A LEXICAL ANALYSIS OF THE CHILD ATTACHMENT INTERVIEW IN AN ADOLESCENT SAMPLE: MARKERS AND CORRELATES OF BORDERLINE PERSONALITY DISORDER

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ABSTRACT

Lexical analysis is a simple tool in understanding how one's language reflects their inner world. The present study uses this methodology to investigate how adolescents with Borderline Personality Disorder (BPD), or BPD characteristics, speak about their attachment relationships. Given the theoretical and empirical evidence of borderline pathology being a developmental concept, with its roots in the attachment relationship, this methodology, which has not been widely used in investigations of BPD, and not at all in studies of adolescent BPD, has the potential to shed some light not only on the subjective experience of family and attachment in adolescents with borderline pathology, but also add support to previous findings regarding the concordance of BPD phenomenology between adolescents and adults. Transcripts of Child Attachment Interviews (CAI) conducted with N=301 adolescents, split into three groups (BPD, Healthy Controls, Clinical Controls), were analyzed using Linguistic Inquiry and Word Count software (LIWC). An ANCOVA framework was used to test for group differences, and Pearson's correlations to test for dimensional relationships between lexical categories of interest and score on a continuous measure of Borderline Symptomology (BPFSC). Results yielded several significant differences between the healthy control group and both clinical groups (words related to anxiety, sadness, death), some significant differences only between the BPD group and the healthy controls (we), and two significant differences specific to the BPD group (words related to positive emotions, anger). There were no significant differences in total word count, first-person singular pronouns, or words related to insight. Dimensional analyses revealed similar patterns, with positive relationships between BPFSC total score and first-person singular pronouns and words related to anxiety, anger, and death and negative relationships between BPFSC and first-person plural pronouns and positive emotion words. Again, there was no significant relationship with word count or words related to insight. Implications of these results are discussed and placed within the context of the larger Borderline and lexical analysis literatures.

Introduction

Borderline Personality Disorder (BPD) is defined in the DSM-5 as a pattern of instability in interpersonal relationships, self-image, and affects, as well as marked impulsivity. In the DSM-5's Alternative Model for Personality Disorders, other BPD features include instability of personal goals accompanied by risk taking and/or hostility (APA, 2013). This alternative model also includes criteria regarding an individual's self/other processing, with BPD being associated with an underdeveloped self-image, unstable goals and values, difficulties recognizing the internal states of others, and relationships marked by mistrust and anxious preoccupation with abandonment. While the myth that BPD cannot be diagnosed in individuals under 18 remains prevalent in the field, there has been longstanding agreement that BPD has its etiological roots in childhood and adolescence (Chanen & McCutcheon, 2008; Sharp, Vanwoerden, & Wall, 2018). Additionally, while many see some borderline traits as normative in adolescent populations and will fade in time, research has shown that the diagnosis' validity and reliability is similar in adolescents and adults (Miller et al, 2008). In a 20-year follow-up study, Winograd et al. (2008) showed that those with higher Borderline symptoms in adolescence not only were more likely to retain a BPD diagnosis in adulthood, but also suffer long-term deficits in their academic, occupational, and social functioning. Finally, studies of early intervention have shown promising results in terms of patients' response to the treatment and their long-term outcomes (Chanen & McCutcheon, 2013; Sharp, 2017).

While it is understood that there are multiple pathways to developing BPD, there is a general agreement that it usually blossoms in response to both genetic and environmental factors. Marsha Linehan's Biosocial Model, updated in 2009, claimed that inborn emotional sensitivity, in conjunction with an environment perceived as invalidating, can lead to emotional and

behavioral dysregulation, generating negative social and cognitive outcomes, which begin to form maladaptive coping strategies and identifiable pathological traits (Crowell, et al, 2009). Peter Fonagy's Mentalization-Based model also asserts that the disorder forms in response to both biological and environmental factors, though focuses on the attachment process and upsets to it as the source of emotional and behavioral dysregulation in BPD (Fonagy et al, 2000; Sharp et al, 2016). With an insensitive caregiver, whether they be objectively neglectful or only ill-equipped to care for an emotionally sensitive child, children develop inaccurate or incomplete second order representations of internal states, both in others and in themselves (Fonagy, 1997). These suboptimal representations lead to the emotional hypersensitivity and behavioral impulsivity that is observed in patients with BPD. Also, this insensitivity leads to a fearful sense of attachment, and a low threshold for activating their attachment system, presenting as the patients' mistrust in relationships and preoccupation with abandonment, which Gunderson describes as an intolerance of aloneness (Gunderson, 1996).

Despite the clear evidence that BPD has its onset in adolescence, and the existence of multiple screening and assessment tools that have been validated for use with adolescents, it is still quite rare for a clinician to assess for BPD, or any personality pathology, when working with adolescent clients. However, as verbal language is the primary means by which a client will tell their provider about their difficulties, as well as by which therapy is provided, a client's speech can offer their clinician a window into their deeper internal states. Even in the early years of the mental health field, language was thought to represent the inner workings of someone's mind. For example, Freud theorized that slips of the tongue may be representative of intentions unknown to even the speaker (1901) and the classical Rorschach test, still in use today, uses the language describing ambiguous inkblots to assess one's unconscious thoughts and psychosocial

traits (Beck, 1944). Even today, this idea holds weight in the field and is now more quantitatively assessed through methods like lexical analysis.

Using the frequency of words used in a text, either written or spoken, lexical analysis has been used with a wide variety of populations, both clinically and in research. The most commonly researched population has been those with Major Depressive Disorder, with the primary findings being an elevated use of self-reference and words related to negative emotions, as well as a decrease in words related to positive emotions (Rude et al, 2004). Further research has suggested that such an elevation in self-reference may be an indicator of general distress, as it was similarly elevated in those with chronic medical illnesses (Fineberg, 2016.) Studies have also investigated language used in creative or autobiographical writings of suicide decedents (Stirman & Pennebaker, 2001) as well as in online forums about suicidal ideation (Al-Mosaiwi & Johnstone, 2018), finding a similar increase in self-reference, as well as increased use of absolutist language and decreased use of words relating to communication. Studies of samples with schizophrenia have also shown an increase in third-person pronouns, indicating a focus on others (Pugh et al, 2018), believed to be related to symptoms of suspiciousness and feelings of persecution. A small number of studies have also been conducted investigating the language of people with BPD. Using language in an online support forum, BPD writers were found to have increased use of third person singular pronouns compared to controls and other clinical groups, as well as greater use of anxiety, sadness, and anger words compared to the control sample (Lyons et al, 2018). Another study used language from the Adult Attachment Interview in a small sample of adult patients with BPD and healthy controls to show that BPD was associated with an increase in third person singular pronouns, swears, and words related to negative

emotions, as well as a decrease in words relating to positive emotions and cognitive processes (Carter & Grenyer, 2012).

While the above studies have been invaluable in further understanding the connections between language use and psychopathology, there remain several gaps in the literature that must be filled. First and foremost, while lexical analysis has been used to study BPD in adults, this research has not extended into adolescent samples. Additionally, the majority of the existing adult literature has several methodological faults. Namely, small sample sizes, inconsistent language sources, no validated diagnoses of participants, or the lack of both a psychiatric and healthy control group. The present study aims to both replicate the findings of the already-existing literature, but also fill these significant gaps by administering a validated diagnostic interview to determine a participant's BPD diagnosis, analyzing a uniform text sample from a validated attachment interview, a large sample size that does not rely on anonymous online forums, and most importantly, the use of an adolescent sample separated into three groups across a continuum of psychopathology.

Background & Significance

Adolescent Borderline Personality Disorder

Since its initial appearance in the third edition of the DSM, Borderline Personality Disorder has been diagnosable in people under 18 years of age (Millon, 1981). However, there are a number of myths that continue to hold many clinicians and researchers back from applying this fact to their practice and research. Not only has it been shown to be a valid diagnosis in adolescents, but also that adolescence is in fact the optimal time for intervention.

In a two-year follow-up study of 733 community adolescents, Bernstein et al (1993) found that, in the 10.8% who met criteria for BPD at baseline, there was a 24% persistence rate of severe diagnoses and a 29% persistence rate of moderate diagnoses. This same study also showed that those meeting diagnostic criteria at baseline (mean age = 14), had a risk ratio of approximately 13.1 for maintaining the diagnosis 2 years later. These findings suggest that, while some adolescents may move above and below the clinical threshold during adolescence, there is a significant proportion that maintains the disorder into adulthood. Another study by Bernstein et al (1996), investigated childhood precursors to adolescent personality disorders in general. This study found that childhood behavioral problems, including conduct problems, depressive symptoms, anxiety, and immaturity were all significant predictors of personality pathology 10 years later. Finally, a 20-year follow-up study (Winograd, 2008), found that participants with higher levels of borderline symptoms in adolescence reported significant deficits to educational and occupational functioning and life satisfaction into mid-adulthood. Adolescent symptoms were also associated with adulthood symptoms and diagnosis, as well as general impairment, even in those who did not maintain an adult BPD diagnosis.

Indeed, it is clear that adolescence is an important time for personality pathology in general, and BPD specifically. In a retrospective study of psychiatric inpatients, Zanarini et al (2001) showed that adults diagnosed with BPD first sought individual treatment at age 18, which was significantly younger than the Axis II controls group, who began individual treatment at roughly 22 years old (z= 3.316, p = .0009). If these patients were 18 when first seeking treatment, it follows that early signs of the disorder likely emerged earlier in adolescence. In addition to the earlier start to seeking treatment, this study showed that these patients also spent significantly longer in treatment, had significantly more psychiatric hospitalizations, and were prescribed

significantly more medications, suggesting that such lasting impairment is detectable in its earliest forms in adolescence.

Heterotypic Continuity of BPD in Adolescence and Adulthood

As interest in adolescent BPD has grown, research has continued to investigate the similarities, and potential differences, between BPD as presented in adolescence and adulthood. In a 2007 review, Sharp & Romero outlined the primary axes upon which these comparisons can be made: diagnostic criteria, prevalence, comorbidity, and course. First, when diagnosing BPD using the criteria outlines in Section II of the DSM-5 (APA, 2013), there is no difference in the symptoms/criteria for adolescents and adults. The only difference when diagnosing these groups is that symptoms must be present for 2 years in adults, whereas adolescents only must present symptoms for 1 year.

Second, studies in adults and adolescents, both in community and clinical samples have suggested that BPD may be more prevalent in younger people. While adult studies have estimated community prevalence from 0.7-1.8% (e.g., Torgensen et al, 2001; Swartz et al., 1990), adolescent studies have suggested much higher, but also more variable prevalence rates, ranging from 3% (Johnson et al., 1999) up to 14% (Chabrol et al, 2001). Clinical studies have shown similar differences between adults and adolescents, with about 20% of adult inpatients (Widiger & Weissman, 1991) and up to 49% of 12-to-18-year-old inpatients (Grilo et al, 1998). Later research has suggested that this higher prevalence in adolescence is due to a subset of adolescents who will meet criteria during this turbulent time in their development, but who remit as they move into adulthood. One study has found that, after a 2-year follow-up, 16% of an

adolescent inpatient sample no longer met criteria for BPD at follow-up, with individual criteria at baseline only predicting 18% of BPD diagnosis at follow-up (Garnet et al., 1994).

Comorbidity and course have also been found to be comparable between adolescents and adults with BPD. Namely, Major Depressive Disorder, Bipolar Disorder, and Substance Abuse Disorders have been associated with BPD in adolescence (MDD: McManus et al, 1984; Substance: Grilo et al, 1996) and adulthood (MDD: Skodol et al., 1999; Substance: Trull et al., 2000). However, there were differences in that Panic Disorder, Social Phobia, and PTSD have also been associated with adult BPD (Zanarini, 1998), whereas such comorbidity has not been found in adolescents. In adults, a 6-year follow-up study showed that approximately two-thirds of 290 Borderline patients met criteria for remission at the final assessment (Zanarini, 2003). In adolescents, a similar remission rate of two-thirds was found in a 2-year follow-up study (Garnet, 1994).

While lexical analysis research has not been extensive in Borderline populations, there has been one study with goals similar to the present study. Outlined in more detail below, Carter and Grenyer (2012) found that, when compared to Adult Attachment Interviews (AAI: George, Kaplan & Main, 1996) conducted with 20 healthy control participants, 20 Borderline participants used a significantly larger proportion of negative emotion words (both generally and the anger sub-category specifically) and smaller proportions of first-person plural pronouns (we, us), positive emotions words, and words related to insight. If the present study yields similar results, this would further suggest that Borderline Personality in adolescence is similar to that in adulthood, showing that even how someone with BPD speaks about their attachment figures is similar across the life course.

Attachment and Borderline Personality Disorder

There are multiple models of the development of BPD, each agreeing that there is no single pathway to developing the disorder and that it is determined by both biological and environmental factors. While each of these models have their merits, this study utilizes Fonagy and Bateman's Mentalizing Model of the Development of BPD (Bateman & Fonagy, 2008). Based in developmental psychopathology, this model asserts that genetic vulnerabilities interact with insensitive caregiving to develop inaccurate or incomplete representations of emotions and other internal states. These inaccurate representations can lead to difficulties in regulating one's own emotions, as well as recognizing and understanding the emotions of others (Fonagy, 1997). These difficulties will then interact with the already insensitive caregiver to further the emotion dysregulation and give way to more behavioral indicators of personality pathology, like fears of abandonment and hostility in interpersonal relationships as well as impulsivity and suicidality.

Indeed, some studies have shown that BPD is often associated with insecure attachment styles, but no specific style has been found to be necessary or sufficient for explaining the disorder. In an adult sample, Barone (2003) found that, of 40 participants meeting criteria for Borderline Personality Disorder, 50% were classified as "Unresolved" (disorganized) and another 43% received an insecure classification on the Adult Attachment Interview (AAI). In the non-clinical group (N=40), 63% received a "Free/Autonomous" (Secure) classification and only 7% receiving an "Unresolved" classification. Further, this study showed that, when compared to the continuous scales used to classify the AAI, those meeting criteria for BPD had significantly higher ratings regarding rejection and neglect from both parents as well as anger toward both parents. Ratings of role-reversal with mothers were also significantly higher in the BPD group. Additionally, those with BPD also received significantly lower ratings on loving experiences

with both parents and ratings of coherence and metacognition in their responses. These finding suggests that overall attachment classification is neither necessary or sufficient to explain Borderline Personality Disorder, though insecure or disorganized classifications are markedly more common among those with BPD.

Findings from a study with an adolescent sample have suggested that even through middle and late childhood, attachment classification is not the most important factor in the development of BPD. In fact, in the first empirical evaluation of the connection between attachment, social cognition, and BPD, results suggested that hypermentalizing, or attributing internal states to others that go beyond the available evidence, and emotion regulation, both constructs thought to develop through the attachment relationship, mediate the relationship between attachment and BPD features in a sample of adolescents (N = 259; Mean age: 15.42 years). However, this mediational effect was primarily driven by hypermentalizing, with the independent effects of emotion regulation not achieving significance (Sharp et al, 2016). Inadequate or inappropriate boundaries in the parent-child relationship have also been shown to be important risk factors in the development of BPD. In an adolescent sample (N= 283; BPD: n= 131, No BPD: n= 152), both guilt induction (mom: r= .31, p< .01; dad: r= .11, p<.05) and psychological control (mom: r= .29, p<.01; dad: r= .13, p<.05) from both parents were strongly correlated with BPD traits in the adolescents (Vanwoerden, et al., 2017).

Taken together, these results suggest that the attachment relationship is indeed an important factor in the development of Borderline Personality Disorder, but that overall attachment classification is not the most important factor, but rather other relational factors within the parent-child relationship, which may or may not be related to one's overall attachment classification. It is for this reason that the present study utilized a validated attachment interview

as the source of our analyzed text, as the CAI was created to prime a child's internal working models of their attachment figures and relationships, which should optimize the use of their speech in examinations of underlying psychological constructs and processes that have been shown to be related to attachment.

Lexical Analysis in Clinical Populations

Lexical Analysis has its origins in computer science. Also called "tokenization", it is a process by which a string of characters are separated into categories ("tokens"), each with assigned meanings (Wolf, 1997). Though it was initially applied to programming code, the same concept can be applied to written and spoken language. Because language is the most common way for people to express their internal processes to others, including perceptions, cognitions, and emotions, it makes sense for such methods to be used to better understand the internal worlds of a writer or speaker, making it ideal for psychological research. Indeed, Linguistic Inquiry and Word Count (LIWC; Pennebaker et al, 2015), a lexical analysis software that identifies proportions of words in a text that fall into pre-determined "dictionaries", or categories of words spanning from parts of speech to content-based categories such as affective or cognitive processes, has been used extensively in clinical, as well as Industrial/Organizational, research.

Depression, as well as suicide and suicidal ideation, have received some of the most attention in the LIWC literature. Rude et al's (2004) study used text from currently-depressed (n= 31), previously-depressed (n= 26), and never depressed (n= 67) college students' response to a simple prompt: "Starting college involved many significant changes, including moving to a new place, being separated from important people, taking on new challenges, and meeting new people. In the 20-minute writing task that follows, please describe your deepest thoughts and feelings about

10

being in college." While the never-depressed and previously-depressed showed no significant

differences in their language patterns, the currently depressed group showed significantly greater

use of first person singular pronouns, especially the subjective "I", than the never-depressed

group (t = 2.37, p< .001). The authors suggested this finding supports Pyczsinki & Greenberg's

self-focus model of depression (1987), which speculates that depressed individuals spend a lot of

time thinking about themselves as they become stuck in a self-regulatory cycle aiming to reclaim

lost feelings of self-worth.

   Similar results have been found in analyses of online suicide support networks and the

writings of suicidal poets in comparison nonsuicidal poets. Specifically, Stirman and Pennebaker

(2001) examined 156 poems by nine poets who died by suicide and 135 poems by nine poets

(fifteen each) who were not known to be suicidal. Poets in each group were matched by gender,

culture, and literary era. Results showed a significantly increased use of first-person singular

pronouns (F = 7.87, p=.02) and a nearing significant increase in references to death (F= 4.00,

p=.08). Al-Mosaiwi and Johnstone (2018) also showed that writing online support networks for

those struggling with suicidal ideation contained greater "absolutist" language, including words

such as "always", "every", "entire", "totally", or "whole", compared to control forums about

medical disorders, including cancer and diabetes. The authors suggest these findings were

reflective of absolutist cognitive distortions seen in those with depression, and especially in those

who die by suicide.

   Language use in schizophrenia has also received considerable attention due to the significant

cognitive and social deficits associated with this and similar psychotic diagnoses. One study of

46 patients diagnosed with schizophrenia and schizoaffective disorder (Minor et al., 2015) found

that schizophrenia symptoms and decreased functioning, as measured by the Positive and

Negative Symptom Scale (PANSS; Kay et al., 1987) were associated with negative emotion words (r= .30 for symptoms) and the anger sub-category (r= .34 for symptoms, r= -.32 for functioning). Social words were also significantly associated with metacognitive abilities (r= .40, p<.01) as measured by the Metacognition Assessment Scale (MAS-A; Lysaker et al, 2005). Another study, using both interview and online blog data (Fineberg et al, 2016) similarly found that, when compared to healthy control participant interviews and online blogs for other mental and medical illnesses, those with psychosis used increased levels of the first person singular "I" as well as negative emotion words.

Recently, Marshall et al (2017) also found that, in a subgroup of the sample used in the present study (n= 85 female adolescent inpatients), participants who disclosed experiences of sexual trauma in the CAI showed a relationship between their use of cognitive process words and their PTSD symptoms, with those reporting greater symptoms using fewer cognitive process words. Also of note, this study showed that using fewer words related to cognitive processes at admission was predictive of greater PTSD symptom improvement at discharge.

Lexical Analysis and Attachment Style

In addition to the extensive literature using lexical analysis in studies of language use in clinical populations, there have also been multiple studies investigating language and attachment style. This literature has primarily been in adult populations, but some research with children has also been conducted. First, in a study of two large corpora (Ns = 826 and 857) of the Adult Attachment Interview (AAI), Waters et al (2016) showed that, overall, those receiving higher ratings on dismissive state-of-mind scales provided much shorter answers than those with higher preoccupied-state-of-mind ratings (β= -.12, -.20 for each sample, p<.01 for both). As such, those

with higher preoccupation were found to have significantly longer interviews than those with greater dismissive ratings(β= .43 and .52 for each sample, p<.01 for both). Preoccupied individuals also used significantly more anger words than dismissing individuals (β= .14, p<.01 in one sample only). Interestingly, this study did not include overall attachment classification, but rather the AAI Q-sort (Kobak, 1993), which contains 100 descriptors related to discourse, attachment-related states of mind, and inferred parent experiences that are organized into forced normal distribution ranging from least to most characteristic of the given interview. These distributions are then associated with prototypical sorts associated with overall attachment classifications.

In another adult study, Borelli et al (2013) further investigated lexical correlates of the AAI, using traditional attachment classification, rather than the less common Q-sort procedure used in the study above. Using transcripts of 102 AAIs (25% women), Borelli et al found that those classified as autonomous (secure) used more affect-related words in the whole interview [F(3, 101) = 3.66, p< .05]. Additionally, those receiving dismissive classifications used significantly fewer words related to general negative emotions than the other participants [F(3, 101)= 2.65, p<.05]. Attachment classification and sex also significantly interacted [F(3,101)= 6.30, p<.05], suggesting that the difference in affect words was greater between secure and insecurely attached women. Anger words, a sub-categroy of the negative emotion category, were used significantly more by those classified as preoccupied [F(3, 101)= 3.81, p<.01]. In addition to standard LIWC categories, this study also investigated the different classifications' associations with a factor analytically derived composite of multiple categories, verbal immediacy, which is thought to reflect one's experiential connectedness to the text they are producing. For instance, a text high in verbal immediacy would seem more concrete and personal whereas low verbal immediacy is

typically associated with more ambivalent and detached language. Interestingly, those whose interviews received an unresolved/disorganized classification showed greater verbal immediacy than those receiving other classifications [F(3, 101)= 4.69, p<.01]. However, in discussions of trauma within the AAI, the disorganized group no longer showed significantly greater verbal immediacy in comparison to the other groups.

This research has expanded into the child literature, though not extensively. In another study by Borelli et al (2011) investigating verbal immediacy in an attachment interview, this time with school-aged children (N= 93) and using the CAI instead of the AAI. In contrast to the adult study, these results suggested that preoccupied attachment is more greatly associated with verbal immediacy throughout the whole CAI [F(1,93)= 6.84, p<.01]. Additionally those who were classified as disorganized also used frequently more words related to death throughout the entire CAI [F (1, 93)= 5.24, p<.05) and specifically in non-loss discussions [F(3,93)= 3.46, p<.05]. However, in portions of the CAI specifically related to loss, this difference did not hold.

Considered together, these studies suggest the importance of words related to affect and death in discussions of attachment, especially in those whose attachment style is classified as disorganized. Additionally, they suggest that word count alone can be a valid signifier of attachment security; specifically, those using more words in their interview are likely to be preoccupied with their attachment relationship. While these studies also suggested the importance of verbal immediacy, due to the factor analytically-derived nature of this category, which includes other categories of interest, the present study did not include this variable in our analyses.

Lexical Analysis in Borderline Personality Disorder

Despite the extensive use of lexical analysis in the clinical samples outlined above, these methods have not been widely extended into BPD research, especially in BPD in adolescence. However, there is a limited number of studies on language use in adults with BPD. Recently, Lyons et al (2018), sought to expand previous findings into the role of self-referential language in those experiencing mental distress by parsing out various forms of such distress. They did this by using language available on online peer-to-peer support networks dedicated to various mental disorders, including Obsessive-Compulsive Disorder, Generalized Anxiety Disorder, Major Depressive Disorder, schizophrenia, and Borderline Personality Disorder. Language from financial blogs unrelated to mental health were used as a non-distressed control. This study showed that, compared to controls, BPD writers used higher rates of overall personal pronouns, first- and third-person singular pronouns, general negative emotion words, as well as in sub-categories of sadness, anger, and anxiety. Compared to writers with GAD, BPD writers showed fewer negative emotion words, including words related to anxiety. BPD writers also used fewer words related specifically to sadness (a sub-category of the negative emotions dictionary) than writers with MDD. Though this study has merits in its multi-group design and large sample size (100 entries for each group), there are also major flaws in their sampling, as they relied on self-diagnoses in online fora and text samples were not based on a uniform prompt. Additionally, this study did not have any data regarding age or gender of their sampled writers.

Another study aimed to investigate potential disturbance in expressive language in BPD, specifically in response to an attachment-related, emotional prompt. Using the Adult Attachment Interview (AAI; George, Kaplan & Main, 1996) as a text source, Carter and Grenyer (2012) analyzed the language of 20 adult patients with BPD and 20 age-, sex-, and education-matched

controls, with a focus on differences in use of pronouns and words related to affective and cognitive processes. Compared to controls, BPD participants showed significant increases in third-person singular pronouns (F=7.007, p=.012), words related to causation (F=20.056, p<.01) and negative emotions (F= 23.789, p<.01), and swear words (F= 8.063, p=.007). The BPD groups also used significantly fewer first-person plural pronouns (F=4.564, p=.039), second-person pronouns (F= 10.273, p=.003) and words related to insight (F= 5.672, p= .022), tentativeness (F=10.605, p=.002), and positive emotions (F= 17.408, p<.01). This study serves as the primary inspiration for the present study, which aims to replicate these findings in a larger, adolescent sample, as well as provide dimensional analyses comparing the chosen lexical categories to participants' severity of Borderline features.

The present study

In sum, despite the agreement of BPD's onset in adolescence, the importance of attachment in its development, and the availability of an effective method for identifying differences in a near-universal social skill (language), these concepts have not been studied together. Previous work investigating lexical differences in clinical samples have widely ignored personality pathology, and any attention paid to BPD has been in adult samples, with no studies having both a uniform, clinically-relevant prompt for their text as well and multi-group design with large sample sizes. To date, while lexical analysis literature has broached into both attachment and BPD research, adolescent samples have not been extensively studied. Additionally, despite the apparent, but as yet not fully understood, connection between the attachment relationship and Borderline Personality Disorder, these have not been studied together using lexical analysis methods.

This study aims to fill these gaps in the literature by assessing language in adolescents divided into three groups, one with Borderline Personality Disorder, one with other psychopathology, and another with no psychopathology, with group designations determined by validated diagnostic interview. This three-group design allows for identification of lexical differences specific to BPD, controlling for other psychopathology with which BPD is often comorbid. It provides a large range of severity in Borderline features, from normative levels in healthy controls to more severe presentations in those meeting diagnostic criteria, to identify any dimensional associations between the chosen lexical categories and symptom severity. Finally, this study used an attachment-focused interview as a text source, ensuring uniformity across the sample as well as activating participants' attachment systems, ensuring greater differences in those with BPD.

Aims & Hypotheses

Aim 1: Identify lexical differences between adolescents with Borderline Personality Disorder, adolescents with other psychopathology, and healthy controls

The primary aim of the current study is to identify any significant lexical differences in the way that adolescents with Borderline Personality Disorder discuss their attachment relationships when compared to healthy control adolescents and adolescents with other psychopathology. It was expected that healthy controls would show lower levels of negative emotion words, first-person singular pronouns, and words related to death than those in the BPD and Psychiatric Control Groups, with the BPD group showing the highest rates of these lexical categories. Also, total word count is expected to be elevated in the BPD group, reflecting preoccupation with the attachment relationship.

Aim 2: Identify lexical categories associated with Borderline Personality Disorder features and symptoms across groups

Beyond identifying categorical differences, this study aims to identify lexical categories that may be correlated with the severity of Borderline Personality Features in adolescents across these three groups. We expected that use of first-person singular pronouns, language related to negative emotions (sub-categories sadness, anger, anxiety), and words related to death would be positively correlated with total score on measures of borderline personality disorder (BPFS-C). Positive emotion words and words related to insight are expected to be negatively correlated with Borderline features, reflecting a lesser focus on positive emotions and less introspection with more severe borderline pathology.

Methods

Participants

BPD and Psychiatric control participants N=804 between the ages of 12 and 17 years were recruited as part of a larger study of social cognitive processes in adolescent inpatients (Sharp, Williams, Ha, et al., 2009). Exclusion criteria included current psychosis or diagnosis of thought disorder, IQ < 70, and non-fluency in English. Of this sample, 494 had available CAI transcripts and CIBPD scores. Of this, 163 met criteria for BPD according to the CIBPD. For the present study, a random sample of BPD and clinical controls (CC) were selected from the overall sample, approximately 100 for each group.

Healthy control (HC) participants were recruited through schools and community resources as part of a larger study of attachment and social cognition in typical adolescents. Participants were excluded if they met diagnostic criteria for any psychiatric disorder. A total of N = 223

adolescents consented for participation in the study. After exclusions for missed data collection appointments, missing data, the above-mentioned exclusion criteria, and incomplete Child Attachment Interviews, the final sample consists of N = 101 participants.

Interview-Based Measures.

The Child Attachment Interview (CAI; Target, Fonagy, & Shmueli-Goetz, 2003) is a semi-structured interview that assesses the quality of a child's relationships with each of their primary caregivers. Though it was initially designed for use with children aged 8-13 years, its validity in late-adolescent samples has been supported (Venta, et al., 2014). The CAI probes the child's experiences with their caregivers with nineteen questions. These include providing descriptions of themselves and their relationships with their caregivers, descriptions of experiences involving loss, injury, or illness, and descriptions of what occurs during conflict in their family. Using 8 9-point scales, coders review transcripts and videos of these interviews to determine a child's attachment style: secure, dismissing, preoccupied, or disorganized. The CAI has demonstrated adequate psychometric properties in use with both clinical and healthy control samples (Shmueli-Goetz et al., 2008). In the present study, the CAI is the source of the participants' language for the lexical analysis. Due to the interview's focus on the attachment relationship, and the role of the attachment relationship in the development of BPD (Fonagy, 2018), it was hypothesized that the language produced in this interview would be an optimal source to identify differences in adolescents with BPD.

The Childhood Interview for Borderline Personality Disorder (CI-BPD; Zanarini, 2003) is a semi-structured interview comprised of 9 items, each covering one of the diagnostic criteria for BPD as outlined in section II of the DSM-5 (APA, 2013). Each item is rated on a 0-2 scale (0=

not present, 1 = probably present, 2= definitely present). At least five of these nine criteria must

be definitely present in order to obtain a diagnosis of BPD. The CI-BPD has been found to have

adequate concurrent validity when compared to measures of externalizing and internalizing

behaviors, self-harm behaviors, and emotion regulation difficulties as well as convergent validity

with other measures of BPD features (Ha et al, 2011). In this study, the CI-BPD was used as both

a categorical variable for identifying participants who meet criteria for BPD as well as a

continuous variable representing the number of borderline features presented. The inter-rater

reliability of the CIBPD in the present sample is adequate (K= .741, p<.001).

Self-Report Measures.

   Demographic information was collected via self-report questionnaire. Demographic

information included the age and gender of the participant, as well as the highest level of

education completed by both parents. Gender was dummy-coded as female = 0, male = 1.

Parental education was dummy-coded as follows: Some high school = 1, High School diploma or

GED = 2, some college = 3, Associate's or Bachelor's Degree = 4, Master's Degree = 5, and

Doctoral or Professional degree = 6.

   The Borderline Personality Features Scale for Children (BPFS-C; Crick, Murray–Close, &

Woods, 2005) is a self-report measure, consisting of 24 items each rated on a 5-point Likert scale

(1- not at all true, 5- always true). The measure contains 4 subscales (affective instability,

identity problems, negative relationships, and self-harm) that are summed to calculate a total

score. The BPFS-C has shown acceptable levels of accuracy in predicting BPD diagnosis in

adolescents as well as moderate internal consistency (Chang, et al., 2011). In the present study,

the BPFS-C total score was used as a continuous measure of BPD features to compare to

measures of mentalization and lexical categories of interest. In the current sample, the BPFSC

has shown adequate internal validity in both recruitment samples (α= .908 for Healthy Controls

and α= .890 for Clinical Groups).

Data Analytic Strategy

  Lexical Analysis. Linguistic Inquiry and Word Count (LIWC; Pennebaker et al., 2015) is a

computerized text analysis software. The software reads a passage of text and identifies the

proportion of words that fall into each of the LIWC "dictionaries", categories of words related to

a certain topic. While LIWC began with two dictionaries of positive and negative emotion

words, it has since expanded to include over 80 dictionaries, covering such categories as nouns,

verbs, and other parts of speech ("function words") as well as "content words" that make up the

unique information in the given text. Such content word dictionaries include the original positive

and negative emotion categories as well as dictionaries related to cognitive processes, social

processes, and even more modern categories such as "netspeak" which includes commonly used

online acronyms such as "lol" or "omg". Validation studies have shown that, especially in the

negative and positive emotion categories, LIWC category ratings correlated with human raters'

emotional rating of the same excerpt (Alpers et al, 2005).

  To prepare CAI transcripts for LIWC analysis, each file was formatted into a single plain text

file using standard procedures (Pennebaker et al., 2015). A trained human reader reviewed the

text and delete anything that is not the participant's own language. This includes questions from

the interviewer, any direct quotes of others' language provided by the participants, and any

behavioral observations noted by the transcriber. Using LIWC, rates of use were identified for

each lexical category of interest.

Selected lexical categories are based on the existing clinical and attachment lexical analysis literature. In adult samples, total word count (WC) and words related to anger were found to be used significantly more by adults classified as preoccupied by the AAI (Waters et al., 2017). Also in an adult sample, Borelli et al (2013) have found that disorganized attachment was associated with greater use of second-person pronouns in discussions of loss in the AAI and of words related to death in the whole AAI. Other literature has also shown that adults with BPD use greater negative emotion words, especially words related to anger than controls. They also used significantly fewer cognitive process words, particularly words related to insight, and fewer positive emotion words (Carter & Grenyer, 2012). In studies of other clinical populations, first-person pronouns have been shown to be significantly related to psychological distress, no matter the diagnosis (Fineberg et al, 2016). While attachment and BPD have not been extensively investigated using lexical analysis in adolescent samples, similar work has been done that informs the present study. Borelli et al (2011) have also found that words related to death can be significantly related to insecure attachment. Given this research, the present study focuses on the following lexical categories: Word Count, first-person singular and plural pronouns, words related to insight, positive emotion words, words related to anger, sadness, anxiety, and death.

Statistical Analyses. All analyses were run using SPSS version 21.0. First, descriptive analyses were performed on participant demographic variables and main study variables. To determine differences across groups in use of lexical categories of interest (Aim 1), controlling for covariates, an analysis of covariance (ANCOVA) was performed with group as the independent variable, age, gender, and parental education as the covariates, and lexical categories of interest as the dependent variables. To test whether the results from the above analyses remain significant when controlling for general psychopathology, the ANCOVAs will

be re-run including the Total Behavior Problems score on the ASEBA Youth Self Report as an additional covariate.

To examine relations between Borderline Personality features and language across diagnosis, bivariate correlations were run using scores on measures of BPD symptomatology (CIBPD, BPFS-C) and LIWC's calculated rates of use of categories of interest: Total Word count, Personal Pronouns, first-person singular pronouns, third-person pronouns, positive emotions, negative emotions, and cognitive processes.

<div align="center">

Results

</div>

Sample Characteristics and Descriptive Statistics

Of the 101 Healthy Control participants, 3 met criteria for BPD on the CIBPD and were thus moved to the BPD group. 7 healthy control participants had incomplete CAIs and were thus removed from analysis. Final count per group is as follows: BPD: N= 103, CC: N=107, HC: N= 91. Table 1 presents descriptive statistics for demographic and diagnostic variables. Table 2 presents frequencies of different levels of parental education. There were no significant differences in age between groups. The clinical control group had significantly fewer females than the BPD group, but not than the healthy control group. On average, parents of the Healthy Control group had received significantly less education than those of the clinical groups, but in both cases by less than one level on the dummy-coded scale. Table 3 presents descriptive statistics for lexical categories of interest. All categories, with the exception of total word count, are presented as the proportion of the total words that fall into the given category. Table 4 presents the inter-correlations between lexical categories of interest. It should be noted that even

significant differences in low base rate categories would likely be unnoticeable to human readers of interview transcripts.

[Tables 1-4]

Aim 1: Group Differences in Lexical Categories

Word count. No significant differences were detected between groups in total word count (F= 2.33, p> .10). However, years of age was a significant covariate (F= 2.277, p< .05), suggesting age is a greater predictor of word count differences than diagnosis. Gender and parental education were insignificant covariates and there were no significant interactions between group and the covariates. Post hoc tests (Tukey HSD) revealed no significant pair-wise differences in word count between the groups, with all 95% confidence intervals including 0.

First-person singular pronouns (I, me, etc.). Figure 1 presents the mean proportion of first-person singular pronouns for each group. Overall differences between groups in use of first-person singular pronouns did not meet the significance threshold (F= 1.241, p> .25). There were no significant covariates or interactions between group and covariates. Additionally, Post hoc Tukey's test revealed a significant pairwise difference in first-person singular pronouns between the healthy control and BPD groups (Mean Difference [BPD-HC]= .5116, p= .023).

[Figure 1]

First-person plural pronouns (we, us, etc.). Figure 2 presents the mean proportion of first-person plural pronouns for each group. ANCOVA revealed a significant difference by group in first-person plural pronouns (F=4.302, p=.015). Covariates age, gender, and parental education were insignificant. Post hoc Tukey's test reveal that the BPD group and the healthy control group

had the only significant pair-wise difference in first-person plural pronouns (Mean difference [BPD-HC]= -.1759, p=.033).

[Figure 2]

Positive emotion words. Figure 3 presents the mean proportion of positive emotion words for each group. ANCOVA revealed no significant overall differences between groups in use of positive emotion words (F= .035, p=.966). However, age (F= 4.848, p<.001), gender (F= 8.002, p=.005) were significant covariates, suggesting they are better predictors of difference in use of positive emotion words than group alone. Post hoc Tukey's test revealed significant pair-wise differences between the BPD group and both control groups in the use of positive emotion words, with the BPD group using significantly fewer than both groups (Mean Difference [BPD-HC]= -.6167, p< .001; Mean Difference [BPD-CC]= -.4186, p<.005).

[Figure 3]

Anxiety words. Figure 4 presents the mean proportion of anxiety-related words for each group. ANCOVA revealed an overall significant difference in anxiety related words between groups (F= 5.357, p<.01). None of the covariates were significant predictors of this difference. Post hoc Tukey's test revealed that the healthy control group used a significantly smaller proportion of anxiety-related words than both clinical groups, with no significant difference between the two clinical groups (Mean Difference [BPD-HC]= .2287, p<.001; Mean Difference [CC-HC]= .1569, p<.005). It should be noted that anxiety words made up less than 1% of total words in all three groups.

[Figure 4]

Anger words. Figure 5 presents the mean proportion of anger-related words for each group. ANCOVA revealed an overall significant difference in the proportion of anger-related words

between groups (F=6.099, p<.005), with a post hoc Tukey's test further revealing significant

pair-wise differences between all pairs of groups, with the Healthy Control group using a

significantly smaller proportion than both clinical groups (Mean Difference [BPD-HC]= .5892,

p<.001; Mean Difference [CC-HC]= .4253, p<.001). The difference between the clinical groups

was just shy of meeting the significance threshold (Mean Difference [BPD-CC]= .1639, p=

.051). ANCOVA revealed Parental Education as the only significant covariate (F= 2.743, p<.05),

suggesting it is also a significant predictor of differences in anger-related words.

[Figure 5]

Sadness words. Figure 6 presents the mean proportion of sadness-related words for each

group. ANCOVA revealed no significant overall difference in the proportion of sadness words

across groups. No covariates were significant predictors of difference in the proportion of

sadness words. Post hoc Tukey's test revealed significant pairwise differences in proportion of

sadness words, with the healthy control group using a significantly smaller proportion than both

clinical groups, but no significant difference between the clinical groups (Mean Difference [HC-

BPD]= -.1729, p<.001; Mean Difference [HC-CC]= -.1367, p<.01). It should be noted that, in all

groups, sadness words made up less than 1% of all the words used in the interview.

[Figure 6]

Insight words. ANCOVA revealed no significant overall difference in insight-related words

(F= 2.155, p=.120). The post hoc Tukey's test revealed no significant pairwise differences in the

proportion of insight-related words used. There was a significant effect of age (F= 4.512,

p<.001), suggesting that age is a better predictor of difference in use of insight-related words

than borderline pathology.

Death words. Figure 7 presents the mean proportion of death-related words used by each group. ANCOVA revealed no significant overall difference in the proportion of death-related words between groups (F= 2.271, p=.107). Parental education was a significant covariate (F= 2.328, p<.05), suggesting it is a more significant predictor of the difference in proportion of death-related words. There were no significant interaction effects. Post hoc Tukey's test revealed significant pairwise differences between the healthy control group and both clinical groups, such that the healthy control group used a significantly smaller proportion of death-related words (Mean Difference [BPD-HC]= .0668, p<.005; Mean Difference [CC-HC]= .0662, p<.005). There was no significant difference between the two clinical groups. It should be noted that the proportion of death words was below .2% in all three groups.

[Figure 7]

Aim 2: Lexical Correlates with Borderline Symptomatology

Lexical categories and covariates. Table 5 presents the correlations of all lexical categories of interest with the covariates of age, parental education, and gender. Gender was dummy-coded as 0=female and 1=male. It should also be noted that, as shown above in Table 2, Parental Education data is missing for 65 participants (21.6% of the sample), thus, correlations are based on N=236 observations. Gender was significantly correlated with the proportion of anger words, such that men used a larger proportion of anger words than women. Gender was not significantly correlated with any other lexical categories of interest. Parental education was significantly correlated with first-person plural pronouns (r= -.162, p<.05), positive emotion words (r= .153, p=.019), and sadness words (r=.138, p<.05). Age was significantly correlated with total word count (r= .171, p<.01), positive emotion words (r= -.189, p=.001), sadness words (r= -.150,

p<.01), and insight words (r= .149, p< .05). While regression analyses are beyond the scope of the present paper, these correlations should be noted when interpreting correlations between lexical categories and BPD symptomatology.

[Table 5]

Lexical Categories and Borderline Symptomatology. 13 healthy control participants, 2 Borderline participants, and 2 clinical control participants had missing BPFSC data (5.32% of the total sample) and are thus not included in the following analyses. Of the 9 lexical categories of interest, total score on the BPFSC was significantly correlated with 7. Table 6 presents the correlations between BPFSC total score and the lexical categories of interest. Contrary to this study's hypotheses, there were no significant correlations between BPFSC total score and total word count (r= .087, p=.142) or insight-related words (r= .021, p=.723). However, in accordance with hypotheses, BPFSC total score was significantly positively correlated with first-person singular pronouns (r= .215, p=.01), anxiety words (r= .297, p<.001), anger words (r=.312, p<.001), sadness words (r=.256, p<.001), and words related to death (r= .246, p<.001). Significant negative correlations were found between BPFSC total score and first-person plural pronouns (r= -.230, p<.001) and words related to positive emotions (r= -.299, p<.001). Significant correlations are presented graphically in Figures 8 through 14 below (8: I, 9: we, 10: positive emotions, 11: anxiety, 12: anger, 13: sadness, 14: death).

It should be noted that, when the sample was separated by group, no correlations remained significant across all three groups, with the clinical control group showing no significant relationships between borderline symptomatology and any lexical category of interest, which suggests that the relationships between dimensional level of borderline pathology and use of lexical categories of interest may be different at different categorical levels of borderline

pathology, or that other psychopathology may confound the usage rates of the lexical categories of interest. Moderation analyses are beyond the scope of the present paper, but the inconsistency of these correlations should be taken into account when interpreting these results.

[Table 6]

[Figures 8-14]

Robustness of Results

Table 7 presents the descriptive statistics for the Total Problems score of the ASEBA Youth Self Report (Achenbach & Rescorla, 2001). The Youth Self Report is part of a set of standardized measures of child and adolescent emotional and behavioral problems, as well as social competencies. The forms are completed by parents, teachers, and the adolescents themselves. The measure includes 118 items that can be scored as zero (not true), one (somewhat or sometimes true) or two (very true or often true). These items provide scores for eight narrowband scales and three broadband scales (Internalizing Behavior Problems, Externalizing Behavior Problems, and Total Behavior Problems). To ensure that the results outlined above remain significant when controlling for general psychopathology across the three groups, a second analysis was run including the Total Behavior Problems score as another covariate. Participants with missing data were removed list-wise, leaving a total of N=233 upon which the present analyses are based. ANOVA revealed significant differences in YSR Total Behavior Problems Score across all groups (F= 132.99, p<.001). Post hoc Tukey's test revealed significant pairwise differences between all pairs of groups, suggesting significantly different levels of psychopathology between all three groups.

Table 8 presents the ANCOVA results for the effect of group for each lexical category of interest including the YSR Total Behaviors Problems Score as a covariate, as well as any significant effects of covariates, including YSR Total Behavior Problems. In this new analysis, the effect of group was no longer significant on the proportion of first-person plural pronouns (F=5.109, p>.1) or anger words (F=2.55, p>.2) used in the interview. However, while pairwise differences in first-person plural pronouns were also insignificant, the pairwise differences in anger words remained significant between the healthy control group and both clinical groups. Additionally, previously significant pairwise differences in the use of first-person singular pronouns and words related to death were no longer significant. Finally, with the addition of YSR Total Behavior Problems, the overall effect of group on proportion of sadness words became significant (F= 16.129, p=.025) and the effect of group on anxiety words grew in magnitude (F= 12.544, p=.035), though it was significant in both analyses. Overall, the results of analyses including a covariate representing general psychopathology show that the use of emotion words, both positive and negative, may be have specific ties to borderline pathology above and beyond other psychopathology.

Table 9 presents the bivariate correlations between YSR Total Behavior Problems and each lexical category of interest. Similarly to the BPFSC total score, significant positive correlations were found between YSR Total Behavior Problems score and first-person singular pronouns (r= .190, p=.001), anxiety words (r= .267, p<.001), anger words (r= .310, p<.001), sadness words (r= .310, p<.001), and death words (r= .248, p<.001). Additionally, a significant positive correlation was found with total word count (r= .138, p<.05). Significant negative correlations were found for first-person plural pronouns (r= -.230, p<.001) and positive emotion words (r= -.299,

p<.001). Just like the correlations between lexical categories of interest and other covariates, these relationships should be taken into account when interpreting results.

[Tables 7- 9]

General Discussion

Experience of Attachment in BPD

Self and other relations. As noted in Tauczik & Pennebaker's 2010 review of studies using LIWC, function words, especially personal pronouns (first-, second-, third-person pronouns), can reflect attentional allocation. For example, someone experiencing physical or emotional pain is likely to be highly self-focused and thus use more first-person pronouns (I, me) (Rude et al, 2004), and sitting in front of a mirror increases use of first-person singular pronouns when completing an open-ended questionnaire when compared to people without the mirror (David & Brock, 1975). This, taken together with the prominent theory of Borderline Personality Disorder, at its core, being a disturbance of mental representations of self and others (Bender & Skodol, 2007), could explain the significant differences and correlations of first-person singular and plural pronouns found in the present study. Bender and Skodol report that such a disturbance could manifest as:

> "(1) unstable mental images of self and others, often marked by self-loathing and attributions of malevolence to others; (2) interactions with others organized around a fundamental need for care that is felt to be necessary for basic functioning; (3) fear of others based on expectations of being mistreated and disappointed and/or terror of having one's identity subsumed by another person; (4) difficulty considering multiple and/or conflicting perspectives, with a tendency toward concrete, all-or-none, or black-and-white, thinking and distortion of reality; and (5) sadomasochistic interpersonal interactions in which a person alternatively inflicts suffering on others and suffers at the hands of others." (p. 500)

It would be easy to, at least partially, explain some of the present study's results in the context of this theory. Dimensionally, Borderline symptoms were significantly related with

higher levels of first-person singular pronouns and lower levels of first-person plural pronouns. The first-person plural result was also found in the categorical approach, with the BPD group using the smallest proportion, though this difference was only significant compared to healthy controls, and not clinical controls. The higher rate of first-person singular pronouns could be reflective of the "self-loathing" expected from those with BPD. Similarly, the lower rate of first-person plural could be reflective of the "difficulty considering multiple and/or conflicting perspectives." It should also be noted that previous work has found that, when examining BPD and its comorbidity using a factor analytic approach within the internalizing-externalizing framework of mental disorders, BPD was found to load significantly on the externalizing factor in general, as well as the distress sub-factor of the internalizing dimension (Eaton et al, 2011). However, these results may not be specific to Borderline Personality Disorder, as there were no group differences in first-person singular, and only a significant difference in plural between the BPD and healthy control groups. It could instead be possible that these relationships between first-person singular and plural pronouns and borderline pathology could be explained by general distress and isolation experienced by anyone with psychopathology. Results from our second analyses, which controlled for general psychopathology by including the Total Behavior Problems score as a covariate, support this notion, as the overall effect of group on these lexical categories, as well as pairwise differences in their use between groups, were no longer significant. Further examinations into the language used in response to specific questions on the CAI, as well as other attachment or borderline-relevant assessment tools could provide clearer explanatory models for these observed differences and relationships.

Emotional focus. Consistent with hypotheses, the present study revealed that borderline pathology, both categorical diagnosis and dimensional severity of symptoms, was related with

higher rate of words related to negative emotions, especially anger, and a lower rate of positive emotion words. Overall, this result is not surprising, as descriptions of BPD often involve intense labile emotions, feelings of anxiety, and intense bouts of anger. However, unlike anger words, rates of words related to sadness and anxiety were not significantly different between the BPD group and clinical controls both clinical groups used significantly more than healthy controls. Because this pattern has been found in lexical studies of most other mental disorders, it is certainly not a trend specific to BPD. However, words related to anger were used significantly more in the BPD group compared to both control groups, suggesting that teens with BPD have and express greater feelings of anger when discussing their attachment relationships. This is consistent with the literature that has shown that there is a high rate of preoccupied attachment within BPD populations, with preoccupied anger being one of the forms such an attachment style could take (See review by Agrawal, Gunderson, et al., 2004). Additionally, others have found that anger, preoccupied attachment, and domain disorganization, defined as "difficulties regulating behavior and emotions in a way that is consistent with the expectations for different kinds of social interaction", jointly predict 22% of the variance in BPD trait scores. With their interactions further predicting another 8% (Morse, Hill, et al., 2009). Together, this literature suggests that preoccupation, anger, and difficulty in understanding appropriate ways to express said anger, as well as other emotions, may contribute significantly to borderline pathology.

The present results further support this literature, showing that anger, specifically in the attachment relationship, is greater in the BPD group than both treatment and community controls. This is significant not only in understanding the experience of family and relationships in BPD, but also identifying potential treatment targets. Further, analyses controlling for general psychopathology showed that overall effect of group on emotional language, and/or pairwise

differences in the use of emotion categories, remained significant, suggesting that those with

borderline pathology may have a specific pattern of emotional language when discussing their

attachment relationships.

Additionally, because this relationship held up dimensionally, with a significant positive

relationship between BPFSC total score and anger words, this clinical utility may be relevant to

treatment of adolescents across the board, and not solely in those meeting criteria for BPD.

However, again, it should be noted that despite the significant difference in the rate of death

words, over the entire sample, the average rate was only .14%, with the standard deviation (.2%)

including 0. For example, below are approximately equal in length excerpts from participants

with the average rate of anger words for their respective groups, with anger words underlined

and in bold. Reading these excerpts alone, it would be difficult to notice any differences in rate

of anger words given the low base rate across groups:

Clinical Control: "But he came in and thought he was gonna hit on me and we **fought**. I mean, I was a child there, but I was always strong-minded to the point where I'm not gonna be mistreated and let it go down, so he and I **fought**, for hours, you know, just sat there and fought, you know. And he had a belt and I was running. It was a mess. It was horrible. But you know, I was a little trooper, I sat there, I mean I wasn't one of those kids who was gonna sit there and let it go down without a **fight**. I knew what was going on was wrong, but you know what could I do? I'm a little 9-year-old child, the **hell** that I was gonna do, like I couldn't litigate that at the time. She had another boyfriend, he was horrible to me. He used to call me names. She did nothing about it. She's very self-centered. She was very inappropriate, like she wanted me to cock her and she wanted me to cock her, she told me once to refer to her as my beautiful black queen, which was absolutely crazy. That was never gonna- I was never gonna say anything like that, so it was totally inappropriate, but she just had this, I don't know what was wrong with her, but she just was **screwed** up. I mean she said I should cock her, that's horrible. I mean that's not appropriate on any level. That's icky, that's disgusting. I don't know, she- she was- that's **ridiculous**."

Healthy Control: "Like **abused**? Mm-mm. When I was younger, but since like Middle School I hadn't gotten hit. My siblings definitely do hit me. Usually it's playing around, but there are days where we get, like, **mad** at each other, and then we just start hitting each other and our parents have to come in. No. Um, my sister, I'm on the computer actually, I'm on- and went to the kitchen to go get something, and then my sister sat on the computer and I was telling her to move, 'cause I was doing work so I needed to get back on the computer, and so, um, she took her

time and she wasted 10 minutes of my time, and when she got up she pushed me against the couch, and so I got **mad** and pushed her back. I was very **mad**. I was being kinda mean, so I'm sure she felt bad about that. Mm-mm. Uh, sometimes when my parents fight, it's kinda scary. Like, um, it was two weeks ago they were fighting, and all my siblings were like crying and then it made me sad, 'cause they were scary and all day at school I couldn't concentrate, 'cause they went back home and were **fighting** again. It was physical, so kinda scary. Both. Kinda like a sibling **fight**, but scary. Um, I don't know, they were kinda like, I don't remember. I mean, I could tell that they weren't trying to hurt each other, but at the same time they were **mad**. Mm-mm. Yeah. I'm just sad, I was kinda like **mad** that they would do that."

Borderline Group: "For the **stupidest** thing, and I'm like 'Mom, like why is he being like this?' Like, he's like a women. Like he's on his period right now. Like, so… He's probably just taking his **anger** out on me 'cause I know that I do that and since we kind of are like the same person, I know. Like at first I didn't think about that, but like now I realize like that's what he's doing. Kind of **annoying**. Like, 'cause in the moment I'm like 'Ugh, why's he mad at me?', but then, like, late ron, I'm like 'Oh, he's just **mad** and he's taking his **anger** out on me.' There;s only been one time where he hit me, um- And it was totally, like, understandable. Like I was- like, that's when they kind of found out like everything that I had been doing behind their backs and like all this stuff and like he got so **mad**. But then other times he'll just **yell** at me and like be like 'go to your room.' So- well, they found out like what I- like my interaction with like boys and like- like I'd tried pit and drank and like all that stuff, so I can understand how they were really **angry**. Yeah. I was like shocked, because he literally is a softy, like I didn't think he would ever hit anyone. And then he hit me and it hurt. Well, first of all, it did hurt, um, and like- I just like couldn't stop crying I was like really scared. He was probably **angry**. She was scared, she was like 'oh, my God!' Like, I've never seen him this **mad**, so and like she told me, she was like, she like, was like "K, like stop, leave, don't hurt her.""

Clearly, noticing the difference in rate of anger words would be difficult without the aid of a software like LIWC, at least in the present study. However, future work could benefit from examining how anger words relate to nearby personal pronouns, indicating whose anger is being discussed and at whom it is being directed. An interesting observation in the above excerpts is that while the control groups seem to be discussing their own anger toward other people, the BPD example seems to focus on anger toward them from others. It is possible that the increase in anger words in BPD may not solely be an emphasis on their own anger, but also perceived anger from others.

Death. Prior work investigating the language of attachment has focused on discussions of death and loss, which can represent significant interruptions or setbacks in attachment

relationships. Specifically, Borelli et al (2011) found that children categorized as having a disorganized attachment style used more words related to death over the entire CAI and in portions unrelated to loss. This difference did not remain significant when looking solely at portions of the interview related to loss. The present study revealed that both clinical groups did use significantly more words related to death and dying than healthy controls. Additionally, borderline symptoms were dimensionally related to the proportion of death words used throughout the entire CAI. This suggests that thoughts of, and references to, death are significantly more common in clinical populations, though not specifically in BPD. However, those experiencing greater BPD symptomatology did use more death-related words than those with lower scores on the BPFSC. Unfortunately, the present study did not separate loss and non-loss discussions, making a direct comparison impossible, as it is impossible to differentiate what death words were referring to an episode of loss and which were referring to general thoughts of death or dying, even in response to questions unrelated to loss. Also, after controlling for general psychopathology, the significant pairwise differences in the use of death words disappeared, suggesting that these differences are better explained by psychopathology in general than by borderline pathology.

Lexical similarities to Other Disorders

The present study partly supports the findings of prior lexical analysis work which has suggested that greater use of first-person singular pronouns (i.e., I, me) is representative of greater internal distress. As expected, there were significant differences in first-person singular pronouns between the borderline and healthy control groups. Additionally, when taking a dimensional approach, it was found that the proportion of first-person singular pronouns was

significantly related to Borderline symptoms as measured by the BPFSC. Rude et al (2004) showed that, compared to never-depressed college students, students currently meeting criteria for depression used a significantly larger proportion of first-person singular pronouns. Rude and colleagues explained this difference using Pyszczynski and Greenberg's control theory of depression (1987), which posits that depression involves a greater level of self-preoccupation. More recent work has extended on this theory, claiming that greater self-reference (i.e., using more first-person singular pronouns) is in fact reflective of general distress. Fineberg et al (2016) found that this increase in self-reference was observable not only in depression, but other mental and medical disorders as well, suggesting that such self-reference, while still reflective of self-preoccupation, is derived from general distress and not depression alone. Based on the results of the present study, the argument still stands that greater distress may lead to a greater level of self-preoccupation, with those with higher levels of Borderline symptomatology, and thus greater distress, using a larger proportion of first-person singular pronouns. However, the group comparisons in the present study suggest that this difference may not be reflected at the diagnosis level, at least in terms of Borderline Personality Disorder specifically.

In a similar vein, the larger lexical analysis literature has suggested that psychopathology is also reflected in one's attention to positive and negative emotions. Beck's cognitive model of depression has emphasized the role of negative biases in attention and memory, which in turn lead to depressive schemas influencing how one perceives, interprets, and behaves in the world. This model has been validated lexically in studies of depression, with results from Rude and colleagues showing greater use of negatively-valenced words and lower use of positively-valenced words (Rude et al., 2004). Similarly, lexical analysis work in schizophrenia has found a greater emphasis on negative emotions, and less emphasis on positive emotions in Tweets

written by those who have also disclosed a diagnosis of a psychotic illness (i.e., schizophrenia, schizoaffective disorder, and schizoid or schizotypal personality disorders) (Mitchell et al., 2015). Thus, it is unsurprising that a similar pattern was found in the present study, with BPD being associated, both dimensionally and categorically, with greater use of negative emotions and less use of positive emotions. However, the specificity to BPD of increased anger in the CAI is a novel finding and could have widespread implications for both research and clinical work with those meeting criteria for BPD as well as those experiencing sub-diagnostic levels of BPD symptoms.

Lexical similarities to Adult BPD

While there is only one study to date examining lexical characteristics in an interview about attachment in adult BPD, the present study allows for replication of the findings in adults and further supports the notion that there is no qualitative difference between Borderline Personality Disorder as experienced and presented in adolescents versus adults. In Carter & Gernyer's adult study (2012), by which the present study was inspired, similar significant differences were found in first-person plural pronouns, positive and general negative emotion words, anger words, and words related to death. However, unlike the present study, Carter & Grenyer's work only had a BPD group and a Healthy Control group, with 20 participants in each group. The present study builds on this literature by including a clinical control group, which allows for identification of any lexical characteristics that are specific to BPD and not to psychopathology in general. Of the nine lexical categories of interest, only one was found to be significantly different in the BPD group compared to both control groups: positive emotions.

While comparing adolescent and adult BPD was only a secondary goal of the present paper, due to the limited research that has been conducted in adults, the present study does indeed present support for the notion that, while there may be some quantitative differences between adult and adolescent BPD, such as in prevalence or remission rates, the phenomenology and even the subjective experience of the disorder, at least in terms of family relationships, may remain similar across the life course. Obviously, further research is needed in this domain, as such a widespread conclusion cannot be drawn from single studies in each population, but this study presents convincing evidence that more research is warranted.

Limitations

While this study does have several strengths, especially when compared to similar research in the literature, there are still a number of limitations that should be kept in mind when interpreting results and should inform future research in this area. First, one of the greatest weaknesses of the word-frequency approach to lexical analysis is the fact that it does not take into account the context in which these words are used. For instance, the sentence "I love my parents." would yield the same LIWC output no the inflection or true intention behind the words. Whether the sentence is uttered sincerely or sarcastically, the present methodology would not be able to take this difference into account as LIWC provides aggregate proportions of each lexical category throughout the analyzed text, with no attention to which words are closest to each other or any behavioral characteristics that may accompany their utterance.

Second, in the present study, important covariates were controlled for statistically using an ANCOVA framework. However, a more robust form of control would be matching participants across groups based on these variables. Within the clinical groups, it could also be beneficial to

match participants on other psychopathology, due to the common comorbidity between BPD and several other mood, anxiety, externalizing, and personality disorders. Additionally, a more comprehensive diagnostic measure for the healthy control group would be beneficial to control for psychopathology. However, due to the archival nature of the study, analyses were conducted on pre-collected data and new participants were not recruited. Additionally, as the healthy control group, which had the smallest participant pool from which to draw, was the final group added to the study, matching participants on age, gender, and parental education would have required excluding already cleaned transcripts from the analysis and redoing much of the work that had already been completed. Additionally, some important demographic variables were not included in the present analyses. While parental education was included as a proxy for family SES, the race and/or ethnicity of the participants were not taken into account. While LIWC dictionaries have been developed in several different languages (Japanese: Shibata et al., 2016; Spanish: Ramirez-Esparza, et al., 2007; etc.), minimal work has been done examining differences by race or ethnicity in US samples, and it is entirely possible that the default LIWC dictionaries are not adequately representative of a multi-ethnic lexicon.

Another limitation of the present study is the lack of more advanced statistical analyses that these results suggest would be necessary to achieve greater clarity in the covariance and interactions between study variables. As several significant ANCOVA findings also revealed significant effects of covariates and interactions between them, and there were several significant correlations between lexical categories and covariates, regression analyses would provide clearer information about the effects of each of these variables and interactions thereof on the use of these lexical categories. Similarly, as all of the presented significant correlations of the full sample did not always remain significant when examined within each group, there may be

moderation at work, in which the relationship between Borderline symptomatology and language is different at different levels of Borderline severity, or when other psychopathology is comorbid. Overall, many of the effect sizes of the present results were also small to moderate, with the correlation between anger words and borderline symptomatology (r=.310) being the highest. This would suggest that such relationships between one's lexicon and BPD symptoms would likely not be noticeable to human interviewers or coders, but are observable under close study of language, such as in the present study. Additionally, while many statisticians would recommend against reporting significant post hoc comparison tests given insignificant omnibus ANCOVA results, a simulation study conducted by Chen et al (2018) suggests that ignoring post-hocs after an insignificant can frequently lead to missed significant differences between subsets of study groups. Given that previous studies similar to the present study have included only two groups (e.g. Borderline and Healthy Controls in Carter & Grenyer, 2012), further examining individual between-group differences also allows for comparison to the existing literature.

Future Directions

   Sub-components of the CAI. The CAI is comprised of 19 questions probing multiple aspects of attachment relationships, including basic descriptions of the relationship, stories about discipline, vulnerability, and loss, and even questions about what qualities of the attachment figures a child would like to embody, or not, in adulthood. While the present study investigated the language used throughout the entire interview, it could be interesting to investigate language used in response to specific questions. For example, Borelli at al (2011) have investigated language use specifically in loss versus non-loss portions of the CAI, finding that, in children

classified as disorganized, discussions of loss were accompanied by a drop in verbal immediacy in comparison to those with organized classifications, potentially reflecting an attempt to verbally disconnect from the episode of loss. In a similar vein, future studies should investigate how language related to negative and positive emotions, as well as personal pronouns, may vary across components of the interview, or in discussions of separate attachment figures. While the present study reflects trends in language across the entire CAI, higher resolution investigations could shed more light upon the subjective experience of family and attachment in adolescents with BPD, insecure attachment, or other psychopathology.

Generalizability. While conducting the CAI with every adolescent client who presents for therapy services would certainly be daunting and add hours to already tightly packed intake assessments, future research should seek to test the generalizability of the present study's findings to less structured discussions of attachment relationships. While a full standardized interview would be unrealistic to conduct with every adolescent therapy client, discussions of the parent-child relationship are likely already covered extensively in intake procedures and therapy sessions throughout treatment. Thus, as shown in the present study, and in the wider lexical analysis literature, the language used in these discussions could be indicative of personality pathology, and could be used to prompt clinicians to conduct more thorough assessments for such pathology. While such applications would require much further research, the present study sets the stage for this ongoing thread.

Other language sources. One of the greatest strengths of lexical analysis methods is the sheer volume of potential sources of language for analysis. Whereas the present study has used spoken responses in a standardized interview, others have used written responses to simple broad prompts (e.g., Rude et al, 2004), written self-introductions (e.g., Robinson et al, 2013),

presidential speeches (Chung & Park, 2010), and even tweets (e.g., Coppersmith et al, 2014). While the possibilities are near endless, in the pursuit of gaining greater knowledge of adolescent BPD, there are several logical next steps from the present study.

While the present study used the CIBPD as the grouping variable, assigning participants to their respective groups based on meeting the categorical criteria for BPD (any five of the nine criteria as listed in Section II of the DSM-5), the language used in this diagnostic interview could prove useful not only in diagnosing Borderline Personality Disorder, but also in providing clearer differentiations between Borderline Personality Disorder and other mental disorders with similar symptoms. For example, the item on the CIBPD that probes for "Chronic feelings of emptiness" asks respondents if they have "felt empty a lot of the time", "had no feelings inside", or "that there was nothing inside." However, this could easily be describing the emotional aspects of a depressive episode. In fact, the DSM-5 lists emptiness as a possible subjective description of "Depressed mood most of the day, nearly every day.", the first symptom of Major Depressive Disorder (APA, 2013). While a clinician experienced in assessing for BPD may be able to differentiate between a positive response reflective of BPD and a positive response reflective of depression, lexical analysis of this specific item on the CIBPD, could provide specific lexical differences in the way these particular groups describe their respective emptiness.

The Parent Development Interview (PDI: Aber et al, 1985; PDI-R: Slade et al., 2003) is an interview analogous to the Child and Adult Attachment Interviews in that it assesses internal working models of relationships. However, the PDI differs in that it is an interview for parents to discuss their current relationships with their children and their personal growth as a parent and as a person through parenting. Using similar methodology to the present study, it would be interesting to investigate how parents' language in the PDI relates to both their own child's

language in the CAI and both parent- and child-report measures of Borderline symptoms. Such a

study could provide, in sense, a mirror image of the present study. The attachment relationship

is, by definition, not a "one-way street", and comprehensive studies of these relationships should

take both sides, as well as the interactive and dynamic effects between them, into account.

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Table 1

Descriptive Statistics for Demographic and Diagnostic Variables

Group	BPD	Clinical Control	Healthy Control	Total Sample
N	103	107	91	301
Female Sex N(%)	88 (85.4)	63 (58.9)	66 (72.5)	217 (72.1)
Years of age M(SD)	15.24 (1.50)	15.27 (1.41)	15.27 (1.18)	15.26 (1.38)
BPFSC Total M(SD)	79.40 (12.17)	65.29 (13.05)	51.60 (13.53)	66.44 (16.93)

Table 2
Parental Education Frequencies

Education Level	BPD N (%)	Clinical Control N (%)	Healthy Control N (%)	Total Sample N (%)
1. Some High School	0 (0.0)	1 (0.9)	5 (5.5)	6 (2.0)
2. High School Diploma/GED	1 (1.0)	2 (1.9)	11 (12.1)	14 (4.6)
3. Some College	18 (17.5)	7 (6.5)	14 (15.4)	39 (12.7)
4. Associate's/Bachelor's Degree	40 (38.8)	36 (33.6)	32 (35.2)	108 (35.3)
5. Master's Degree	17 (16.5)	18 (16.8)	16 (20.9)	51 (16.7)
6. Doctorate/Professional Degree	7 (6.8)	8 (7.5)	3 (6.6)	18 (5.9)
Mean (SD)	4.13 (.89)	4.67 (1.17)	3.64 (1.23)	4.01 (1.08)
Missing Education Data	20 (19.4)	35 (32.7)	10 (11.0)	65 (21.6)

Table 3
Descriptive Statistics for Lexical Categories of Interest

Lexical Category	BPD M (SD)	Clinical Control M (SD)	Healthy Control M (SD)	Total Sample M (SD)
Total Word Count	3944 (2455.79)	3579.38 (1785.48)	3315.99 (1550.60)	3624.77 (1990.73)
First-person sing pron	10.62 (1.17)	10.45 (1.40)	10.02 (1.44)	10.38 (1.36)
First-person plur pron	0.96 (.47)	1.02 (.46)	1.16 (.60)	1.04 (.52)
Positive Emotions	3.01 (.76)	3.35 (.93)	3.64 (.91)	3.32 (.90)
Anxiety	0.61 (.34)	0.57 (.35)	0.35 (.19)	0.52 (.32)
Anger	1.16 (.50)	1.07 (.51)	0.62 (.30)	0.96 (.51)
Sadness	0.65 (.32)	0.60 (.31)	0.44 (.24)	0.57 (.30)
Insight	3.30 (.95)	3.34 (1.06)	3.12 (1.04)	3.26 (1.02)
Death	0.16 (.12)	0.16 (.13)	.09 (.09)	0.14 (.12)

Table 4

Inter-correlations Between Lexical Categories of Interest

	1	2	3	4	5	6	7	8	9
1. WC	1								
2. I	-.132*	1							
3. we	-0.069	-.369**	1						
4. posemo	-.298**	-0.038	.136*	1					
5. anxiety	-.164**	0.067	-.181**	-0.086	1				
6. anger	-0.027	.241**	-.143*	-.235**	.196**	1			
7. sadness	-.117*	.208**	-0.084	0.044	.245**	.157**	1		
8. insight	.136*	.286**	-.223**	-0.085	0.073	-0.021	-0.013	1	
9. death	0.071	0.077	-0.010	-.161**	0.049	.151**	.270**	-0.009	1

posemo = positive emotion words
* correlation is significant at the .05 level (2-tailed)
** correlation is significant at the .01 level (2-tailed)

Figure 1
First-person Singular Pronouns by Group
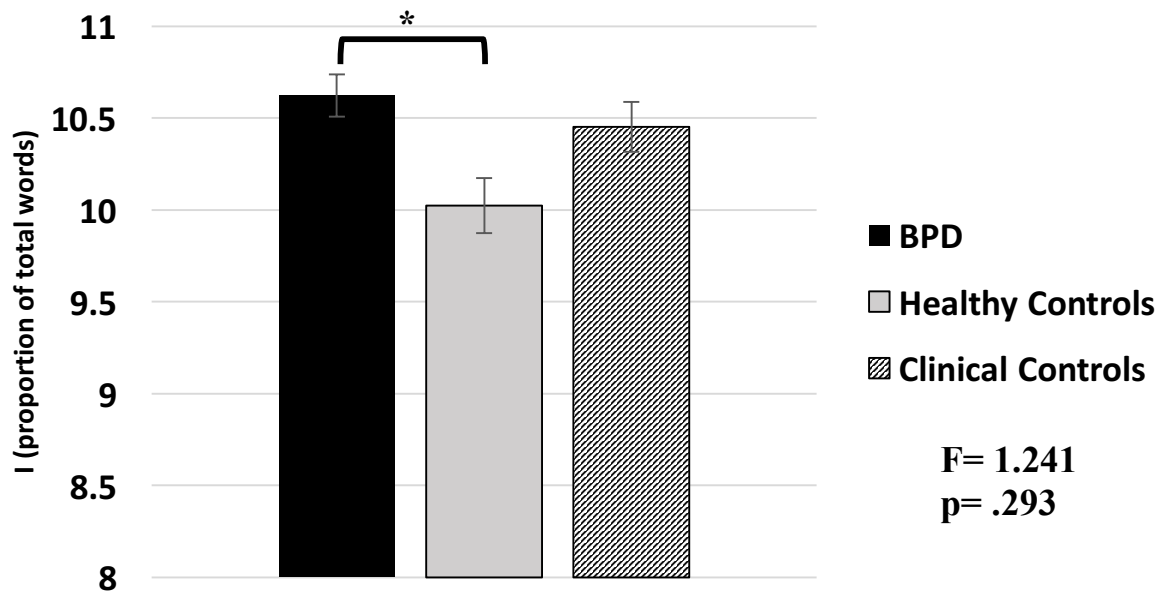
* Difference is significant at .05-level

Figure 2
First-person Plural Pronouns by Group
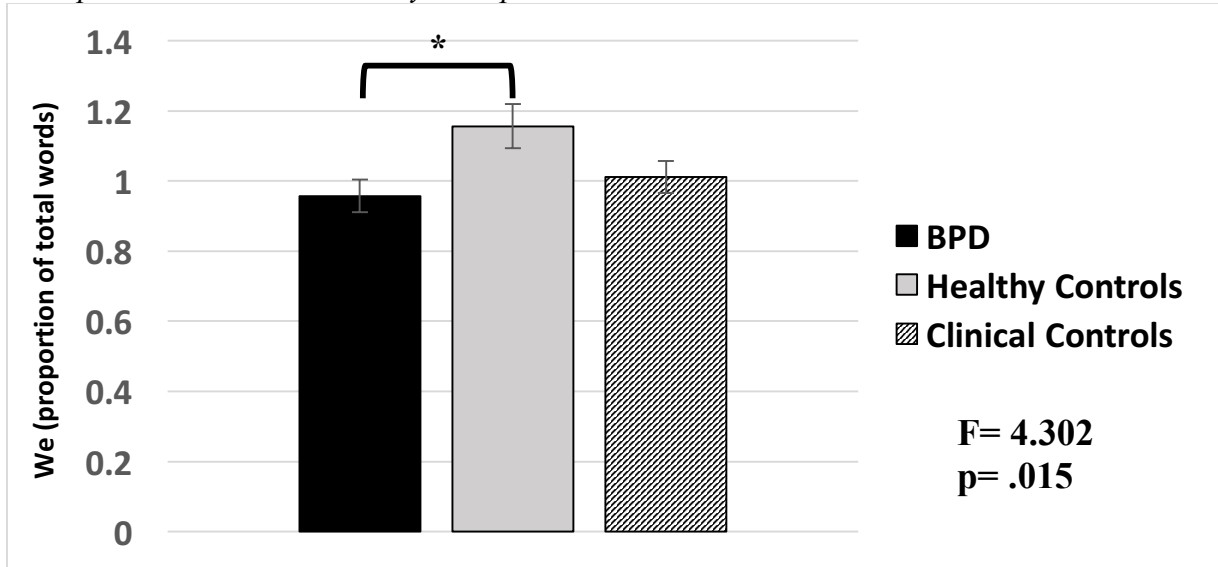
* Difference is significant at the .05-level

Figure 3
Positive Emotion Words by Group
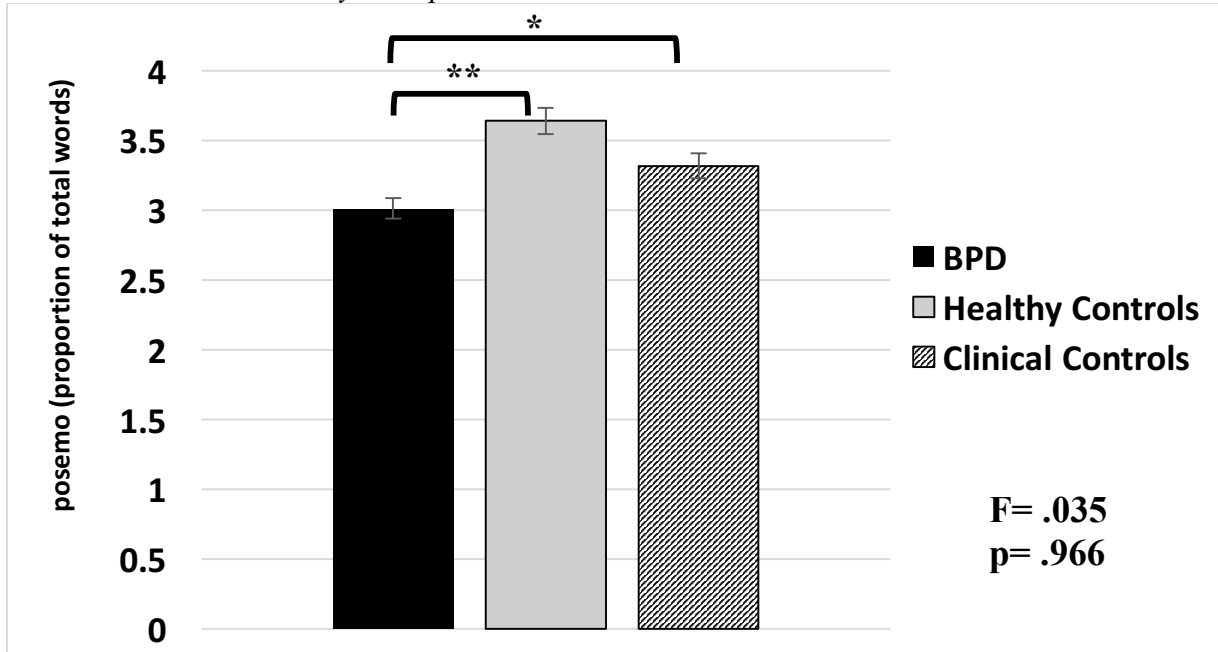
Note: posemo= positive emotion words
* Difference is significant at .005-level
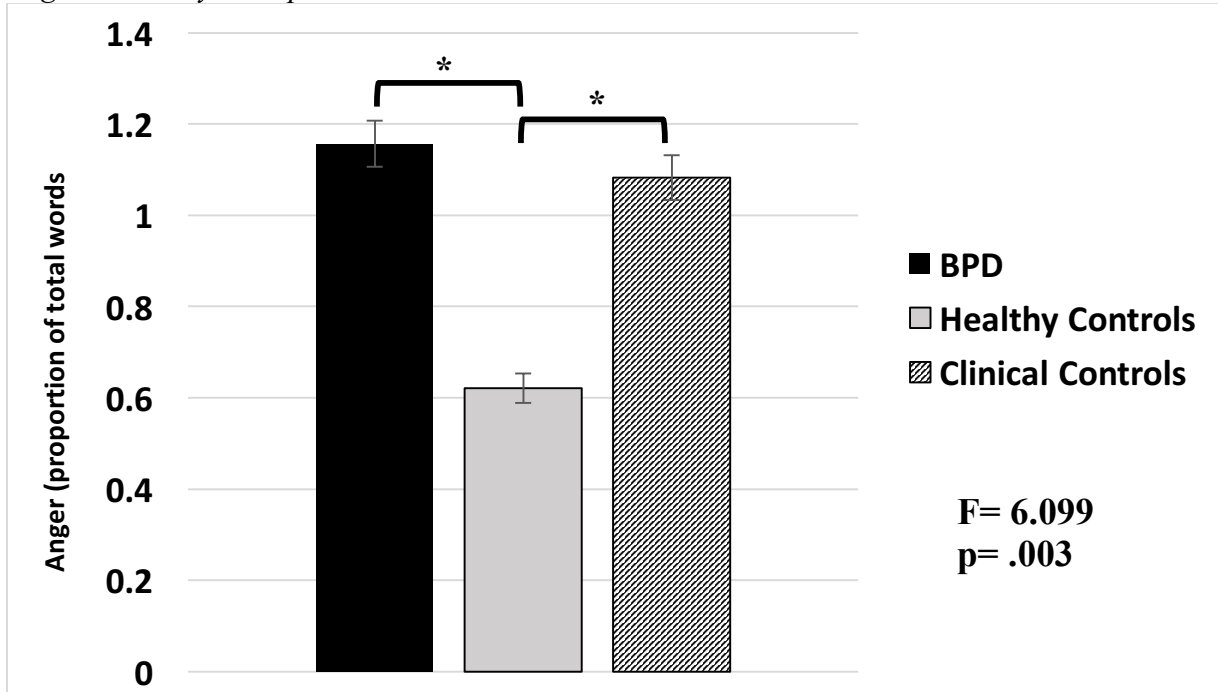** Difference is significant at .001-level

Figure 4
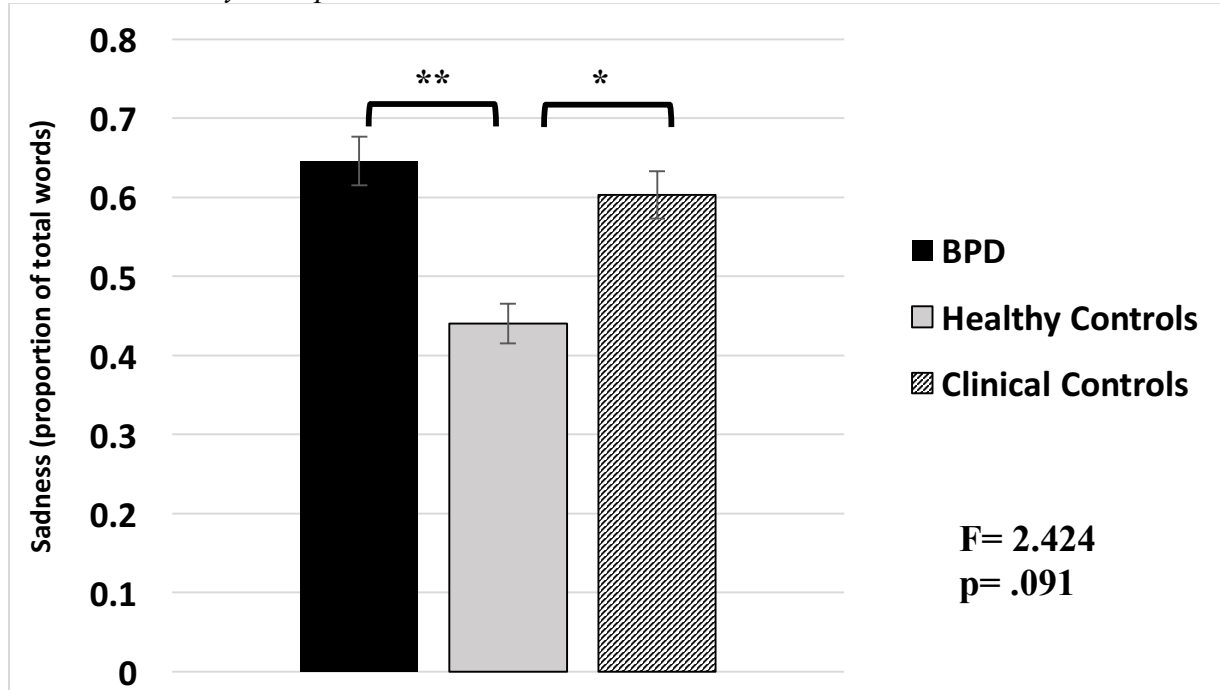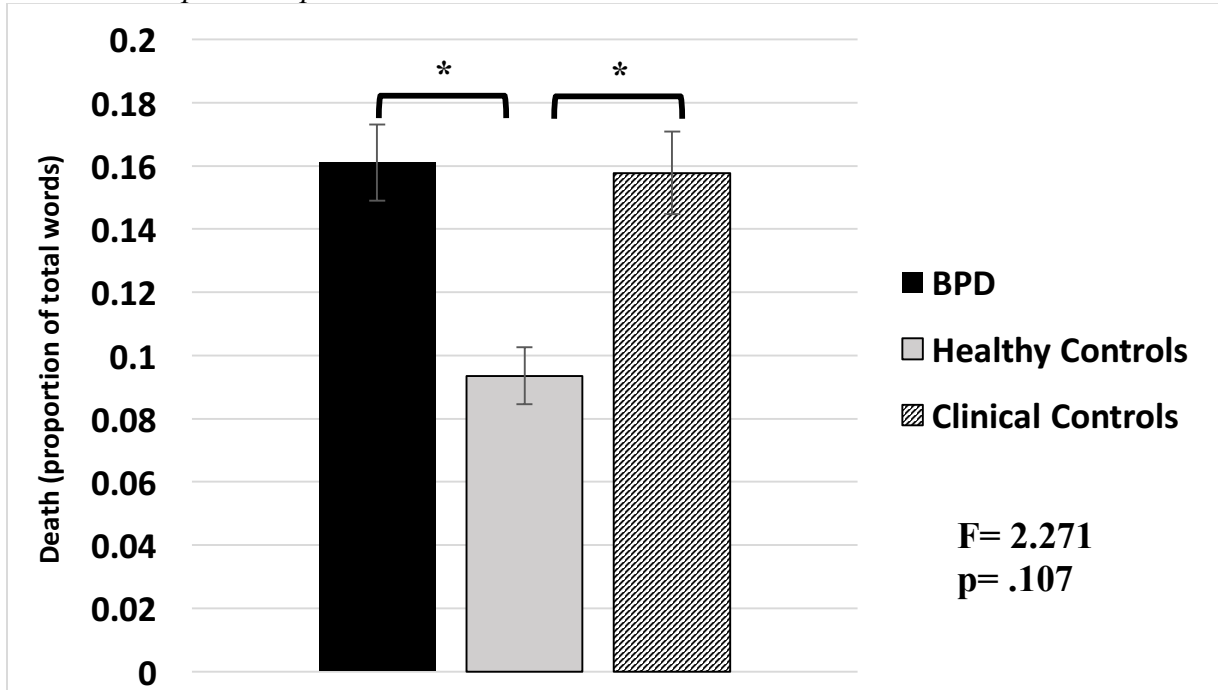*Anxiety Words by Group*
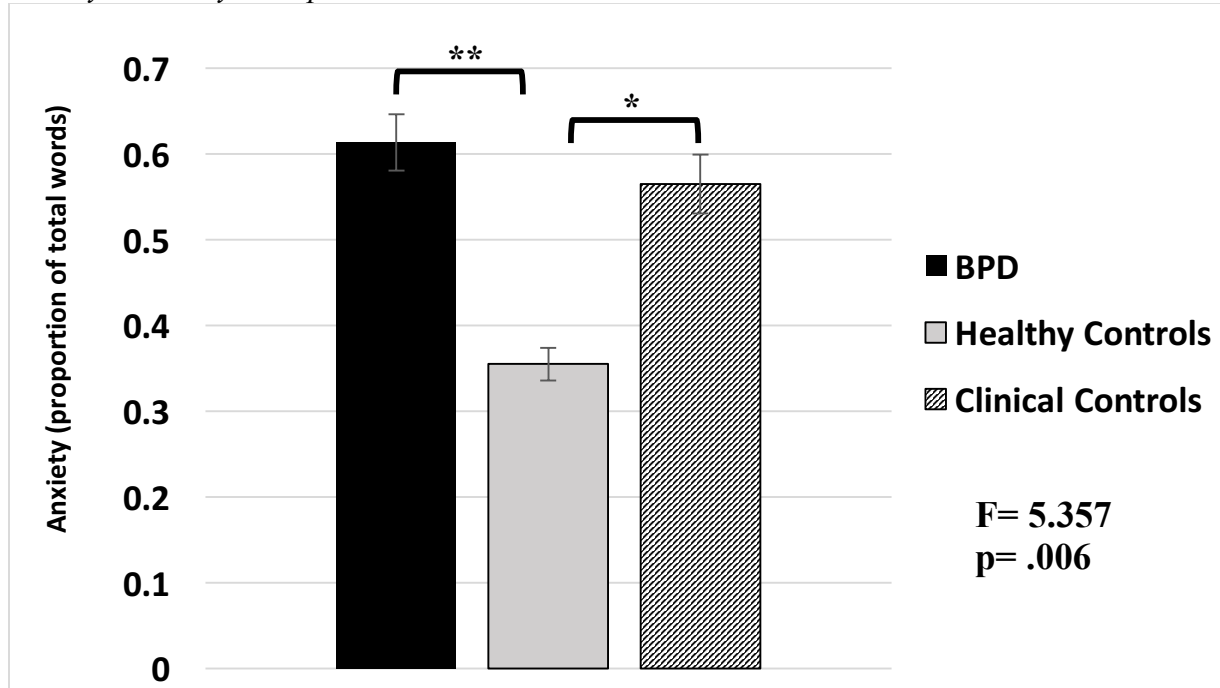
* Difference is significant at .005-level
** Difference is significant at .001-level

Figure 5
Anger Words by Group

* Difference is significant at .001-level

Figure 6
Sadness Words by Group

* Difference is significant at .01-level
** Difference is significant at .001-level

Figure 7
Death Words per Group

* Difference is significant at the .005-level

Table 5

Correlations between lexical categories and covariates

	WC	I	we	posemo	anxiety	anger	sadness	insight	death
Gender	-0.089	-0.037	-0.036	0.042	-0.028	0.116*	-0.065	0.032	-0.011
Age	.171**	-0.073	-0.039	-.189***	0.029	-0.106	-.150**	.149**	-0.088
Parental Education	-0.039	-0.088	-0.162*	.153*	0.108	-0.027	0.138*	0.062	0.055

Note: posemo = positive emotions

* Correlation is significant at the .05-level

** Correlation is significant at the .01-level

*** Correlation is significant at the .001-level

Table 6
Correlations between BPFSC Total Score and Lexical Categories of Interest

	WC	I	we	posemo	anxiety	anger	sadness	insight	death
BPFSC Total Score	.087	.215*	-.230*	-.299*	.297*	.312*	.256*	.021	.246*

Note: posemo = positive emotion words
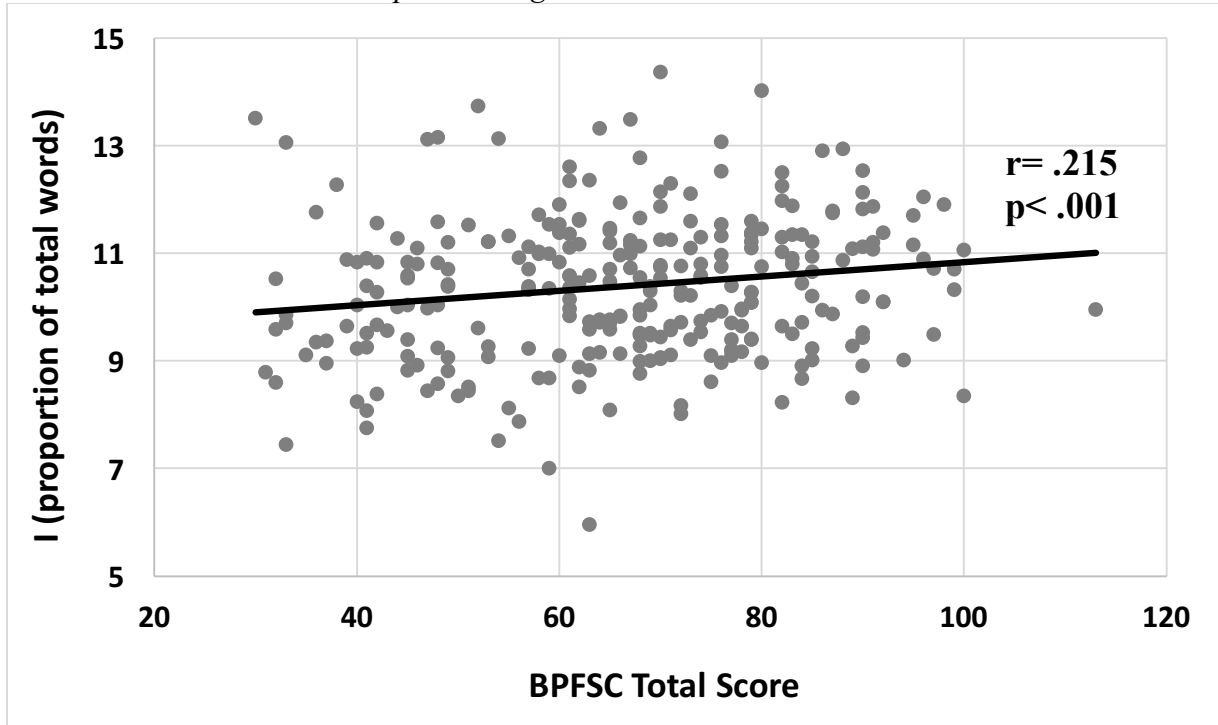* Correlations are significant at .001-level

Figure 8
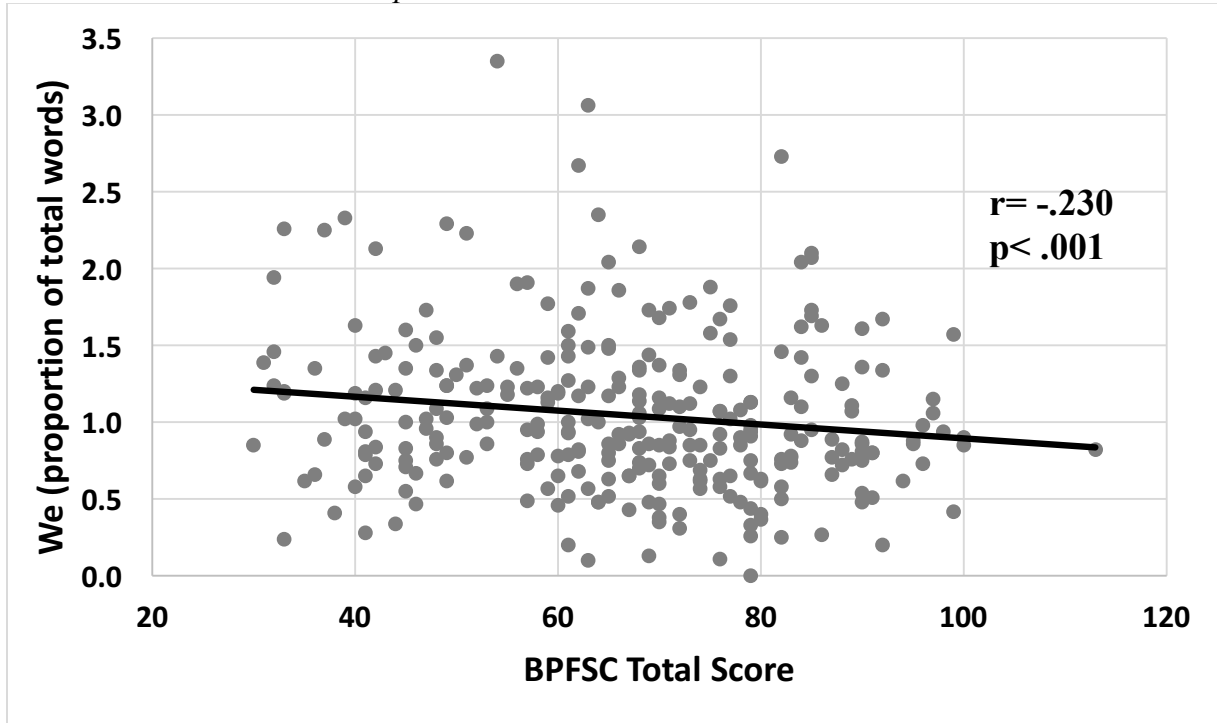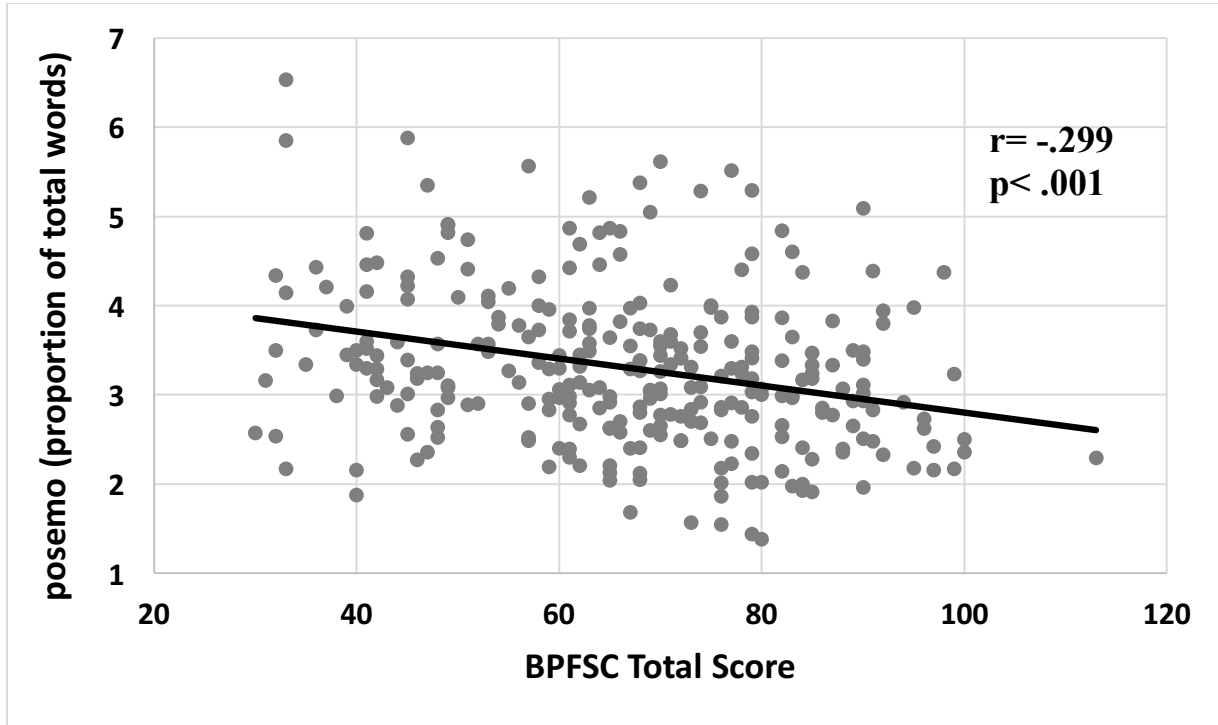*BPFSC Total Score and First-person Singular Pronouns*

Figure 9
BPFSC Total Score and First-person Plural Pronouns

Figure 10
BPFSC Total Score and Positive Emotion Words

Note: posemo = positive emotion words
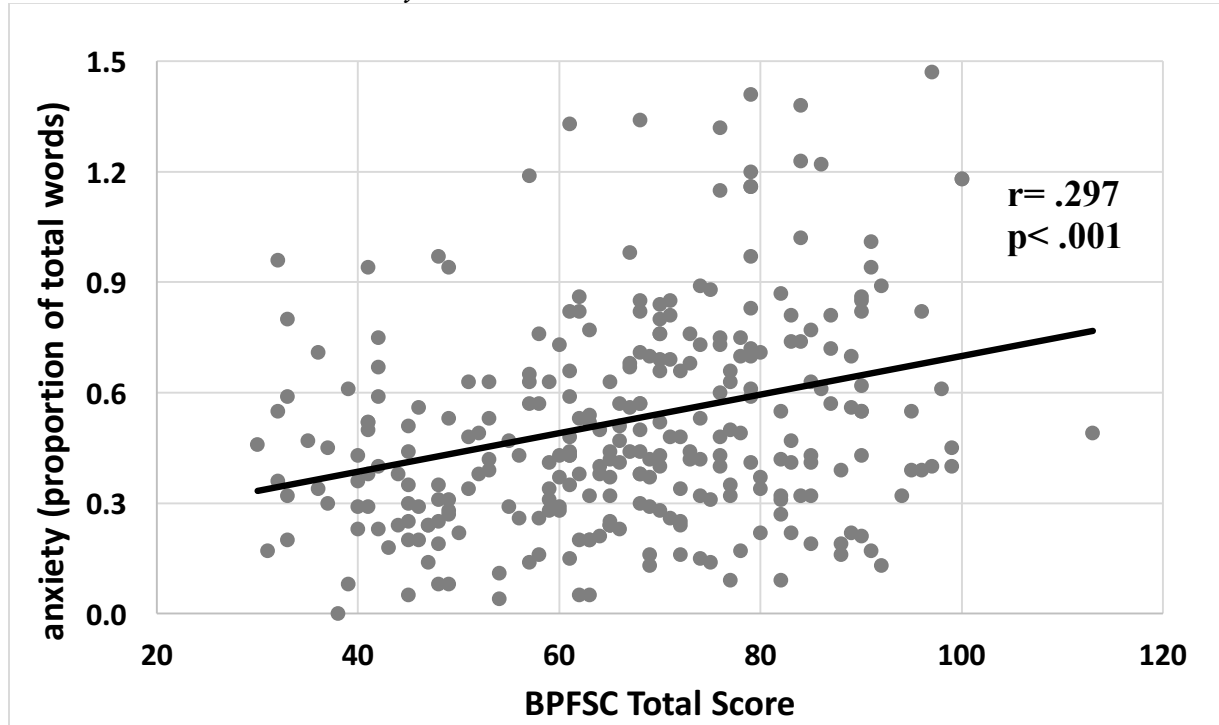
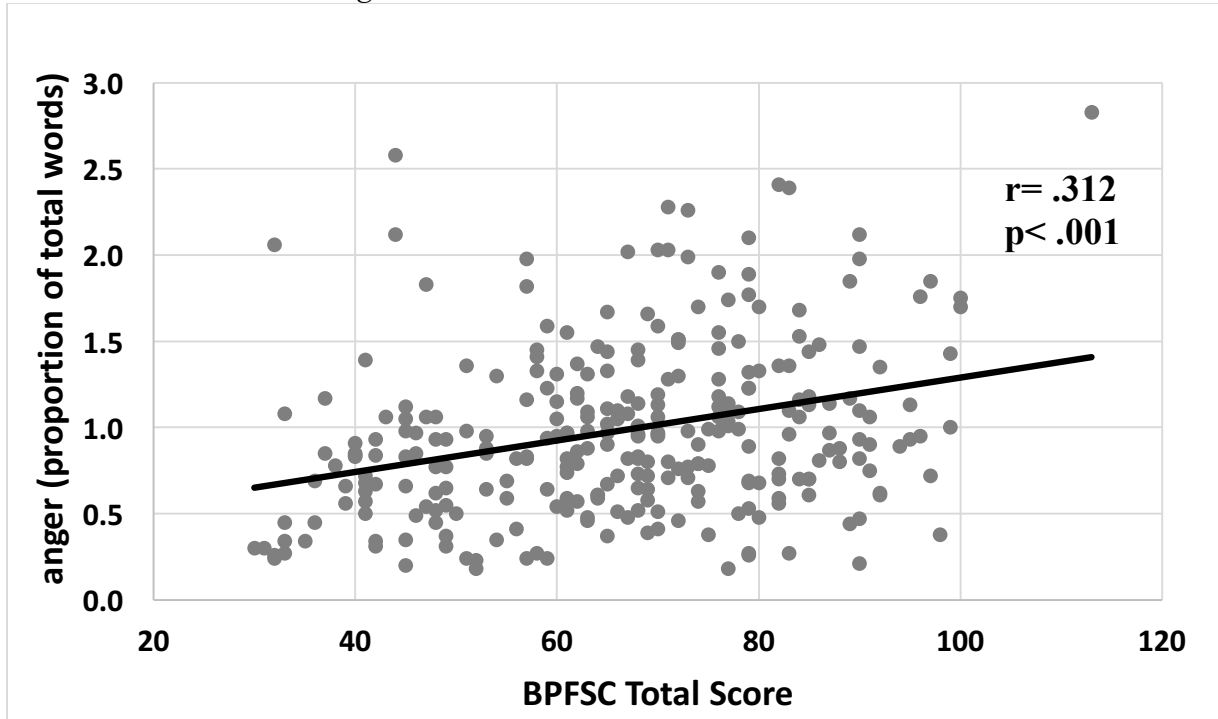Figure 11
BPFSC Total Score and Anxiety Words

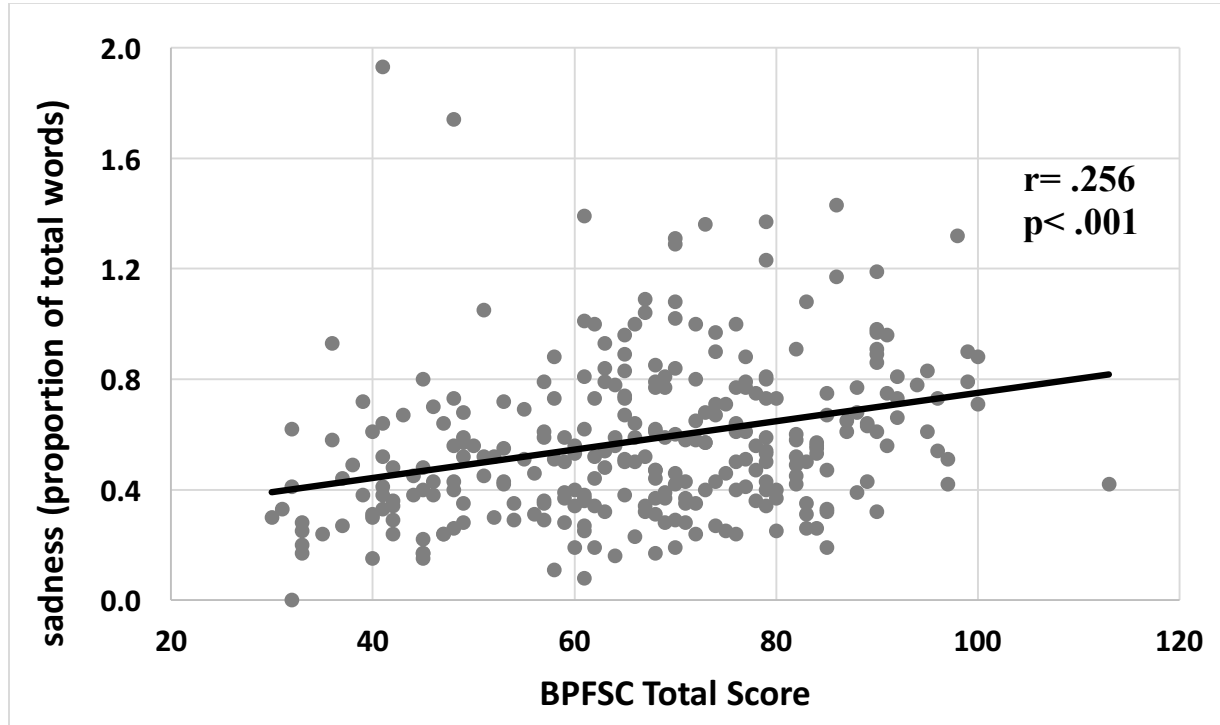Figure 12
BPFSC Total Score and Anger Words
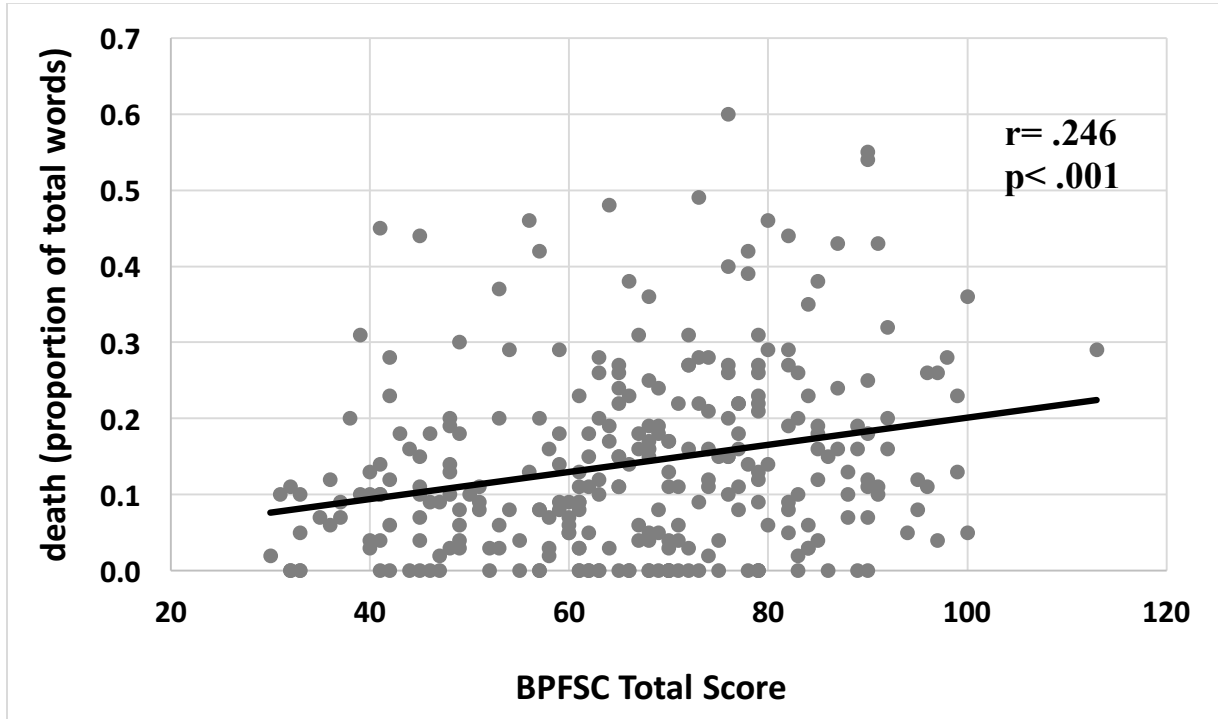
Figure 13
BPFSC Total Score and Sadness Words

Figure 14
BPFSC Total Score and Death Words

Table 7
Descriptive Statistics for YSR Total Behavior Problems Score

Group	BPD	Clinical Control	Healthy Control	Total Sample
YSR Total Behavior Problems Score M (SD)	93.39 (25.26)	66.55 (27.05)	34.26 (21.95)	65.79 (34.44)

Table 8
Effects of Group and Covariates on Word Use, Controlling for Psychopathology

| | Effect of Group | | Significant Covariate Effects | | |
	F	p	Covariate(s)	F	p
WC	1.148	0.426	-	-	-
I	0.204	0.826	-	-	-
we	5.109	0.108	Gender	11.995*	<.05
posemo	2.921	0.198	-	-	-
anxiety	12.544*	0.035	-	-	-
anger	2.55	0.225	-	-	-
sadness	16.129*	0.025	-	-	-
insight	1.132	0.430	-	-	-
death	0.945	0.480	-	-	-

Note: posemo = positive emotion words
* Effect is significant at .05-level

Table 9

Correlations between YSR Total Behavior Problems and Lexical Categories of Interest

	WC	I	we	posemo	anxiety	anger	sadness	insight	death
YSR Total Behavior Problems	0.138*	0.19**	-0.223**	-0.310	0.267**	0.310**	0.248**	0.042	0.248**

Note: posemo = positive emotion words
* Correlation is significant at .05-level
** Correlation is significant at .001-level