

LINGUISTIC MARKERS OF TRAUMA SYMPTOMS FOLLOWING SEXUAL ABUSE IN
FEMALE ADOLESCENT INPATIENTS

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ABSTRACT

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Sexual trauma is a widespread and serious issue in adolescent females.

Unfortunately, subsequent PTSD symptoms is a common consequence for individuals who experience this form of trauma. Additionally, inpatient adolescents report elevated rates of PTSD symptoms and sexual abuse has been found to be the largest contributor to trauma symptoms in adolescent inpatients. Therefore, female adolescent inpatients constitute a high risk population for sexual trauma and resulting trauma symptoms. More concerning are the limitations of current methods (e.g. self-report, clinical interview) in accurately measuring trauma symptoms. The aim of the current study is to use the computer program Linguistic Inquiry and Word Count (LIWC) to analyze trauma narratives of female adolescents in an inpatient facility and determine if specific linguistic markers are associated to an individual's current symptomology. Additionally, it will be determined if these linguistic markers can predict trauma symptom change from time of admission to time of discharge. Conducting a LIWC analysis will provide objective data about adolescent's language use that can aid in obtaining an accurate measure of inpatients trauma symptoms.

KEY WORDS: Linguistics, Trauma, Sexual abuse, Adolescent, Inpatient

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CHAPTER I

Trauma Exposure in Adolescence

A traumatic experience is characterized by actual or threatened death, serious injury, or sexual violence (APA, 2013). It can include direct exposure, witnessing the event, or hearing about this event happening to a loved one. Trauma early in life is a serious and widespread problem (Finkelhor, Turner, Shattuck, Hamby, & Kracke, 2015) such that The Office of Juvenile Justice and Delinquency Prevention estimates that about 60 percent of children, ages 1 month to 17 years, experience an event that would qualify as traumatic (Finkelhor et al., 2015). While these estimates extend to children of all ages, adolescents make up a substantial portion of these victims. Indeed, it is estimated that adolescents, ages 12 to 17, make up almost 36% of these trauma exposures (U.S. Department of Health and Human Services, 2013). More specifically, six percent of these victimizations are sexual assault, with girls aged 14 to 17 being at the greatest risk for sexual assault and the lifetime sexual assault estimate for older adolescent girls stands at 17.4 % (Finkelhor et al., 2015). Estimates of sexual trauma are even higher in psychiatric inpatients, where 21.8% report exposure to sexual trauma (Jardin, Venta, Newlin, Ibarra, & Sharp, in press). In sum, many adolescents have been exposed to trauma, and for female adolescents, sexual trauma is particularly prevalent. With this in mind, the broad aim of the current study was to examine the linguistic properties of sexual trauma accounts from adolescent females undergoing inpatient psychiatric treatment, examining associations with their trauma symptomology and treatment response.

It is well documented that experiencing trauma in youth can lead both to internalizing and externalizing psychopathology (Beauchaine & Hinshaw, 2013; Cerezo-

Jimenez & Frias, 1994). Particularly concerning is the frequency with which Posttraumatic Stress Disorder (PTSD) symptoms affect victims of past sexual trauma. In fact, it is estimated that nearly three quarters of sexual abuse survivors experience PTSD symptoms and sexual abuse is hypothesized to be the largest preventable cause of psychopathology (Roesler, 2000). Broadly, PTSD is characterized by impairing trauma-related symptoms such as intrusive re-experiencing, avoidance of trauma related stimuli, increased psychological arousal, and mood-related changes, all resulting from exposure to a traumatic event and lasting for longer than a month (American Psychological Association, 2013). PTSD is particularly prevalent among inpatient adolescents, of whom 41.5% report clinically significant symptoms (Venta, Hatkevitch, Mellick, Vanwoerden, & Sharp, in press) and 32% meet criteria for current PTSD (Lipschitz, Winegar, Hartnick, Foote, & Southwick, 1999). In fact, sexual abuse was identified as the largest contributor (69%) to PTSD symptoms in inpatient adolescents by Lipschitz et al. (1999). Thus, PTSD symptoms are prevalent after sexual trauma in general, with particularly elevated rates among inpatient adolescents.

CHAPTER II

Challenges in Measuring Sexual Trauma

Against this background it is clear that sexual trauma among female adolescents is a great societal and mental health concern; however, there are currently numerous impediments to measuring sexual trauma and its effects on adolescents. Information regarding sexual trauma is typically gathered through self-report questionnaires or clinical interviews. Though self-report is a common method for gathering information about sexual trauma (Fricker & Smith, 2001), the accuracy of information gathered through this method can be called into question. Relying on respondents to provide accurate information is a major limitation of obtaining data through self-report in general, and it is particularly problematic when a respondent is reporting sensitive information in which repercussions could follow (Butcher, Kretschmar, Lin, Flannery, & Singer, 2014). In fact, a common reason individuals modify a report about their trauma symptoms is the perceived consequences of disclosing such information (Tourangeau & Yan, 2007; Hershkowitz, Lanes, & Lamb, 2007; Fricker & Smith, 2011). Because trauma is a sensitive topic, a victim's reporting of the resulting symptoms may be at risk for response bias, which can manifest as either minimizing socially undesirable behaviors or exaggerating behaviors that would be perceived as positive (Butcher et al., 2002; Paulhus, 2002). Specifically, a victim of sexual trauma might alter a report about subsequent trauma symptoms to avoid the emotional impact of the trauma or protect oneself from the repercussions of disclosing those symptoms; on the other hand, an individual also might exaggerate the severity of the symptoms to ensure removal from the abuser or to obtain services (Fricker & Smith, 2011). While many adult measures of

trauma symptomology have accompanying validity scales to identify systematic response biases, such scales are less common in child and adolescent measures. Moreover, the Trauma Symptom Checklist for Children—a measure in which response bias scales have been developed—has demonstrated inconsistent utility in detecting inaccurate responding (Butcher et al., 2014). In fact, when analyzing symptomology after sexual trauma in a clinical sample of adolescents, it was found that the measure did not adequately detect extreme scores that would suggest both minimization and exaggeration (Fricker & Smith, 2011). Ultimately, the accuracy of self-reports about trauma symptoms is contingent upon the victim's disclosure, which leaves the potential for response bias and inaccurate information.

Considering the challenges associated with self-report data, some clinicians advocate for clinical interviews with the rationale that a trained professional can ask appropriate questions and discern the symptoms the victim is experiencing. However, interviewing an adolescent about trauma symptoms not only takes the time of the victim but also consumes the clinician's time, resulting in a long and expensive process (Sisteré, Domènech Massons, Pérez, & Ascaso, 2014). Furthermore, not only does the actual interview take time but the training required to be competent in conducting such an interview can take two to three days (Shaffer, Fisher, Luca, Dulcan, & Schwab-Stone, 2000), limiting the number of clinicians and researchers able to conduct clinical interviews. Additionally, reluctance to discuss trauma symptoms impacts the information extracted by clinical interviews. This is particularly relevant in youth, who may not be willing to discuss their trauma symptoms (Sim et al., 2005). One reason for this is that victims may try to avoid recalling traumatic events, resulting in a reluctance to talk about

trauma at all (Walsh, Jamieson, Macmillan, & Trocme, 2004). As a clinician can only assess what a victim outwardly expresses, avoidance regarding trauma symptoms can present a serious limitation to clinical interviews. Thus, accuracy and honesty can be difficult to determine in these situations, and contribute to the challenge of obtaining an objective measure of trauma symptoms because of sexual abuse (Fricker & Smith, 2011). Consequently, even if the method of measuring sexual trauma symptoms is flawless, other challenges, such as a victim's willingness to discuss symptoms or the accuracy of those symptoms, prevent researchers and clinicians from gathering objective and in-depth data about trauma symptoms.

Furthermore, clinical interviews rely on an individual's clinical judgment, which is not only subjective but often inaccurate when assessing symptoms and assigning a diagnosis (Jenson & Weisz, 2002; Guy, 2008). In fact, Zimmerman and Mattia (1999) posit that when using clinical interviews, half of actual PTSD cases are missed. This concern is echoed by Fink and colleagues who suggest that there is inadequate psychometric support for clinical interviews assessing childhood trauma, such that studies often do not report reliability or validity data (Fink, Bernstein, Handelsman, Foote, & Lovejoy, 1995). More problematic is that agreement among evaluators is low when diagnosing disorders in which symptoms were not directly observable (Jenson & Weitsz, 2002), such as trauma symptoms. Reliability is also influenced by a clinician's subjectivity. For instance, a clinician's preconceived notions and biases have been found to affect clinical judgment (Garb, 2005), meaning that reasonable clinicians will disagree about the same case due to individual differences. Specifically, it has been demonstrated that an individual's preconceived attitudes about child sexual abuse can result in

differences between professionals' decision-making about sexual trauma (Everson & Sandoval, 2011). Moreover, expressions, other non-verbal cues, and race of the interviewer have been found to influence what information an individual who has experienced sexual trauma provides (Keenan, McGlinchey, Fairhurst, & Dillenburg, 2000; Springman, Wherry, & Notaro, 2006). Therefore, no matter how well trained or professional a clinician is, there are still individual characteristics about that clinician that will affect the information extracted and the consequent decision-making, compounding the cost, time, and personnel-intensive limitations of clinical interview methods.

It is clear, that self-reports and clinical interviews have limitations that impede the accurate measure of trauma symptoms, as they are both affected by subjectivity. Reluctance and partial disclosures by victims exacerbate the challenge of obtaining objective information about sexual trauma. Furthermore, these methods can only assess the content that is expressed by the individual, not any underlying cognitive processing. Indeed, both methods ultimately rely upon the self-reported content of the respondent, with no objective or observational data available. Being able to tap in to objective metrics of cognitive processing regarding trauma symptoms could give clinicians a more accurate understanding of the symptoms an individual is experiencing. Accordingly, researchers need to explore other methods for obtaining more in-depth information regarding an individual's psychological state and trauma symptoms, for instance, the way individuals talk about their trauma as a metric of symptom severity. A method that obtains objective information about trauma symptom severity, beyond what is being endorsed by the individual, is necessary.

CHAPTER III

Linguistic Inquiry and Word Count

Given the current challenges to measuring effects of sexual trauma, recent research has aimed to better understand how to assess symptom severity and treatment progress for those who experience early life trauma (Miller & Veltkamp, 1995; Butcher et al., 2014). Advances in technology have been a tremendous asset in combating some of the aforementioned methodological challenges in the assessment of trauma symptoms. Recently, the analysis of a victim's language has been used to evaluate symptomology and cognitive processing (Gray & Lombardo, 2001; Ng, Ahishakiye, Miller, & Meyerowitz, 2015). To date, the most common method of linguistic analysis is with the computer program Linguistic Inquiry and Word Count (LIWC; Pennebaker, Booth, & Francis, 2007). LIWC is a computer program that analyzes language by searching for and counting psychologically-relevant words across multiple text files (Tausczik & Pennebaker, 2010). LIWC analyzes every word in a narrative, determines if it is in the dictionary and then places the word into a category. For instance, the word "the" is determined to be in the dictionary, and is then categorized as an article, whereas the word "hurt" would be put in the category emotionality and then specified as a negative emotion word. LIWC is also able to produce objective characteristics of the narrative, such as word count, narrative length, and use of speech fillers (e.g., um, like, you know; Jaeger, Lindblom, Parker-Guilbert, & Zoellner, 2014). Thus, LIWC can evaluate a narrative and transform subjective content into objective data.

Prior trauma research using LIWC broadly indicates that LIWC can assess three cognitive processes: attentional focus, emotionality, and thinking styles. Attentional focus

measures an individual's priorities, intentions, and processing through analyzing pronoun use and verb tense (Tausczik & Pennebaker, 2010). For instance, an individual experiencing emotional pain is more likely to focus on himself and subsequently use first-person singular pronouns (Rude, Gortner, & Pennebaker, 2004). Furthermore, to gain a better understanding of how an individual is experiencing the world, emotionality is another variable that can be evaluated. This category analyzes the extent to which emotion (positive or negative) words are used, the valence of those emotion words, and how the emotion words are expressed (Tausczik & Pennebaker, 2010). Finally, thinking styles refer to language use that reflects how an individual is processing and interpreting information to make sense of the environment. Thinking style is evaluated by analyzing the conjunctions, nouns, verbs, and cognitive process words individuals use to connect thoughts (Tausczik & Pennebaker, 2010). These cognitive processes are assessed through LIWC identifying specific linguistic markers corresponding to 80 different categories; the categories used by LIWC range from simple (i.e., articles) to more complex (i.e., cognitive process words) and are reviewed in the following section. Overall, the goal of LIWC is to use objective linguistic data to glean information about an individual's cognitive processing, including attentional focus, emotionality, and thinking styles. Thus, LIWC evaluates language beyond the surface level content an individual is expressing and may provide more in-depth data on trauma symptoms and processing. While these are just a few of the many cognitive processes assessed by LIWC, they are particularly important to understanding the language use of an individual who has experienced trauma and have produced the most robust relations within post-trauma language use, as evidenced by the literature base reviewed in the next section.

CHAPTER IV

LIWC and PTSD

Accumulating research suggests that evaluating the linguistic markers of trauma narratives can provide important insight into a victim's psychological state and potentially predict later symptomology (Gray & Lombardo, 2001; Ng et al., 2015). Within the three broad cognitive processes mentioned (i.e., attentional focus, emotionality, and thinking style) specific linguistic markers have been determined to be associated with symptomology. Current literature focuses primarily on trauma narratives produced by adults and has found emotion words, pronoun use, and cognitive process words to be the strongest predictors of PTSD symptoms. Additionally, increased word count, increased use of somatosensory detail, and greater use of death and dying words have been shown to predict PTSD symptoms (Alvarez-Conrad, Zoellner, & Foa, 2001; Gray & Lombardo, 2001; Papini, Yoon, Rubin, Lopez-Castro, & Hien, 2015; Crespo & Fernández-Lansac, 2016). While there is literature documenting the link between greater use of death and dying words and increased PTSD symptom severity (Alvarez-Conrad et al., 2001), it is unlikely that this linguistic marker will be frequent in a narrative about sexual trauma. Therefore, it is beyond the scope of this study to discuss and analyze death and dying words. Thus, the current study analyzed the linguistic markers that are most common in the three broad categories relevant to trauma: (a) emotion words, (b) cognitive process words, (c) pronoun use, (d) somatosensory detail, as well as (e) word count to be related to symptomology (Eid, Johnsen, & Saus, 2005; Jaeger et al., 2014; Papini et al., 2015).

Emotion Words

Existing literature is mixed about the relation between PTSD symptoms and various emotion words, including general affect words, negative emotion words, and positive emotion words. Specifically, a recent meta-analysis conducted on 22 studies of trauma narratives since 2004, found that use of negative emotion words, but not general affect is related to increased PTSD symptoms (Crespo et al., 2016). However, in contrast with the Crespo et al., (2016) meta-analysis, an earlier meta-analysis revealed that affect words in general were prominent within narratives produced by individuals suffering from PTSD (O’Kearney & Perrott, 2006). Additionally, Eid et al. (2005) found that negative emotional expression present in trauma narratives is related to trauma-specific symptoms and psychological distress. This finding was also supported by Jaeger et al., (2014) who reported that in female assault survivors, increased use of both positive and negative emotion words was related to PTSD symptoms. However, in Jaeger et al.’s (2014) study, both negative and positive emotion words were related to lower PTSD re-experiencing symptoms. Therefore, there is evidence to support both positive and negative relations between use of emotion words (i.e., general affect, negative, and positive) in a trauma narrative and PTSD symptoms.

Cognitive Process Words

Numerous studies have also established an association between cognitive process words and PTSD symptoms. Cognitive process words are those that express causal and insightful thinking (e.g., Tausczik & Pennebaker, 2010). Overall, greater use of cognitive process words, like “think” and “hence,” is associated with lower PTSD symptoms (Alvarez-Conrad et al., 2001; Jaeger et al., 2014). Specifically, trauma narratives with

increased use of cognitive process words predicted lower PTSD symptoms (Jaeger et al., 2014). This result is echoed in trauma-exposed females who were currently being treated for PTSD, such that greater use of cognitive process words in their trauma narrative was associated with decreased symptom severity (Alvarez-Conrad et al., 2001). Furthermore, in trauma-exposed adults with a diagnosis of PTSD, cognitive flexibility, a construct closely related to cognitive process words, was negatively related to symptom severity (Papini, et al., 2015). This further supports the notion that the more often cognitive process words are used in a trauma narrative, the less severe manifesting PTSD symptoms are. In contrast, D'Andrea, Chiu, Casas, and Deldin (2012) reported that in undergraduate students, following September 11th, lasting PTSD symptoms, measured six months after the event, were predicted by greater use of cognitive process words in their narrative produced a week after the traumatic event. This finding is inconsistent with the rest of the literature on cognitive process words, which suggests that greater use of these words is associated with fewer PTSD symptoms. However, it is also the only study in a non-military sample to assess follow-up data on trauma symptoms, thus it is the only data that can provide insight into continuing trauma symptoms. While contradictory, these findings have important implications for linguistic analysis. By measuring linguistic markers and presenting symptoms immediately after a trauma exposure and then linking these variables with manifesting symptoms six months later, D'Andrea et al. (2012) suggest that perhaps linguistic markers can predict symptom change in the months following a traumatic event. Overall, the existing literature points to an association between cognitive process words and trauma symptoms, however, research suggests a negative relation between cognitive process words and trauma symptoms when the

constructs are measured simultaneously. Though, when assessing symptom change, it has been found that more cognitive process words predict lasting trauma symptoms. These findings contradict each other, warranting further research on the association between cognitive process words and trauma symptoms.

Pronoun Use

Empirical research also links pronoun use and PTSD symptomology. A pronoun is any word that substitutes as a replacement for a noun or noun phrase, such as “I,” “we,” or “who.” Findings from Jaeger et al. (2014) established that greater use of pronouns in general was related to increased trauma related guilt and dissociation. More specifically, research indicates that a diagnosis of PTSD is positively associated with third-person singular pronouns (i.e., he/she) but negatively related to third-person plural pronouns (i.e., they; Papini et al., 2015). The same study also reported a positive association between the severity of re-experiencing symptoms and singular pronouns in general. Likewise, lasting PTSD symptoms have been found to be related to greater use of first-person singular pronouns (e.g., I; D’Andrea et al., 2012). Consequently, the current literature demonstrates robust support for pronoun use, both first and third person, as linguistic markers of PTSD symptomology.

Somatosensory Detail

As previously mentioned, the meta-analysis on language use within trauma narratives determined that somatosensory details are often used in trauma narrative, however, it did not discern if use of these words were related to PTSD symptoms (Crespo et al., 2016). This assertion was echoed by Beaudreau (2007) in the comparison of neutral, positive, and trauma narratives produced by community dwelling adults. These

findings suggest that compared to other narratives, trauma narratives contain more somatosensory details, especially when the event occurred recently (Beaudreau, 2007). Again this reiterates that somatosensory details are common in trauma narratives but does not give an indication to the association with subsequent PTSD symptoms. The only evidence for a link between somatosensory detail and PTSD symptoms comes from an evaluation of trauma narratives produced about genocide and symptomology measured six years later (Ng et al., 2015). All sensory detail words were analyzed but only tactile details (e.g. feel, touch) were associated with a greater risk of PTSD avoidance six years later. Therefore, it is well established that somatosensory details are an important characteristic of trauma narratives. However, additional research is needed to determine if the presence of the details does in fact represent a relation with presenting PTSD symptoms.

Word Count

Both word count and narrative length appear in the literature and essentially measure the same element, how much an individual talks about the trauma. While these linguistic markers provide a fair amount of overlap, each appear individually within the literature, thus it is important to consider the evidence surrounding both constructs. However, the current study will simply refer to it as word count. Literature exists supporting the link between increased word count and narrative length with trauma symptoms but how this relation functions has yet to be determined. Firstly, it is important to mention that trauma narratives have been found to be lengthier than narratives on other topics (Crespo et al., 2016). Within trauma narratives though, the evidence is mixed. For example, one study examining community dwelling adults posited that longer trauma

narratives were associated with better psychological adjustment (Beaudreau, 2007).

Contrastingly, when comparing narratives of trauma exposed adults with and without subsequent PTSD, those in the PTSD group produced lengthier narratives. Notably, though, this difference in length between the two groups did not reach a level of significance, thus it can only be stated that there was a trend toward longer narratives in the PTSD group but they were not significantly different from those in the trauma-exposed no PTSD group (Gray & Lombardo, 2001). This trend is supported by Ng et al., who found that increased word count in narratives about genocide was associated with greater hyperarousal six years later. These findings lend support to the notion that longer narratives or those containing more words are related to later PTSD symptoms.

Conversely, word count was not found to be a significant marker in narratives of women being treated for PTSD, such that there was no relation between the two constructs (Alvarez-Conrad et al., 2001). These results lead to indeterminate conclusions about the link between narrative length/word count and trauma symptomology, making further exploration of the ability of these linguistic markers to predict PTSD symptoms and severity even more important.

In sum, LIWC analysis can provide important and objective insight into the psychological state of adult trauma victims. Specifically, (a) emotion words, (b) cognitive process words, (c) pronoun use, (d) somatosensory detail, and (e) word count have been identified as relevant linguistic markers of PTSD symptom severity in trauma narratives. Additionally, the previously mentioned study conducted by D'Andrea et al. (2012) on trauma narratives after 9/11 advocates that there is evidence that linguistic markers, specifically cognitive process words and first person pronouns, can also predict symptom

change in the months following trauma. While there are well-established links between linguistic markers in trauma narratives and PTSD symptomology, further research needs to be conducted to parse out the exact nature of these relations, as prior research has documented mixed findings.

CHAPTER V

LIWC and Youth Trauma Narratives

Accordingly, linguistic markers in trauma narratives also have been extended to children, although the literature base is indirect and considerably less developed, as only one study exists (Sim & Lamb, 2013). This study by Sim and colleagues (2013) analyzed 97 forensic interviews of alleged child sexual abuse victims and reported similar findings to those in adult trauma narratives. Evaluations of the narratives demonstrated that children used more negative emotion words when describing abuse by a family member (Sim & Lamb, 2013). It can be assumed that sexual abuse by a family member, as compared to any other individual, is more traumatic for a child, and accordingly, increased use of negative emotion words is consistent with the adult literature, which shows that increased trauma symptoms are associated with increased negative emotion word use. Moreover, fewer pronouns were used when children described less severe abuse, such as exposure to genitals, as compared to touching and penetration. Therefore, as would be expected based on the adult literature, with increased severity of abuse, more first-person singular pronouns were used in the narrative (Sim & Lamb, 2013). While notable similarities exist between the linguistic markers of these child narratives and the adult literature, it is important to recognize that the focus in this study was on motivation and deception in child disclosures so trauma symptoms were not assessed in these children, thus, links can only be made between the severity of the experienced trauma and linguistic markers. With this being the only study, it is uncertain whether relations between linguistic markers and trauma symptom severity identified in the adult literature also exist in children; further research is needed to clarify the association between trauma

symptoms and linguistic markers in youth.

There is a paucity of knowledge concerning if language use in trauma narratives is related to trauma symptomology in children, however, there is a complete absence of relevant literature in adolescents. Currently, no empirical research exists examining the relation between linguistic markers and trauma symptoms in adolescents. While it is necessary to bridge this gap for the sake of knowledge, it is even more important to understand this relation given the high levels of trauma exposure in adolescents (U.S. Department of Health and Human Services, 2013). Furthermore, it is important to note that linguistic markers identified in adults and children will not necessarily extend to adolescents because of the nature and complexity of language changes across development (Andersen, 2001). It has been found that in forensic interviews older children, age 10-12, provide longer and more detailed narratives of trauma than younger children, nine and under (Lamb, Sternberg, & Epslin, 2000). Thus, it can be assumed that this pattern would continue with adolescents, differentiating the nature of their language use from that of children or adults. Andersen (2001) emphasizes this notion by positing that experts and laypersons alike can detect the differences in language use by adolescents from that of adults.

CHAPTER VI

Current Study

In sum, early life trauma is widespread and affects a large number of adolescents but is particularly problematic in inpatient samples. More specifically, sexual trauma is a serious issue in female adolescents and can often result in PTSD symptoms.

Unfortunately, current methods pose several challenges to gaining accurate measures of trauma symptoms. These challenges are the potential for response bias in self-reports and the time consumption and innate subjectivity associated with clinical interviews. Due to these limitations, it has been difficult to obtain accurate, in-depth, and objective measures of sexual trauma and victim's symptoms following such events. However, recent advances in technology have assisted in producing objective measures of trauma symptoms, most commonly through linguistic analysis produced by LIWC. Using LIWC, linguistic markers relevant to trauma symptoms have been established, however, only for adults and further research is still warranted. Research has yet to address this association in adolescents, with no data in a group that is highly affected by sexual trauma— inpatient female adolescents. Given the high rates of trauma (Finklehorn et al., 2015), lack of research (Crespo et al., 2016), and seemingly unique language use of adolescents (Andersen, 2001), there is a great need to understand how adolescents talk about their trauma exposure and if it is related to their trauma symptoms.

Therefore, the broad aim of the current study was to use archival data to conduct a LIWC analysis of sexual trauma interview data among female inpatient adolescents, a question that has not been examined in the literature to date. Using the response to a question about sexual trauma, within the context of a larger interview, linguistic markers

were analyzed and compared to the adolescent's trauma symptomology assessed through interview and self-report methods. Specifically, we evaluated if relevant LIWC metrics were related to individuals' current trauma symptoms assessed via self-report, parent-report, and structured clinical interview. Based on the existing literature in adults, we expected use of (a) more emotion words (i.e., affect, positive, and negative), (b) fewer cognitive process words, (c) greater pronoun use (i.e., first and third person), (d) more somatosensory detail, and (e) greater word count to be associated with increased trauma symptoms.

A second aim of this study was to examine if LIWC metrics could predict trauma symptom change from time of admission to the inpatient facility, to time of discharge. Given that only one existing study with a non-military sample has examined the ability of trauma narratives to predict symptom change, in adults, from the time of the event to six months later (D'Andrea et al., 2012), predictions were constructed based on those findings. Thus, it was predicted that fewer cognitive process words and fewer first person pronouns at time of admission would be related to greater symptom change (i.e., decreased trauma symptoms) at time of discharge.

Gaining a better understanding of the association between female adolescent language use and symptomology has important implications for both treatment and assessment. LIWC can provide a source of objective data that can be integrated with measures of an adolescent's current symptoms, allowing for more accurate measurement. Accurate measurement is fundamental in developing an effective treatment plan (Ganellen, 2007), and thus, this data could be instrumental in providing individualized treatment. Furthermore, if LIWC can aid in predicting symptom change, it will further

enhance the efficiency of treatment. By being able to generally predict the progression of a client's symptom change early on, clinicians and therapists can collaborate proactively to customize treatment and strategize how to manage foreseeable challenges (Verlinden et al., 2015). Consequently, the extra layer of knowledge that LIWC analysis might provide clinicians and therapists would be invaluable, making the evaluation of its relation with adolescent trauma symptoms a necessity.

CHAPTER VII

Methods

Participants

Female participants were recruited from a local psychiatric inpatient facility. To ensure participant comprehension, those with intellectual disability and psychosis were excluded. Also, to ensure quality linguistic analysis, only those participants who endorsed a history of sexual trauma using greater than 50 words were included in this study.

Eighty-six participants met these inclusion criteria. One participant was excluded as she was a statistical outlier on the variable Pronoun Use, resulting in a final sample of 85 participants. Sample size varied by the measurement being used, such that for the YSR $n = 85$, CBCL $n = 82$, youth C-DISC $n = 78$, parent C-DISC $n = 80$, and for YSR at both admission and discharge $n = 65$, while CBCL at admission and discharge $n = 38$.

Participants ranged from 12 to 17 years of age ($M = 15.35$, $SD = 1.28$) and the racial breakdown was as follows: 75.3% Caucasian, 5.2% Asian, 5.2% African-American, and 14.3% Multiracial or other. 6.3% of respondents indicated Hispanic ethnicity (regardless of race).

Procedure

On the day of admission, adolescents and their families were approached for consent; parental consent was obtained first, followed by adolescent assent. All assessments were conducted within one week of the adolescent's admission to the treatment center and one week prior to discharge. Assessments were conducted by trained clinical research assistants or doctoral clinical psychology students, all in private and within the facility. On average, the length of stay for this sample was 36.00 days ($SD =$

12.74, Min = 13, Max = 85). During their stay, adolescents participated in a milieu-based treatment that aimed to improve the formation of close relationships and social cognitive capacity. Clinicians provided individualized attention focusing on resolving and processing the emotional and behavioral problems adolescents experienced throughout the day. The primary framework of the treatment is interpersonal-psychodynamic, however, it also integrates cognitive-behavioral and family systems based approaches (Sharp et al., 2009). All data used in this study was archival; IRB approval from the appropriate institutions was obtained at the time of data collection and analysis.

Measures

History of Sexual Trauma. The Child Attachment Interview (CAI; Target, Fonagy, Shmueli-Goetz, Datta & Schneider, 2007) was given upon admission to the facility. The CAI contains 17 questions designed to evaluate representation of attachment to the primary caregiver as well as self-representation. For the purposes of the current study, only one question from the interview was analyzed to assess history of sexual trauma. The specific item from the CAI reads as follows: “Have you ever been touched sexually by someone when you did not want them to do it?” Participants answered this item with either “yes” or “no.” If participants endorse “yes”, follow up questions, known as scaffolding in the CAI, are asked (Target et al., 2007). These prompts (e.g., “Who else was there?” “How did you feel?”) allow adolescents to expand and provide detail surrounding the incident without using leading questions. However, if the participant does not want to discuss the issue, the interviewer moves on to the next question. All interviews are videotaped and transcribed. Empirical data supports the validity of the CAI being used to assess inpatient adolescents (Venta, Shmueli-Goetz et al., 2014) as well as

younger clinical samples (Target et al., 2003; Shmueli-Goetz et al., 2008).

Posttraumatic Stress Disorder. The youth version of Computerized Diagnostic Interview Schedule for Children (C-DISC; Shaffer, Fisher, Lucas, Dulcan, & Schwab-Stone, 2000) also was given upon admission and used to assess posttraumatic stress symptoms. The C-DISC is a computerized, fully structured diagnostic interview used to assess children and adolescents and screen for over 30 diagnoses. This yielded both a dimensional and categorical diagnosis of PTSD. Categorical diagnosis is a three-category variable: negative, intermediate, and positive. All interviews were conducted by either doctoral clinical psychology students or trained clinical research assistants.

To supplement this categorical diagnostic variable, both self-report and parent report of PTSD symptoms were obtained through the Youth Self Report and Child Behavior Checklist (YSR; CBCL; Achenbach & Rescorla, 2001), which yield dimensional T-score ratings of PTSD symptoms. Both the YSR and CBCL were conducted at admission and discharge and are appropriate to use on adolescents, age 12 to 17, and their parents. They each contain 112 problem items of which 13 comprise the PTSD scale. Examples of such items are “I have nightmares” and “I am too fearful or anxious.” They are scored using a 3-point rating scale, from 0 to 2 (0 = not true, 1 = somewhat or sometimes true, or 2 = very or often true). T-scores of 70 or greater are considered clinically significant. Both measures demonstrate adequate psychometric properties in adolescent and clinical samples (Gomez, Vance, & Gomez, 2014). Note that scale reliability was not computed because the YSR and CBCL were administered and scored electronically and, thus, item-level data was not included in the archival dataset.

Objective Language Analysis. To evaluate how participants responded to a

question about sexual abuse, a content-analysis computer program, Linguistic Inquiry and Word Count (LIWC), was used. The LIWC program analyzes the transcribed text from the CAI interview and computes the total percentage of words in each linguistic category. These percentages are then converted to 100-point scales along a 0-100 dimension based upon “research based composites” (Pennebaker Conglomerates Incorporated, 2015). Linguistic markers used for the current project are (a) emotion words (specifically subcategory scores for negative emotion, affect, and positive emotion words), (b) cognitive process words total score (and the subcategory of insight), (c) pronoun use total score (and the subcategories of first person and third person singular pronouns), (d) somatosensory detail (and the subcategory of body words), and (e) word count.

CHAPTER VIII

Data Analytic Plan

First, we evaluated if LIWC metrics were related to individuals' current trauma symptoms assessed via self-report, parent-report, and structured clinical interview data. To this end, we created a correlation table with the aforementioned LIWC dimensional ratings. We also conducted an ANOVA to identify significant group difference in LIWC metrics between C-DISC diagnostic groups (i.e., negative, intermediate, and positive).

The second aim of the study was to examine if LIWC metrics could predict trauma symptom change from time of admission to the inpatient facility to time of discharge. The YSR and CBCL were administered at admission and discharge. Repeated Measures General Linear Model framework was used to test the hypothesis that LIWC metrics significantly predict symptom change. Two separate models were tested. In the first model, YSR PTSD dimensional scores from admission and discharge served as repeated measures of Time as a within-subjects variable. LIWC metrics were included as covariates. We expected a main effect of Time (i.e., symptoms decrease from admission to discharge) as well as interactions between Time and two LIWC metrics identified in prior research: cognitive process words and first person pronouns at time of admission. Second, this model was run using CBCL PTSD dimensional scores to evaluate the same hypotheses from a parent-report perspective.

CHAPTER IX

Results

Bivariate correlations between the Youth Self Report (YSR), Child Behavior Checklist (CBCL), LIWC metrics, and age are presented below in Table 1. While correlations with the YSR did not indicate a significant relation with either cognitive process words or somatosensory detail in general, subcategories of each (i.e., insight and body words) were significantly correlated with the YSR. Indeed, correlations with the YSR indicated a positive relation with body words but a negative relation with insight. Additionally, a positive relation between the CBCL and word count was noted. No evidence of a significant relation between emotion words or pronoun use with either measure was noted. Furthermore, it is important to note that age was positively related to both cognitive process words and insight.

Table 1

Correlations between LIWC metrics, trauma measures, and age

Measure	YSR	CBCL	Age
Negative emotion	.012	.034	.121
Affect	-.068	.024	.161
Positive emotion	-.136	-.005	.069
Cognitive process	-.173	-.101	.231*
Insight	-.259*	-.098	.244*

continued

Measure	YSR	CBCL	Age
Pronoun Use	-.007	-.014	-.028
I	-.088	-.159	.131
We	-.128	-.156	-.155
He/She	.153	-.112	-.104
Somatosensory Detail	.153	-.012	-.057
Body words	.279**	.029	-.206
Word Count	.006	.230*	.168

Note. Sample size differs based on YSR ($n = 85$) and CBCL ($n = 82$). ** $p < .01$, * $p < .05$

Relations between parent and youth C-DISC categorical data and emotion words, pronoun use, cognitive process words, word count, and somatosensory detail were analyzed using Analyses of Variance (ANOVA). Regarding the youth C-DISC data, evidence of significant group differences in pronoun use, $F(2, 76) = 3.96$, $p = .023$, were noted across the different PTSD diagnoses (i.e., negative, intermediate, positive). Post hoc analyses, using Tukey HSD test (Levene's Test of Homogeneity of Variance verified that variance was equal across these PTSD groups, $p = .505$), were conducted to further examine this result and indicated that individuals with a positive diagnosis of PTSD ($M = 25.85$, $SD = 2.31$) used significantly more pronouns when discussing their trauma than those without a diagnosis of PTSD ($M = 24.02$, $SD = 2.54$, $p = .047$). However, the

intermediate diagnosis group ($M = 25.64$, $SD = 3.06$) was not significantly different from the positive diagnosis group ($p = .962$) or the negative diagnosis group ($p = .061$).

However, there were no differences in the specific types of pronoun use across diagnostic groups pronoun use- I, $F(2,76) = 1.13$, $p = .330$, pronoun use- We, $F(2,76) = .87$, $p = .424$, pronoun use- He/She, $F(2,76) = 1.15$, $p = .324$. No evidence of differences across PTSD groups was found for negative emotion words, $F(2, 76) = .95$, $p = .393$, affect, $F(2,76) = 1.73$, $p = .184$, positive emotion words, $F(2,76) = 1.53$, $p = .223$, cognitive process words, $F(2, 76) = 2.50$, $p = .089$, insight, $F(2,76) = 1.55$, $p = .218$, somatosensory detail, $F(2,76) = .53$, $p = .590$, body words, $F(2,76) = 2.60$, $p = .081$, or word count, $F(2,76) = .95$, $p = .393$, assessed by youth C-DISC.

ANOVA results using parent C-DISC data demonstrated significant group differences for both affect, $F(2, 78) = 4.24$, $p = .018$, and positive emotion words, $F(2,78) = 3.76$, $p = .028$, suggesting there was a difference in the number of affect and positive emotion words across the different diagnostic classifications. Again, Tukey HSD (Levene's Test of Homogeneity of Variance indicated that variance across PTSD groups was equal for both affect [$p = .113$] and positive emotion words [$p = .446$]) post hoc tests were conducted to further examine these results. Results indicated that adolescents with PTSD used more affect words ($M = 7.29$, $SD = 3.02$) than adolescents without PTSD ($M = 4.99$, $SD = 2.10$, $p = .015$). Again, there was no difference between adolescents with an intermediate diagnosis ($M = 5.69$, $SD = 1.58$) and a positive diagnosis ($p = .265$) or a negative diagnosis ($p = .607$). Similarly, adolescents with a positive PTSD diagnosis used more positive emotion words ($M = 3.12$, $SD = 1.43$) when talking about their trauma than those with a negative diagnosis ($M = 1.86$, $SD = 1.24$, $p = .020$). There was no difference

between adolescents with an intermediate diagnosis ($M = 2.01$, $SD = .940$) and a positive diagnosis ($p = .142$) or a negative diagnosis ($p = .932$). No evidence of significant differences emerged across PTSD groups for negative emotion, $F(2,78) = 1.04$, $p = .358$, cognitive process words, $F(2,78) = 1.18$, $p = .311$, insight, $F(2,78) = 3.08$, $p = .051$, pronoun use, $F(2,78) = 1.24$, $p = .295$, pronoun use- I, $F(2,78) = .643$, $p = .528$, pronoun use- We, $F(2,78) = 1.10$, $p = .338$, pronoun use- He/She, $F(2,78) = .033$, $p = .967$, somatosensory detail, $F(2,78) = .015$, $p = .985$, body words, $F(2,78) = 1.39$, $p = .256$, or word count, $F(2,78) = 1.31$, $p = .276$.

To analyze if relevant LIWC metrics predicted symptom change from time of admission to time of discharge a General Linear Model was conducted using cognitive process words and first person pronoun use as predictor variables. As bivariate correlations indicated a significant relation between LIWC metrics and age, age was included as a covariate. Using the YSR at admission and discharge as (repeated) the outcome variable, results indicated that there was a main effect of time, $F(1,65) = 10.19$, $p = .002$, suggesting that there was a significant reduction in adolescents' symptoms of PTSD, overall, from time of admission to time of discharge. Additionally, there was a significant time by cognitive process words interaction, $F(1,65) = 7.19$, $p = .009$. In order to graphically illustrate these results, adolescents were separated into dichotomous groups of low and high use of cognitive process words at time of admission (see Figure 1 below). The average score on cognitive process words ($M = 15.27$) was used to determine the cut off between low and high groups for illustrative purposes only (i.e., analyses treated cognitive process words continuously). Figure 1 shows that adolescents with low use of cognitive process words showed significantly more symptom reduction from

admission to discharge than did individuals with high use of cognitive process words at admission. Conversely, adolescents with higher use of cognitive process words experienced less symptom reduction. No evidence of significant interactions between time and either first person pronoun-I, $F(1,65) = .952, p = .33$, or first person pronoun-We, $F(1,65) = 2.48, p = .120$, was noted.

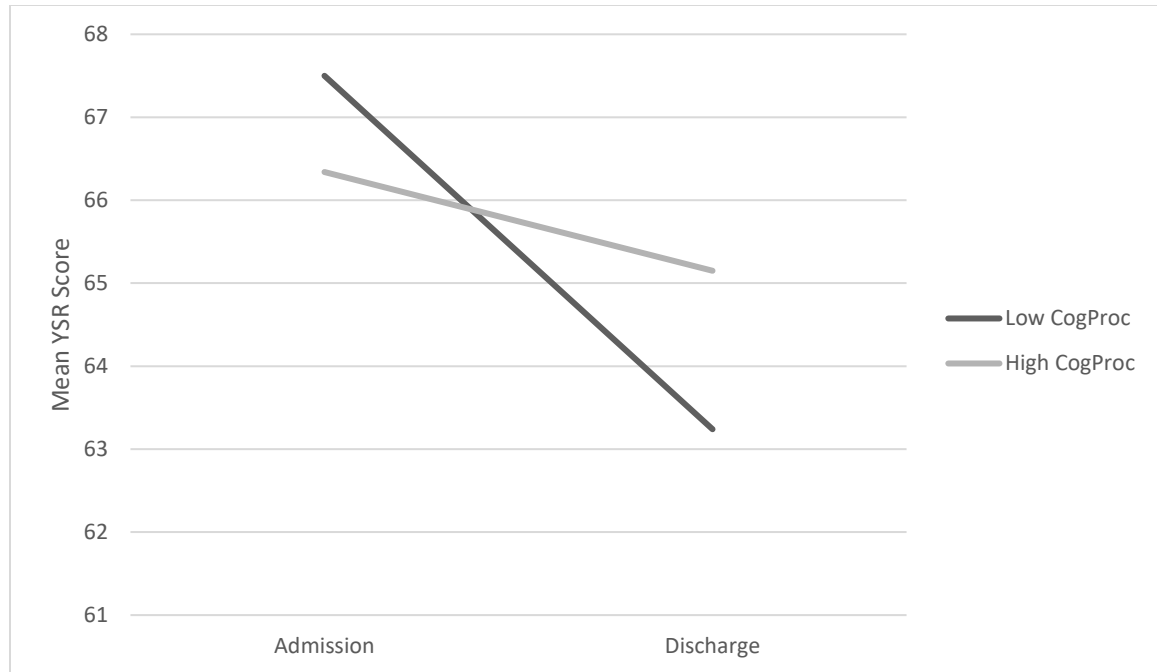


Figure 1. Mean score on the YSR at admission and discharge across groups.

When the model was run using the CBCL at admission and discharge (repeated) as the outcome variable, no evidence of a main effect of time, $F(1,38) = .042, p = .838$ was noted. Additionally, no significant interactions between time and LIWC metrics were detected: time x cognitive process word, $F(1,38) = .016, p = .901$, time x first person pronoun-I, $F(1,38) = .015, p = .904$, time x first person pronoun-We, $F(1,38) = 1.49, p = .230$.

CHAPTER X

Discussion

Overall the aim of the current study was to examine how linguistic markers in the trauma accounts of female adolescent inpatients, who endorsed experiencing sexual trauma, related to their self- and parent-reported PTSD symptomology. The first aim of the study was to examine if LIWC metrics that have been linked to PTSD symptoms in adults and children also proved a significant association with trauma symptoms in adolescents, a previously unexamined age group. Based on the literature in adults and children, it was predicted that greater use of emotion words, singular and third person pronouns, somatosensory detail, and word count, as well as fewer cognitive process words would be associated with increased trauma symptoms. Our results partially supported these hypotheses. Findings indicated that increased word count, greater use of body words (a subcategory of somatosensory detail), and fewer insight words (a subcategory of cognitive process words) were related to increased trauma symptoms, assessed by youth and parent self-report. Additionally, increased general pronoun use, affect, and positive emotion words were associated with a diagnosis of PTSD, assessed by youth and parent clinical interview.

Continuous PTSD Ratings

The fact that findings linked increased word count with greater trauma symptoms lends support to prior research which indicates that individuals with greater trauma symptoms use more words—regardless of word type—to talk about their trauma (Gray & Lombardo, 2001; Ng et al., 2015). However, it is unclear why individuals with greater symptomology produce longer narratives, as prior studies do not provide an explanation

(Ng et al., 2015) and it is counterintuitive to the conceptualization of PTSD, which states that individuals often have poor memories of their trauma, resulting in brief descriptions (Gray & Lombardo, 2001). Indeed, Gray and Lombardo (2001), who also found that increased word count was linked to greater symptomology expected decreased word count to be associated with greater symptomology since individuals with PTSD commonly have impoverished memories of their trauma, leading to brief descriptions of the event. Therefore, current findings, along with previous research provide evidence contradicting this conceptualization of PTSD, suggesting there may be an alternate mechanism influencing these results—such as hyperarousal when describing the traumatic event. Notably, the present study only identified a significant link between word count and PTSD symptoms based on parent report. One possible explanation is that those adolescents who talk more about their trauma in the interview also talk about it more in everyday life, thus their parents might interpret this as increased symptomology and accordingly report more severe symptoms. Moreover, all previous research on word count has relied on self-report data and has been inconsistent in their findings, with evidence for positive, negative, and no relations between word count and trauma symptoms. Consequently, the current study suggests that it may be beneficial to have a second perspective to help make sense of how word count is related to trauma symptomology, but further research is needed to clarify this postulation.

The current study also linked body words (e.g., ache, heart), a subcategory of somatosensory detail, positively to youth-reported trauma symptoms. In general, research on somatosensory detail has established that these types of words are common in trauma narratives and that greater use of sensory detail is linked to increased trauma

symptoms (Beaudreau, 2007; Greenhoot et al., 2013; Ng et al., 2015; Crespo et al., 2016). However, the current study found that only one aspect of somatosensory detail, body words, was linked to increased trauma symptoms. This finding is congruent with Beaudreau (2007) who determined that increased references to body states and symptoms in narratives were associated with PTSD symptoms as well as poorer adjustment. A similar pattern was found by Ng et al. (2015) such that, of all the sensory details words analyzed, only tactile details (e.g., feel, touch) were related to PTSD. The findings of the present study therefore bolster prior research linking somatosensory details to PTSD symptoms. One explanation for these findings is that sensory detail in trauma narratives bring about the intrusive, distressing memories typical in PTSD (Ehlers & Clark, 2000; Greenhoot et al., 2013). Thus, it may be that an adolescent uses sensory detail to describe their trauma because they are re-experiencing the event, to some extent, at that time. It has also been suggested that narratives dominated by sensory words rather than cognitive process words are associated with greater symptomology because the individual has been unable to make sense of the trauma, therefore using somatosensory details rather than causal and insight words to describe the event (Ehlers & Clark, 2000). This notion is further supported by the current study's findings on cognitive process words. Indeed, insight words, a subcategory of cognitive process words, were found to be negatively associated with youth-reported trauma symptoms—providing support for Ehlers and Clark's (2000) hypothesis. The current study only found insight words (not cognitive process words in general) to be negatively related to trauma symptoms, which may suggest that insight words are the most relevant component of cognitive process words to trauma symptoms because they indicate an understanding of *why* certain events took

place. In sum, current findings on body words and insight words complement each other and demonstrate that adolescents who are reporting more severe trauma symptoms are more likely to use somatosensory detail and fewer cognitive process words.

Notably, the current study did not find any association between self-reported or parent-reported trauma symptoms and emotion words or pronoun use, in contrast to expectations and prior research. However, both affect and positive emotion words were related to a diagnosis of PTSD, and thus, explanations for these results will be discussed in the following section.

Categorical PTSD Diagnosis

Categorical data, assessed by youth and parent clinical interview, allowed examination of LIWC metrics for individuals with negative, intermediate, and positive PTSD diagnoses on a structured interview. Overall, increased pronoun use, affect, and positive emotion words were associated with a diagnosis of PTSD. More specifically, adolescents with a positive diagnosis of PTSD demonstrated increased general pronoun use when talking about sexual trauma. These results are in line with previous research in adults that found greater use of pronouns to be associated with trauma-related symptoms of guilt and dissociation (Jaeger et al., 2014). However, unlike previous research the current findings did not identify additional relations based on the type of pronoun (e.g., singular, first person), whereas prior literature has linked pronoun use in general, as well as both first and third person singular pronoun use specifically, to increased trauma symptoms (D'Andrea et al., 2012; Papini et al., 2015). Overall results suggest that, similarly to adults, adolescents with greater trauma symptoms use more pronouns when talking about their trauma, but, in contrast to the adult literature, these findings do not

indicate that a specific type of pronoun use is related to adolescent symptomology.

Furthermore, greater use of affect words was linked to a diagnosis of PTSD. This directly contradicts what Crespo et al. (2016) found in his meta-analysis of trauma narratives but agrees with an earlier meta-analysis showing a wealth of emotion words in narratives produced by individuals suffering from PTSD (O’Kearney & Perrott, 2006). With conflicting prior research, it is difficult to make sense of these results in the broader context. Nevertheless, similar to the aforementioned results with somatosensory detail, an affect-laden narrative is consistent with the cognitive model of PTSD (Ehlers & Clark, 2000), such that individuals who have not processed their trauma are more likely to use affect words, typically negative emotion words (Eid et al., 2005; Crespo et al., 2016) when describing the incident, rather than using cognitive words. However, in the current study, *positive* emotion words not *negative* emotion words were associated with increased trauma symptoms, such that adolescents with a positive diagnosis of PTSD used more positive emotion words when talking about their trauma. This contradicts prior research that indicates that use of positive emotion words is typically associated with better adjustment and fewer trauma symptoms (Greenhoot et al., 2014; Jaeger et al., 2014). Thus, it is unclear why the reverse showed up in the current study. As there is no previous research done in adolescents, there are limited resources from which to draw a conclusion.

One possible explanation is that the results are evidence of adolescents participating in positive impression management. Indeed, using positive emotion words may have been an attempt to convey to the interviewer that they were not distressed by the trauma—an attempt that was only undertaken by adolescents with significant trauma

symptoms. This paradoxical finding may be a unique adolescent experience; adolescents are more likely to engage in positive self-presentation (Hewitt et al., 2011) due to the concerns about social conformity and acceptance that dominate adolescence. It is likely that this notion is applicable to the current results, especially considering that interviews were conducted close to the day of admission, a time when adolescents might be motivated to present themselves in a positive light to reduce time spent in the hospital. It is also important to note that this relation was based on the parent diagnostic interview; it is possible that parents report higher trauma symptoms than the adolescent because they are the ones responsible for making the decision to put their child in an inpatient facility. Since they have made the decision that their child needs inpatient treatment, it may be that they perceive the adolescent's symptoms as more severe or that they are attempting to justify their action by reporting increased symptomology.

Symptom Change

The second aim of this study was to determine if LIWC metrics that have been linked to symptom change in adults (D'Andrea et al., 2012) would also predict significant symptom change from time of admission to time of discharge among inpatient adolescents. Specifically, it was predicted that fewer cognitive process words and first person pronouns would significantly predict symptom change across time. Partially supporting this hypothesis, use of fewer cognitive process words at time of admission predicted significant change in youth self-reported PTSD symptoms from time of admission to time of discharge. More specifically, while adolescents showed improvement across time in general, those adolescents who used fewer cognitive process words when talking about their trauma demonstrated a significant decrease in trauma

symptoms as compared to adolescents who used more cognitive process words. That is, to say, those adolescents who used more cognitive process words at admission demonstrated lasting trauma symptoms. This finding is consistent with the only prior study that assessed symptom change in a non-military sample based on LIWC metrics (D'Andrea et al., 2012). Putting together findings from aims one and two, adolescents with more severe PTSD symptoms also used fewer cognitive process words (i.e., insight words) at admission and experienced greater symptom reduction over time. It may be that these adolescents had more room for improvement during their inpatient hospitalization, due to increased PTSD symptoms, and therefore benefitted more from their treatment.

Contrary to our hypothesis, first person pronouns did not predict significant symptom change across time. Since the YSR was used to evaluate trauma symptom change for this model, it is not surprising that first person pronouns did not predict symptom change, as they were not related to the YSR symptoms in bivariate analyses. Moreover, not only was first person pronoun use not related to self-report data but pronoun use in general showed no evidence of a link with symptomology when assessed continuously. Thus, the mechanism behind these results could simply be the difference in methodology measuring trauma symptoms but it might also be that adolescents differ in their use of pronouns in general, as compared to adults. Furthermore, the only prior study, in a non-military sample, on symptom change across time, examined if linguistic markers predicted symptom change six months later (D'Andrea et al., 2012). The average length of stay in the inpatient facility was just over a month. Therefore, it may be that the timeframe of the current study was too short to detect significant symptom change. With that, more research is warranted to uncover the nature of pronoun

use in adolescents and how it relates to their trauma symptomology.

Conclusions

As this is the first study analyzing linguistic markers and trauma symptoms in adolescents, it inherently contributes to the existing literature base. The current findings demonstrate that overall specific LIWC metrics were related to trauma symptomology in female inpatient adolescents and predict symptom change across time. Specifically, findings indicated that word count, body words, insight, pronoun use, affect words, and positive emotion words were associated with trauma symptomology as assessed by youth and parent self-report and clinical interview. Furthermore, cognitive processing words were able to predict significant symptom change from time of admission to time of discharge. Thus, the current study bridged the gap in linguistic markers and trauma symptom research by extending it to an adolescent population. This study will serve as a foundation for further development on these constructs in other adolescent populations. In addition to expanding the literature, current findings have vast implications in various disciplines within psychology. One of the main motivations for this study was the limitations of collecting sexual trauma data via self-report and clinical interview. While not flawless, LIWC can provide objective information that can assist in assessing trauma symptoms. Being able to apply this to the assessment of trauma symptoms in adolescents, contributes an extra layer of information for clinicians to help conceptualize an individual. Conducting a LIWC analysis on adolescent trauma accounts does not fix the issues associated with measuring sexual trauma, but it does however, take a step in the right direction by contributing objective data to help make sense of the more subjective data gathered. Thus, it is the hope that analyzing linguistic markers will improve the

accuracy of trauma symptom measurement. An accurate measure of symptoms is crucial for effective treatment planning (Ganellen, 2007), making the current findings a valuable asset for individualized and beneficial treatment. Knowing which linguistic markers are associated with increased symptomology will help clinicians more accurately assess an individual and provide personalized information about the client, so that treatment can be tailored to the individual's needs.

Perhaps more importantly, the current findings demonstrated the ability of cognitive processing words to predict symptom change over time. Being able to predict an adolescent's progression early on would allow clinicians to collaborate proactively to customize treatment and manage foreseeable challenges, leading to more efficient treatment. For example, predicting a client's progression based on their use of cognitive processing words at time of admission, would allow clinicians to identify clients who may not benefit as much as others from the standard treatment and subsequently brainstorm other options for them. Additionally, clinicians could use cognitive process words to monitor a client's progress in treatment. It could allow the clinician to gauge if the client is learning to organize and conceptualize their trauma and if not, adjust treatment accordingly.

The current findings also have implications for the realm of forensic psychology. In particular, being able to analyze linguistic markers to predict symptom change with treatment would aid in juvenile certification cases (deciding if a juvenile should be tried in an adult court). As one of the considerations in these cases is a juvenile's amenability to treatment, information from a LIWC analysis could be influential in determining if an adolescent would benefit from treatment. Similarly, the current methodology could be

useful to those who are deciding about where to place (i.e. probation, detention) a juvenile after being adjudicated. One thing considered in these decisions is a juvenile's mental health and treatment needs. It follows then that an accurate assessment of an adolescent's trauma symptomology would be instrumental in these cases. While more research would be needed before applying the current findings to these situations, they illustrate the impact the current study's methodology can have on various practical situations.

It is important to note the limitations of the current study as well. First, data focused on adolescents who endorsed sexual trauma and LIWC analysis required that an adolescent be willing to talk about it using at least 50 words. These inclusion criteria may have biased the data by restricting analysis to those participants who inherently talk more about their trauma, and therefore, may not capture the experience and symptoms of adolescents who are the victims of sexual trauma but hesitant to discuss the event. Second, trauma symptom data was collected around the day of admission, when these symptoms might be more severe than normal and efforts to present in a positive light may be particularly pronounced, which could impact the accuracy of these data. Third, the current results cannot be generalized to the broader outpatient victims of sexual trauma, as only inpatients females were included. Additionally, the socioeconomic status and race of the participants were lacking in diversity. Fourth, previous research on linguistic markers in trauma narratives have typically used methodologies that have focused on participants producing a trauma narrative—a collaborative clinical activity undertaken with the supervision of a trusted clinician. The current study however, analyzed a response to a question within the context of a broader interview. It is possible that the

difference in the method of extracting this information impacted the narrative, and subsequent data produced by the adolescents. Finally, the present study's analyses did not control for multiple comparisons and one of the relations noted had p-values quite close to the .05 threshold for statistical significance, specifically, the difference in pronoun use between positive and negative PTSD diagnosis assessed by youth interview ($p = .047$). The results were discussed, nonetheless, because, as the first study to examine LIWC metrics in the context of adolescent trauma accounts, clinical significance may exist even where statistical significance does not. Still, the relations identified in this study are in need of replication. Notwithstanding these limitations, the current study addressed a major gap in the linguistic marker and trauma symptom literature as the first study to examine these constructs in adolescents. Thus, the findings of the present study establish groundwork for further research to expand upon and the current methodology and findings have important implications in various topics such as measurement and treatment of PTSD symptoms.

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VITA

CURRICULUM VITAE

Kaisa Kristine Marshall

Education

Sam Houston State University, Graduated December 2014
B.S. in Psychology with a minor in Criminal Justice, GPA 3.95

University of Memphis, August 2011 - December 2012
GPA 3.9

Kingwood High School, May 2011
GPA 4.9/5.0

Professional Experience

Duties and Dates:

Teaching Assistant
Sam Houston State University
Jorge Varela

August 2016 – August 2017
Taught Introduction to Psychology
Presented lectures, administered tests
worked with students to enhance
their basic understanding of the
foundations of psychology.

Graduate Student Psychology
Organization (GSPO) Secretary
Sam Houston State University
Craig Henderson

May 2016 - Present

Summer Internship
Memphis Child Advocacy Center

Nancy Williams

June 2013 – August 2013
Special projects assistant to the
Executive Director, conducted
research to investigate
trends of forensic interviewing and
prosecutions at the Center, wrote
features and articles for internal
newsletter, assisted in planning Child
Protection Investigation Team
(CPIT) training, completed Stewards
of Children Training, assisted
planning and implementing special
events and activities

Production Assistant Next Level Soccer Solutions	June 2012 – June 2014 Operated high-end game filming equipment to film full soccer matches, marketed the product and handled customer payments
Angie Rigsby	
Career Athletes University of Memphis	January 2012 – May 2012 Job shadowed with Clinical Psychologist at the University of Memphis
Kristin Rusboldt	
Varsity Division 1 Soccer Athlete Sam Houston State University	July 2011 – May 2014 Member of the Leadership Group at Sam Houston State University, elected to the position by teammates
Tom Brown	

University of Memphis

Publications

Abate, A., **Marshall, K. K.**, Sharp, C., and Venta, A. *Trauma and aggression: Investigating the mediating role of mentalizing in female and male inpatient adolescents*. Submitted, Child Psychiatry & Human Development.

Conference Presentations

Marshall, K., Long, T., Abate, A., Barker, M., Henderson, C., Venta, A. (2017). *First data on linguistic analysis as a method for assessing symptoms after sexual trauma in adolescents*. Poster submitted to the annual convention of the American Psychology Law Society, Seattle.

Abate, A., Harmon, J., **Marshall, K.**, Hart, J., Ball, E., Henderson, C., Desforjes, D., & Venta, A. (2017). *Perceptions of the legal system and recidivism: Investigating the mediating role of perceptions of chances for success in juvenile offenders*. Paper submitted to the annual convention of the American Psychology Law Society, Seattle.

Abate, A., **Marshall, K.**, Sharp, C., & Venta, A. (2016, November). *Trauma and aggression: Investigating the mediating role of mentalizing in female and male inpatient adolescents*. Paper accepted for presentation at the annual convention of the Texas Psychological Association, Austin.

Abate, A. C., **Marshall, K. K.**, Sharp, C., & Venta, A. (2016, August). *Trauma and aggression: Investigating a moderating role of hypermentalizing in inpatient*

adolescents. Poster presented at the annual convention of the American Psychological Association, Denver.

Hoskowitz, N.A., Schmidt, A. T., **Marshall, K. K.**, Harmon, J., & Henderson, C. E. (2016, March). *Psychotropic medication does not decrease delinquent behaviors in at-risk youth over a five year period*. Paper presented at the American Psychology- Law Society Conference, Atlanta, GA.

Ridge, B. E., Pennington, C. R., Bryson, C. N., McCallum, K. E., **Marshall, K. K.**, & Schmidt, A. T. (2016, February). *Connecting the dots: Relating executive dysfunction to the externalizing spectrum of psychopathology*. Poster presented at the International Neuropsychological Annual Meeting, Boston, MA.

Pennington, C. R., **Marshall, K. K.**, Bryson, C. N., McCallum, K. E., Ridge, B. E., Cheiffetz, R. T., Stanford-Galloway, P., & Schmidt, A. T. (2016, February). *The role of executive functions in externally-valid decision-making processes*. Poster presented at the International Neuropsychological Society annual meeting, Boston, MA.

Formon, D. L., Schmidt, A. T., **Marshall, K.**, & Camins, J. S. (2015, August). *Dollars-and-cents differences in ex-offender employment outcomes*. Poster session to be presented at the APA Annual Conference. Toronto, Ontario.

Pennington, C.R., Schmidt, A.T., Bryson, C.N., Ridge, B.E., McCallum, K.E., **Marshall, K.K.**, & Cheiffetz, R.T. (2015, March). *The Triarchic Conceptualization of Psychopathy and the Five Factor Model of Personality in a Diverse College Sample*. Poster presentation submitted to the Conference of the American Psychology-Law Society.

Pennington, C. R., Schmidt, A. T., Ridge, B. E., McCallum, K. E., Bryson, C. N., **Marshall, K. K.**, & Cheiffetz, R. T. (2015, February). *Personality traits influence processing speed performance in a neurologically intact population*. Poster presented at the International Neuropsychological Society annual meeting, Denver, CO.

Invited Presentations:

Sam Houston State University 2014 Undergraduate Research Symposium
Can Community Research be Crowdsourced?
Faculty Supervisor: Kelly Knight

Research Laboratory Assistance:

Amanda Venta, Ph.D.
Youth and Family Studies Lab

Duties:

Conduct research, CAI reliability coding, write manuscripts, Language

Sam Houston State University
Department of Psychology and Philosophy

analysis project leader

Adam Schmidt, Ph.D.
Resilience and Social Cognition Laboratory
Sam Houston State University
Department of Psychology and Philosophy

Literature review, assisted in various
experimental procedures, preparation
of testing materials, protocol scoring,
data quality control, data entry

Scholarships:

Athletic Soccer Scholarship
University Transfer Scholarship (3.5-3.99 GPA)
Helen Hardin Honors Program Scholarship
Elliot T. Bowers Honors Program
Emerging Scholars Honor
Provost Scholarship

Honors and Activities:

SHAPA Travel Award

- Awarded to those students presenting research at the Texas Psychological Association Annual Convention

Dean's List

- Fall 2011, Spring 2012, Fall 2012, Spring 2013, Fall 2013, Spring 2014

SHSU Psi Chi National Honor Society

- Minimum GPA requirement of 3.0
- Active member 2013, 2014

Alpha Chi National Honor Society

- Acceptance awarded to top ten percent of Juniors and Seniors at Sam Houston State University
- Active Member, 2014

Elliot T. Bowers Honors Program: Sam Houston State University

- Acceptance awarded based on record at University of Memphis Honors Program and cumulative GPA of 3.4
- Active Member, 2013

Who's Who

- Who's Who among American Universities and Colleges
- Spring 2014

Tiger Top 30

- Awarded to the top 30 athletes with the best GPAs at the University of Memphis
- 2011

Helen Hardin Honors Program: University of Memphis

- Acceptance awarded to those with an ACT score of at least 27, SAT composite score of at least 1200, and a high school GPA of 3.5
- 2011, 2012

Alpha Lambda Delta Honors Society: University of Memphis

- Acceptance awarded to freshmen with a GPA of at least 3.75
- 2012

Regents Scholar Finalist

- selected SHSU Representative but ineligible because of early graduation

Professional Association Membership

American Psychological Association

Texas Psychological Association

American Psychology – Law Society

Volunteer Experience

Humane Society of Memphis and Shelby County

- Weekly service
- Promotional efforts on social media, follow up calls for donations, data entry

Huntsville Youth Soccer Association

- Coached an Under 6 coed youth soccer team
- Directed practice twice a week and managed games once a week for nine weeks

Galveston Bay Foundation

- Worked at fundraisers, clean-up days, and membership drives
- Registered, directed, and coordinated volunteer participants
- Worked on projects to improve the Galveston Bay and provide a better environment

Various Volunteer Activities:

- Worked as a guide at the National Civil Rights Museum
- Course Volunteer for the Race for the Cure
- Course Volunteer for the St. Jude Marathon
- Course Volunteer for Texas 10 Series
- Passed out food for Houston Food Bank
- Served food to the homeless at CHOP