a different demographic it is plausible that upon investigation these patients may exhibit less severe expressive language disturbances. It is worth noting however that there was considerable variability across the two obtained BPD samples in the current research with regard to indices of illness severity (i.e. social and occupational functioning measures, number of co-morbid axis I disorders), which may serve to partially address the above outlined limitation. However, further expressive language studies in BPD across a variety of service providers are required in order to ascertain whether the observed deficits differ either in form or severity between private and public sector samples.

Sample Size. Firstly, the moderate sample size across both studies may limit the ability of these results to generalise to other BPD samples. A larger sample size may have also yielded greater detection with regard to the effect of psychosocial factors on overall expressive language impairment, syntactic and semantic complexity. Thus, larger studies with greater statistical power are required to both replicate and extend upon these results. It is worth noting that significant attempts were made to recruit greater numbers of BPD participants, yet the chronic nature of the disorder and the difficulties associated with engaging and retaining this population significantly impacted upon the feasibility of recruiting additional BPD participants. This resulted in the current sample sizes for both Study 1 (n=20) and Study 2 (n=12). The sample sizes for both Study 1 and Study 2 are comparable to those utilised in past schizophrenia

research focussed on speech and language investigations. That is, sample sizes of approximately 10 to 12 patients with matched control numbers are common (Covington, et al., 2007; Docherty, 1995; King, Fraser, Thomas, & Kendell, 1990; Thomas, King, & Fraser, 1987). Furthermore, with respect to semantic complexity scores, follow-up analyses revealed a small effect size and indicated that a sample size of over 360 participants would be required to detect a meaningful difference if one existed. It therefore appears that any difference on semantic complexity scores, if there were one, would be so subtle that they are probably not meaningful.

Interviewer Bias. There were numerous interviewers involved in the collection of data for Study 1, whereas there was better interviewer control in Study 2 due to the use of only one interviewer to collect data for the entire study sample. The heterogeneity of interviewers for Study 1 could therefore have influenced the results by effecting fluency or depth of recall during the collection of AAI narratives. Thus, the impact of interviewer effects requires further investigation.

Methodology. The current limitations in using more advanced technologies to access underlying brain functioning whilst assessing speech highlight the appropriateness of the methodology utilised in the current research. However, the current research uses language as a marker of brain activity, which may be imperfect. Use of alternative more advanced imaging methods of investigation in future studies (e.g. fMRI) is therefore desirable and may further complement the results found here. Yet, due to logistical constraints and monetary costs, the use of such technologies was not feasible in the current research.

Computerised Language Measures. To date, prior studies using the computerised language measures in the current research have focussed on patients with psychosis and dementia (Brown, et al., 2007; Covington, et al., 2006; He, et al., 2007). The PCAD3 which measures overall impairment in the current research represents the exception in that extensive empirical research has established the validity and reliability of its underlying Cognitive and Intellectual Impairment (CI) Scale across a range of psychological states (Gottschalk, 1994). The current research is the first known investigation to use the other computerised measures (ShAC, CPIDR & LIWC2007) in a sample of BPD patients. Therefore, the use of the above measures in a BPD sample may have altered the validity and reliability of the results.

Further, the PCAD3, ShAC, CPIDR & LIWC2007 programs were all developed in America, and are thus based upon assumptions associated with the use of English language in America and not Australia. Future investigations are therefore necessary to establish the validity and reliability for use of these programs in both additional Australian samples and personality disorder samples worldwide. Importantly, the current research design utilised the above measures across two distinct BPD and control samples, in order to partially address this limitation and provide preliminary validity data supporting use of these novel measures in BPD research.

The Process of Recording & Transcription. The accuracy of the semi-automated language analysis software utilised in both Study 1 and Study 2 was contingent upon both clear audio recording and precise transcription. Although every effort was made to ensure that audio recordings were clear and audible, the upsetting nature of the AAI did appear to impact upon the clarity of the participant's responses at times. This sometimes made it difficult for the independent transcriber to decipher and therefore translate the content into the written transcript. To combat the above limitation, each transcript was systematically checked against the corresponding audio file by an additional rater prior to finalising the written transcript. Consequently, despite the human and technological limitations inherent in the translation of verbal to written content, significant attempts were made to ensure that the transcripts that were analysed were as accurate as possible prior to computerised analysis.

Attachment Status. The current research utilised the AAI as a clinically relevant emotive stimulus for BPD patients. It is worth noting that the AAI is designed to gather information regarding the interviewee's attachment status. Though the aims of this particular research were not focussed on investigating the link between attachment status (i.e. secure, insecure preoccupied, insecure dismissing, and disorganised) and expressive language disturbances, this is potentially a fruitful area of research. Future studies designed to investigate a link between attachment status and the nature and form of expressive language disturbances across a range of disorders may assist in moving attachment research forward.

Medication. The current research was not designed to analyse specific details with regard to medication use. Most of the sample reported using medications (80%). However, each one of the patients included in the above study was selected because they were stable and engaged in psychotherapy and the clinician who conducted the

interviews was satisfied at the time that the patients were not sedated. Additionally, there is significant doubt around medication compliance in the BPD patient population considering their lives are often chaotic. Yet, it is unknown to what extent medications may impact upon expressive language, therefore, future investigations designed to specifically analyse this relationship may be of interest.

4.3 Implications and Future Directions

The current research highlights the precise expressive language deficits that BPD patients present within the clinical context and contributes to understanding of the specific language factors that impact upon history-taking and therapeutic progress. In particular, the clinically observed difficulties BPD patients have articulating their emotive states and the quality of their interpersonal relationships, may now be linked to specific linguistic deficits (i.e. increased overall impairment and reduced syntactic and lexical complexity) which results in the production of less linguistically detailed narratives (see Study 1).

The current research also offers insight into the factors which impact upon expressive language and therefore BPD patients' capacity to benefit from psychotherapy and interpersonal relationships. Specifically, Study 2 presents important information with regard to the likely long-term effects of abuse on brain development and its contribution to the multiple deficits observed in BPD patients. This has important implications for therapeutic progress. The finding in study 2 that BPD patients evidence greater proportions of pauses across both emotive and non-emotive conditions supports the notion that BPD patients require greater amounts of time to express concepts and articulate their personal histories. The observed delays in the production of language may therefore partially explain the demonstrated therapeutic delays in improvement in the BPD population. This result also further validates the importance and potential value of BPD patients engaging in longer-term psychotherapy treatments. In support, Giesen-Bloo and colleagues (2006) demonstrated significant changes in BPD patients' personality (as revealed by reductions in all BPD symptoms, psychopathologic dysfunction and increases in quality of life) after a total treatment period of three years. Levy and colleagues (2006) found significant improvements in BPD patients' narrative coherence and reflective functioning following a year-long treatment. Consistent with this, Linehan also suggests that two rotations of dialectical behaviour therapy (i.e. one

year of treatment) is necessary to allow BPD patients time to absorb and process material and subsequently optimally benefit from treatment (Linehan, et al., 2006)..

The results of the current research also have direct implications for psychotherapy and future research given that the creation of a meaningful narrative is arguably a central component of positive therapeutic outcome (Music, 2011b). Importantly, the recent developments in computerised software packages have ensured that investigation of overall disturbances in expressive language and pause profile, in addition to lexical, syntactic and semantic complexity are now significantly more feasible (Gottschalk, et al., 2000). If, via an assessment of an individual's specific language deficits (utilising the computerised measures from Study 1 & 2), researchers were able to identify a patient's individualised expressive language profile prior to therapy, then patients may be able to be referred to treatments better suited to targeting those specific deficits. That is, different treatments may be more efficacious for BPD patients with certain expressive language profiles. Future studies designed to ascertain whether specific BPD subtypes exist (based upon expressive language profile) that may respond distinctively to alternative treatments are of value, given that to date no pharmacologic or psychosocial treatments have demonstrated efficacy for all aspects of BPD (Leichsenring, et al., 2011).

Importantly, there is compelling preliminary research that has been conducted regarding recovery from trauma. Prior studies of expressive language indicate that use of verbs, emotion words, and cognitive process words (i.e. content words) subtly change in response to personal or shared traumatic experience (Pennebaker & Lay, 2002; Stone & Pennebaker, 2002). Furthermore, pronoun shifts and flexibility in pronoun usage has been shown to be positively correlated with improvements in physical health (Campbell & Pennebaker, 2002). These results suggest that future studies focussed on investigation of linguistic components of expressive language over time in a treatment sample, may provide valuable information with regard to linguistic indices of therapeutic change. Such studies would indicate whether expressive language improvement occurs following successful treatment or if the language deficits remain unaffected by the process of talking therapy.

4.4 Conclusion

The clinical literature suggests that BPD patients present with impaired memory and affect regulation alongside reduced capacity to describe mental states in the therapeutic context. This phenomenon has been linked to research that indicates that the therapeutic relationship activates the BPD patients' attachment system, resulting in emotional dysregulation and expressive language deficits. This thesis sought to identify the specific expressive language deficits that emerge in response to clinically relevant emotionally salient stimuli. Study 1 found that BPD patients as compared to controls evidenced greater levels of overall impairment, in addition to reduced syntactic and lexical but not semantic complexity scores. Whilst, Study 2 further validated this finding by demonstrating that the deficits in overall impairment and syntactic complexity were specifically related to affective arousal in this patient group.

Study 2 also sought to determine whether pause profile differed significantly between BPD patients and healthy controls. Results indicated that BPD patients utilise significant greater proportions of pauses across both emotive and non-emotive stimuli. That is, the delays in speech evidenced in the BPD group appear to reflect a global trait-like deficit, rather than state-dependent disturbance. To further elucidate the above results, this thesis also sought to determine whether the proportion of pauses utilised by BPD patients were comparable when completing a key component of the AAI which requires the generation of adjectives related to early relationship with mother and father. Results revealed that BPD participants utilised significantly greater proportions of pauses compared to controls when generating adjectives related to early relationship with mother. No such differences were found when generating adjectives related to early relationship with father. These results appear to support the notion that lack of early affective involvement (involvement often primarily provided by a maternal figure) disrupts right temporal-frontal and frontal sub-cortical connectivity necessary for emotion descriptive verbal communication (Schore, 1994). Thus it is plausible that the brain networks and/or neuronal pathways involved in the generation of words encapsulating early memories with mother may be less interconnected and/or functional which results in the observed delays (Bressler & Menon, 2010; Iacoboni, 2005; Music, 2011a).

Overall, the greater proportion of BPD pauses may be more reflective of

developmental disruptions to underlying associated brain networks as opposed to a state-dependent deficit. This notion is partially supported by Study 2 also demonstrating a link between childhood physical abuse and reduced syntactic and semantic complexity but not overall impairment when completing the AAI. No relationship was found between expressive language deficits and emotional abuse, sexual abuse, emotional neglect or physical neglect. Finally, results also revealed that PTSD symptomatology was associated with overall expressive language impairment, but not semantic or syntactic deficits. While depressive and dissociative symptomatology were not significantly related to expressive language variables.

This is the first known BPD investigation to identify the specific expressive language deficits that emerge in response to clinically relevant salient stimuli versus those language deficits that appear to reflect the existence of developmental limitations. Furthermore, this study provides valuable preliminary information with regard to the psychosocial factors that impact upon expressive language in BPD.

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