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Linguistic Analysis as a Method for Assessing Symptoms After Sexual Trauma Among Female Adolescent Psychiatric Inpatients

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ABSTRACT

Using a sample of female psychiatric inpatient adolescents, the current study aimed to extend this literature to an adolescent sample for the first time by examining if linguistic markers and their subcategories (cognitive process words, pronoun use, and somatosensory detail) in a trauma account are related to trauma symptomology and recovery during inpatient care. Results indicated that greater use of body words and fewer insight words were related to increased trauma symptoms at admission. In addition, use of fewer cognitive process words at admission predicted greater symptom change at discharge, extending previous research findings to an adolescent sample. Findings suggest that linguistic analysis may be an important component of adolescent trauma symptom assessment and treatment monitoring.

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Adolescent; clinical issues; measurement issues; sexual abuse; treatment; victim

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 about 60% of youth under 18 experience an event that would qualify as traumatic (Finkelhor et al., 2015). While these estimates include youth 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 those exposed to trauma (U.S. Department of Health and Human Services, 2013). Moreover, girls aged 14 to 17 are at great risk for sexual assault, and the lifetime sexual assault estimate for older adolescent girls stands at 17% (Finkelhor et al., 2015). Estimates of sexual trauma are even higher in psychiatric inpatients, where 22% report exposure to sexual trauma (Jardin, Venta, Newlin, Ibarra, & Sharp, 2015). In sum, many adolescents have been exposed to trauma, and

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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. A second aim was to examine linguistic analysis as a tool to assess longitudinal associations between trauma symptomology and treatment response.

It is well-documented that experiencing trauma in youth can lead both to internalizing and externalizing symptoms (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 functional impairment from trauma-related symptoms, such as intrusive reexperiencing, 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 psychiatric inpatient adolescents, of whom 42% report clinically significant symptoms (Venta, Hatkevitch, Mellick, Vanwoerden, & Sharp, 2016), while 32% meet diagnostic criteria for current PTSD (Lipschitz, Winegar, Hartnick, Foote, & Southwick, 1999). In fact, Lipschitz and colleagues (1999) found sexual abuse to be the largest contributor (69%) to PTSD symptoms in psychiatric inpatient adolescents. Thus, PTSD symptoms are prevalent after sexual trauma in general, with particularly elevated rates among psychiatric inpatient adolescents.

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 the effects of sexual trauma 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 is questionable. 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 perceived repercussions could follow (Butcher, Kretschmar, Lin, Flannery, & Singer, 2014). Moreover, a victim's reporting of the resulting symptoms may be at risk for response bias, either through minimizing or exaggerating these symptoms (Butcher et al., 2014; Fricker & Smith, 2001; Paulhus, 2002). 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 actually detecting inaccurate responding (Butcher et al., 2014). Ultimately, the accuracy of self-reports about trauma symptoms is contingent on the victim's disclosure, which leaves the potential for biased assessments.

Considering the challenges associated with self-report data, some clinicians advocate for empirically guided clinical interviews with the rationale that a trained professional can ask questions to more accurately discern the symptoms the victim is experiencing (Walsh, Jamieson, MacMillan, & Trocmé, 2004). However, training is required to be competent in conducting such an interview (Shaffer, Fisher, Luca, Dulcan, & Schwab-Stone, 2000), constraining the use of this methodology to trained clinicians and researchers and limiting the number of non-mental-health professionals (e.g., nurses, admitting medical doctors) who can assess symptoms. Moreover, 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). As a clinician can only assess what a victim outwardly expresses, adolescent reluctance to report trauma symptoms can present a serious limitation to clinical interviews. Further complicating these limitations are the issues related to clinical judgment, specifically the subjectivity and inaccuracy of assessing symptoms and assigning a diagnosis, especially in the case of childhood trauma (Fink, Bernstein, Handelsman, Foote, & Lovejoy, 1995; Guy, 2008; Jenson & Weisz, 2002; Zimmerman & Mattia, 1999). For instance, interviewers' personal characteristics and individual differences, such as preconceived notions about child sexual abuse, race, and nonverbal expressions, influence what information an individual who has experienced sexual trauma provides (Garb, 2005; Keenan, McGlinchey, Fairhurst, & Dillenburger, 2000; Springman, Wherry, & Notaro, 2006). Therefore, no matter how well-trained or professional a clinician is, there are still individual characteristics that could affect the information extracted and the consequent decision making, compounding the cost, time, and personnel-intensive nature of clinical interview methods.

Given the challenges inherent in measuring trauma symptoms, recent research has aimed to better understand how to assess symptom severity and treatment progress for those who experience early life trauma (Butcher et al., 2014; Miller & Veltkamp, 1995). Advances in technology have been tremendous assets in combating some of the aforementioned methodological challenges in the assessment of trauma symptoms. Recently, the analysis of a victim's spoken or written trauma account has been used to evaluate symptomology and cognitive processing to better understand how an individual's language use relates to her or his presenting symptomology (Gray &

Lombardo, 2001; Ng, Ahishakiye, Miller, & Meyerowitz, 2015). To date, the most common method of linguistic analysis is through the use of 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). By analyzing every word in a narrative, LIWC determines first if it recognizes the word as one from its dictionary; if it does, the word is assigned to a specific category (such as emotionality). LIWC then further classifies the word within that category. As an example, the word "hurt" is found in a narrative: the word is determined to be in the dictionary and is placed in the "emotionality" category. The word is then identified 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 evaluating a narrative and transforming subjective content into objective data. In addition, LIWC can be applied to unstructured linguistic content, such that participants can be asked an open-ended question and objective linguistic markers can be extracted from the language that is spontaneously generated—whether or not it relates explicitly to trauma symptoms. In doing so, LIWC evaluates language beyond the surface-level content an individual is expressing and potentially provides a deeper, more objective analysis of trauma symptoms and processing. It must be kept in mind, however, that LIWC does not account for context; therefore, it ignores the situational use of verbal styles such as sarcasm and irony (Tausczik & Pennebaker, 2010). While it is important to recognize that LIWC is not error-free, context-specific situations (like sarcasm) are less likely to be present in trauma narratives, thus reducing the impact of this limitation is reduced in the current study.

Accumulating research suggests that evaluating the linguistic markers of trauma accounts can provide important insight into a victim's psychological state and potentially predict later symptomology (Gray & Lombardo, 2001; Ng et al., 2015). Many existing studies have examined specific linguistic markers and their ability to predict PTSD symptoms in trauma narratives (Crespo & Fernandez-Lansac, 2016). Current literature focuses primarily on trauma narratives produced by adults and has found several linguistic markers to be associated with PTSD symptoms. Specifically, links have been found between cognitive process words, pronoun use, and somatosensory detail with trauma 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 (Jaeger et al., 2014; Papini, Yoon, Rubin, Lopez-Castro, & Hien, 2015). In particular, greater use of cognitive process words was associated with decreased symptom severity in females being treated for

PTSD (Alvarez-Conrad et al., 2001). In addition, empirical research points to a positive association between pronoun use in general and trauma symptoms (Jaeger et al., 2014; Papini et al., 2015). In particular, Papini and colleagues (2015) found that first and third person singular pronouns were associated with a diagnosis of PTSD. Finally, somatosensory detail has been found to be common in trauma narratives (Crespo & Fernández-Lansac, 2016), particularly when compared to other types of narratives (Beaudreau, 2007). In a study examining trauma narratives produced after genocide, sensory detail (specifically tactile details e.g. "feel" "touch") predicted PTSD avoidance symptoms six years later (Ng et al., 2015). In reviewing the available data, it would appear that while LIWC analysis can provide important and objective insight into the psychological state of adult trauma victims, (a) cognitive process words, (b) pronoun use, and (c) somatosensory detail specifically are relevant linguistic markers of PTSD symptom severity worthy of future research.

While important, these studies focused on concurrent associations and therefore do not provide evidence on how victims' use of language relates to symptom change over time. To our knowledge, only one study to date has examined if specific linguistic markers can predict symptom change over time (D'Andrea, Chiu, Casas, & Deldin, 2012). D'Andrea and colleagues (2012) examined participants' trauma narratives and symptomology the week following the September 11th terrorist attack in New York City and how this compared to their symptomology six months later, finding that greater use of cognitive process words and first-person singular pronouns predicted a longer duration of PTSD symptoms. These results are consistent with the literature on pronoun use, which has found a positive association with trauma symptoms, but contradict the existing research on cognitive process words, which has found that a *decrease* in symptoms is significantly related to the use of more cognitive process words. It is important to note that a questionnaire assessing trauma symptoms was tailored to ask about symptoms related to the 9/11 attacks. As the only study of its kind, additional research regarding longitudinal associations between LIWC and trauma symptoms is needed. Together these studies indicate the importance of cognitive process words in trauma narratives, echoing Ehlers and Clark's (2000) cognitive model of PTSD, which also emphasize the importance of cognitive processing in relation to trauma symptomology. In addition, Ehlers and Clark (2000) posit that somatosensory detail is central to descriptions of traumatic experiences, further supporting the importance of these LIWC metrics in trauma narratives. Taken together, evidence suggests cognitive process words, pronoun use, and somatosensory detail are important in the relation between trauma narratives and symptomology; likewise, cognitive process words and pronoun use, in particular, may predict symptom change over time.

In sum, trauma affects a large number of adolescents but is particularly problematic in inpatient samples and women, who are disproportionately impacted by sexual trauma and subsequent PTSD symptoms. Recent advances in technology, including the progression of linguistic analysis, hold promise for improving the limitations of self-report and clinical interview as assessment tools following sexual abuse. Using LIWC, linguistic markers relevant to trauma symptoms have been established; however, this literature is entirely based on adult samples. Given the high overall rates of reported trauma (Finkelhor et al., 2015), lack of research (Crespo & Fernández-Lansac, 2016), and the seemingly unique language use of adolescents (Andersen, 2001), there is a need to understand how adolescent trauma accounts might provide insight into trauma symptoms and symptom change over time. Gaining a better understanding of the association between female adolescent language use and trauma symptomology has important implications for both trauma assessment and treatment. LIWC can provide objective data, which could be integrated to allow for more accurate assessment of trauma symptoms and the ability to predict an individual's symptom change, both of which would contribute to more efficient, effective, and customized treatment.

Based on these findings, the broad aim of the current study was to conduct a LIWC analysis of sexual trauma interview data among female psychiatric 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. First, we evaluated if LIWC metrics were related to individuals' current trauma symptoms assessed via self-report. Based on the existing literature in adults, we expected use of (a) fewer cognitive process words, (b) greater pronoun use, (c) and more somatosensory detail to be associated with increased trauma symptoms. In order to assess these linguistic markers comprehensively, all subcategories of these LIWC metrics were included in analyses. Second, we sought to replicate the D'Andrea and colleagues' (2012) study in an adolescent population by examining if LIWC metrics predict trauma symptom change from time of admission to the inpatient facility to time of discharge. Given the findings of D'Andrea and colleagues, it was expected that fewer cognitive process words and fewer first-person pronouns at time of admission would be related to greater symptom change (decreased trauma symptoms) at time of discharge.

Methods

Participants

All subjects in this study were participants from a larger study (see Sharp et al., 2009). Female participants were recruited from a local psychiatric inpatient facility. To ensure participant comprehension, those with intellectual

disability and psychosis were excluded. Also to guarantee quality linguistic analysis, only those participants who endorsed a history of sexual trauma using greater than 50 words were included in this study (following LIWC guidelines). Eighty-six participants met these inclusion criteria. One participant proved to be statistical outlier on the *pronoun use* variable and thus was excluded, resulting in a final sample of 85 participants. Sample size varied by the time frame of the measurement being used, such that for the youth self-report (YSR) just at admission $n = 85$ and for YSR at both admission and discharge $n = 65$. Notably, those participants who were missing discharge data were not significantly different with regard to age, $t(44) = 1.05$, $p = .300$ (equal variance was not assumed and therefore degrees of freedom were adjusted accordingly), or YSR admission scores, $t(83) = .262$, $p = .794$. They also did not differ significantly across LIWC metrics: cognitive process words, $t(83) = -.104$, $p = .917$, pronoun use, $t(83) = .771$, $p = .443$, or somatosensory detail, $t(83) = -.173$, $p = .863$. Participants ranged from 12 to 17 years of age ($M = 15.35$, $SD = 1.28$), and the racial breakdown was as follows: Caucasian (75.3%), Asian (5.2%), African American (5.2%), and multiracial or other (14.3%). Of those, 6.3% of respondents indicated Hispanic ethnicity (regardless of race).

Overall, levels of psychiatric disorder were high in this sample, with most adolescents meeting diagnostic criteria for two to three disorders. More specifically, the most common diagnoses (not mutually exclusive) at time of discharge were depressive disorders (82.4%), anxiety-related disorders (76.5%), substance use disorders (40.0%), impulse-control/conduct disorders (25.9%), and eating disorders (15.3%).

Throughout the course of the study, participants were provided individualized treatment focusing on resolving and processing their emotional and behavioral problems, with each taking part in a milieu-based treatment approach that aimed to improve the formation of close relationships and social cognitive capacity. The treatment program, which was provided equally to all participants, operates from an interpersonal-psychodynamic framework with integrated aspects of both cognitive-behavioral and family-systems-based approaches (Sharp et al., 2009).

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. Trained clinical research assistants or doctoral clinical psychology students conducted assessments privately within the facility. Research assistants were trained in the Health Insurance Portability and Accountability Act (HIPAA) as well as hospital policies, they completed training in research with human subjects through Collaborative Institutional Training Initiative (CITI), and they were trained in

the in the measures used in this study by one of the authors of this manuscript (Sharp) by shadowing and checkout. It should be noted that research assistants do not have mental health licenses but rather operate under the license of Sharp. On average, the length of stay for this sample was 36.00 days (*SD* = 12.74, min. = 13, max. = 85). All data used in this study were archival based on a larger study (Sharp et al., 2009). Institutional review board approval was obtained from the appropriate institutions prior to data collection and analysis.

Measures

History of sexual trauma

The Child Attachment Interview (CAI; Target, Fonagy, Shmueli-Goetz, Datta, & Schneider, 2007), a 17-question measure designed to evaluate representation of attachment to the primary caregiver as well as self-representation, was given upon admission to the facility. Empirical data supports the validity of the CAI being used to assess psychiatric inpatient adolescents (Venta, Shmueli-Goetz, & Sharp, 2014) as well as younger clinical samples (Target et al., 2003; Shmueli-Goetz, Target, Fonagy, & Datta, 2008). For the purposes of the current study, only one yes/no question from the interview ("Have you ever been touched sexually by someone when you did not want them to do it?") was analyzed in order to assess history of sexual trauma. If participants endorse "yes," follow-up questions, known in this measure as scaffolding, were asked (Target et al., 2007). Prompts such as "Who else was there?" and "How did you feel?" allowed adolescents to expand and provide detail surrounding the incident without using leading questions. However, if the participant did not want to discuss the issue, the interviewer moved on to the next question. All interviews were videotaped and transcribed.

Posttraumatic stress disorder symptoms

PTSD symptoms were measured at the time of admission and discharge from the facility utilizing the YSR (Achenbach & Rescorla, 2001), which yields dimensional T-score ratings of PTSD symptoms. The measure demonstrates adequate psychometric properties in adolescent and clinical samples (Gomez, Vance, & Gomez, 2014). Appropriate for use with adolescents ages 12 through 17 and their parents, the YSR contains 112 problem items, 13 of which (e.g. "I have nightmares" and "I am too fearful or anxious") comprise the PTSD scale. They were 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. Scale reliability was not computed as the YSR was administered and scored electronically, thus, item-level data was not included in the archival dataset.

Linguistic analysis

LIWC (Tausczik & Pennebaker, 2010), a content-analysis computer program, was used to evaluate participants' responses to a question about sexual abuse.

The program analyzed the transcribed text from the CAI and computed the total percentage of words in each linguistic category. These percentages were then converted to 100-point scales along a 0–100 dimension based on "research based composites" (Pennebaker Conglomerates Incorporated, 2015). Linguistic markers and their relevant subcategories used for the current project were (a) cognitive process words, (b) pronoun use, and (c) somatosensory detail. The subcategories of cognitive process words consisted of insight (e.g., think, know, consider), causation (e.g., because, effect, hence), discrepancy (e.g., should, would, could), tentative (e.g., maybe, perhaps, guess), certainty (e.g., always, never), and differentiation (e.g., but, except, without). The subcategories of pronoun use were I, we, and he/she. The subcategories of somatosensory detail were body (e.g., ache, heart, cough), seeing (e.g., view, saw, look) hearing (e.g., heard, listen, sound), feeling (e.g., touch, hold, felt), and biological processes (e.g., eat, blood, pain).

Results

Bivariate correlations between the YSR, LIWC metrics, and age are presented in Table 1. The YSR was not found to be significantly correlated with the broader categories of either cognitive process words or somatosensory detail; however, the subcategory insight was found to have a significantly negative correlation, while the subcategory body words demonstrated a significant positive correlation. No evidence of a significant correlation between pronoun use and the YSR was demonstrated. Furthermore, it is important to note that age was positively related to both cognitive process words and insight.

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. Since a significant correlation was found between LIWC metrics and age, age was included as a covariate. Using the YSR scores from admission and discharge (repeated) as the outcome variable, results indicated a main effect of time, $F(1,65) = 10.19$, $p = .002$, suggesting that there was a significant reduction in adolescents' symptoms of PTSD from time of admission to time of discharge. Likewise, there was a significant time (from admission to discharge) 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. The average score on cognitive process words ($M = 15.27$) was used to determine the cutoff between low and high groups for illustrative purposes only (i.e., analyses treated cognitive process words continuously). Figure 1 demonstrates 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

Table 1. Correlations Between LIWC Metrics, Trauma Symptom Measures, and Age.

LIWC Metrics	PTSD Symptoms	Age
Cognitive process	−.173	.231*
Insight	−.259*	.244*
Cause	−.120	.094
Discrepancy	.005	.171
Tentative	−.055	.053
Certain	−.127	.064
Differ	−.028	.016
Pronoun use	.007	−.028
I	−.088	.131
We	−.128	−.155
He or she	.153	−.104
Somatosensory detail	.153	−.057
Body	.279**	−.206
See	.048	−.010
Hear	.018	.004
Feel	.196	−.078
Bio	.151	−.038

Note. $^{**}p < .01$, $^{*}p < .05$.

cognitive process words at admission experienced less symptom reduction at time of discharge. No significant interactions were identified between time and either first person pronoun-I, $F(1,65) = .952$, $p = .33$, or first person pronoun-We, $F(1,65) = 2.48$, $p = .120$.

Discussion

The overall aim of the current study was to examine how linguistic markers in accounts of sexual trauma reported by female adolescent psychiatric inpatients related to their self-reported PTSD symptomology. The first aim of the study was to examine if LIWC metrics that have been linked to PTSD symptoms in adults also demonstrated significant associations with trauma symptoms in adolescents, a previously unexamined age group. Based on the literature in adults, it was predicted that greater use of pronouns and somatosensory detail but use of fewer cognitive process words in female adolescent accounts of trauma would be associated with increased symptoms of PTSD. Our results partially supported the study hypotheses, namely that reports of trauma with greater use of body words (a subcategory of somatosensory detail) and fewer insight words (a subcategory of cognitive process words) were related to higher levels of trauma symptoms.

Similar to the current study, research regarding somatosensory detail has established that these types of words are common in trauma narratives, and greater use of sensory detail has been linked to increased trauma symptoms (Beaudreau, 2007; Crespo & Fernández-Lansac, 2016; Greenhoot, Sun, Bunnell, & Lindboe, 2013; Ng et al., 2015). Indeed, Beaudreau (2007) determined that increased references to body states in narratives were associated with PTSD symptoms as well as poorer adjustment posttrauma; while Ng and colleagues

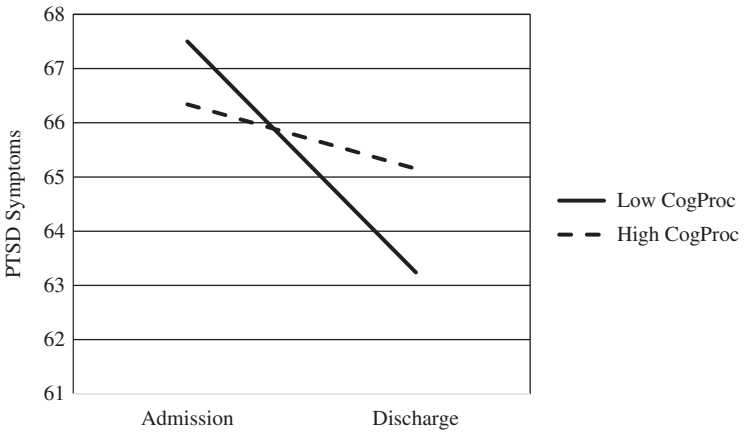

Figure 1. Mean score on the YSR at admission and discharge across groups. This figure illustrates the significant reduction of PTSD symptoms from admission to discharge in those adolescents who used fewer cognitive process words.

(2015) found that of all the sensory detail words analyzed in their study, only tactile details (e.g., feel, touch) were related to PTSD. Therefore, the current study, where at least one aspect of somatosensory detail, body words, was linked to increased trauma symptoms demonstrates findings congruent with prior research in this area linking somatosensory details to PTSD symptoms. One explanation for these findings is that sensory detail in trauma narratives triggers the intrusive, distressing memories typical of those experiencing PTSD (Ehlers & Clark, 2000; Greenhoot et al., 2013). Thus it may be that adolescents use somatosensory detail to describe their trauma because they are reexperiencing the event, to some extent, at that time. It also has 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, 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 this hypothesis. In the current study insight words only (not the larger category of cognitive process words) were found 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; one explanation may be that insight words indicate a person's understanding of *why* the traumatic 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 trauma symptoms and pronoun use, in contrast to expectations and prior research.

The finding of reduced use of cognitive process words fits with a larger literature from both cognitive-behavioral (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996) and psychodynamic (Bateman & Fonagy, 2015) perspectives. For instance, from a cognitive-behavioral perspective, the concept of experiential avoidance has been used to refer to "an unwillingness to remain in contact with uncomfortable private events by escaping or avoiding these experiences" (Hayes et al., 1996, p. 1154) and has been shown to relate not only to PTSD in general but also to a history of sexual abuse in particular (Hayes et al., 1996). From a psychodynamic perspective, insight is viewed as a metacognitive process, specifically mentalizing, which enables an individual to reflect on his or her own mind in order to make sense of internal experiences (Fonagy, 1991). In individuals with a trauma history, this capacity is shut down as a protective mechanism. From both theoretical perspectives, the goal in treatment is to facilitate a metacognitive perspective in order to unblock unwanted thoughts, feelings, and internal experiences that may ultimately allow processing of the trauma.

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 psychiatric 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, evidence of a significant interaction between time and cognitive process words was noted. Specifically, while adolescents showed improvement across time in general, those adolescents who used fewer cognitive process words when talking about their trauma at admission demonstrated a greater decrease in trauma symptoms as compared to adolescents who used more cognitive process words at that time. Conversely, those adolescents who used more cognitive process words at admission demonstrated elevated trauma symptoms throughout their course of treatment. This finding is consistent with the only prior study that assessed symptom change based on LIWC metrics (D'Andrea et al., 2012). Putting together findings from both aims of the current study, adolescents with more severe PTSD symptoms also used fewer cognitive process words (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 higher 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, and surprisingly neither was pronoun use in general. Thus, the mechanism behind these results simply could be the difference in how trauma symptoms were measured and the type of trauma measured. In D'Andrea and colleagues (2012) asked about trauma symptoms specific to the

9/11 attacks, whereas in this study trauma symptoms in general were assessed. Another explanation might be that adolescents differ in their use of pronouns as compared to adults. Furthermore, D'Andrea and colleagues (2012) used a five-month time frame (D'Andrea et al., 2012), while the average length of stay in the inpatient facility was just over a month. It may be that the time frame of the current study was too short to detect significant symptom change as a function of first-person pronoun use. More research is warranted to uncover the nature of pronoun use in adolescents and how it relates to their trauma symptomology.

As this is the first study analyzing linguistic markers and trauma symptoms in adolescents, it makes a contribution to the existing adult-centric literature base. The current findings demonstrate that specific LIWC metrics are significantly related to trauma symptomology in female psychiatric inpatient adolescents and predict symptom change across time, replicating many findings from the adult literature. By bridging the gap in linguistic markers and trauma symptom research related to the adolescent population, this study may serve as a foundation for further development on these constructs in future research in this area. In addition to expanding the literature, current findings have 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 through clinical interview. As graduate students collected data, an important aspect of the current study is that it demonstrates that individuals with relatively little training can adequately execute this assessment method. Moreover, preliminary data from this study as well as a growing literature based with adults indicates that LIWC is able to provide objective information that can assist in assessing trauma symptoms. An accurate measure of symptoms is crucial for effective treatment planning (Ganellen, 2007), making the current findings a valuable asset for individualizing treatment. Knowing which linguistic markers are associated with increased symptomology may further help clinicians more accurately target specific psychological processes as mechanisms of change in treatment of PTSD, though specific research in this regard is needed. Perhaps most important, 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, perhaps leading to more efficient and effective treatment and progress monitoring.

It is important, however, to note the limitations of the current study. First, the data analyzed focused on adolescents who endorsed sexual trauma and talked about it using at least 50 words, per requirements for use of LIWC analysis. 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 are more hesitant to discuss the event. Second, trauma symptom data was collected around the day of admission, when bias in adolescent's reporting of

symptoms may be particularly pronounced, which could impact the accuracy of these data. Third, the current results cannot be generalized to those victims of sexual trauma in outpatient settings, as only inpatients females were included. In addition, these youth were highly similar in socioeconomic status and race/ethnicity, therefore caution must be used in assuming potentially similar outcomes in more diverse populations. Fourth, previous research on linguistic markers in trauma narratives typically have used methodologies that 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 any subsequent data produced by the adolescents. This aspect, however, is also a strength of the current study as it allows for the examination of a spontaneous response, which is more likely to be genuine and unstructured than a prompted response.

Notwithstanding these limitations, the current study serves to address a gap in the literature on linguistic markers and trauma symptoms as the first of its kind to examine these constructs in adolescents. Consistent with other research in the field on adult samples, the findings of this study support analysis of linguistic markers as a valuable and relevant approach to managing and facilitating treatment of trauma. By demonstrating empirical support for this technique as well as establishing groundwork for further research that may expand on the current methodology and study sample constraints, these findings have important implications in the measurement and treatment of PTSD symptoms and outline clear areas in need of further research.

Compliance with ethical standards

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2000. Informed consent was obtained from all patients for being included in the study.

Conflict of interest

All authors declare that they have no competing interests.

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References

Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for ASEBA school-age forms & profiles*. Burlington, VT: University of Vermont, Research Center for Children, Youth, & Families.

Alvarez-Conrad, J., Zoellner, L. A., & Foa, E. B. (2001). Linguistic predictors of trauma pathology and physical health. *Applied Cognitive Psychology*, *15*(7), S159–S170. doi:10.1002/(ISSN)1099-0720

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed. ed.). Washington, DC: APA.

Andersen, G. (2001). *Pragmatic markers and sociolinguistic variation: A relevance-theoretic approach to the language of adolescents*. Amsterdam, The Netherlands: John Benjamins Publishing.

Bateman, A., & Fonagy, P. (2015). Borderline personality disorder and mood disorders: Mentalizing as a framework for integrated treatment. *Journal of Clinical Psychology*, *71* (8), 792–804. doi:10.1002/jclp.22206

Beauchaine, T. P., & Hinshaw, S. P. (2013). *Child and adolescent psychopathology* (2nd ed.) Hoboken, NJ: John Wiley & Sons.

Beaudreau, S. A. (2007). Are trauma narratives unique and do they predict psychological adjustment? *Journal of Traumatic Stress*, *20*(3), 353–357. doi:10.1002/jts.20206

Butcher, F., Kretschmar, J. M., Lin, Y., Flannery, D. J., & Singer, M. I. (2014). Analysis of the validity scales in the trauma symptom checklist for children. *Research on Social Work Practice*, *24*(6), 695–704. doi:10.1177/1049731513516803

Cerezo-Jimenez, M. A., & Frias, D. (1994). Emotional and cognitive adjustment in abused children. *Child Abuse & Neglect*, *18*(11), 923–932. doi:10.1016/S0145-2134(05)80003-1

Crespo, M., & Fernández-Lansac, V. (2016). Memory and narrative of traumatic events: A literature review. *Psychological Trauma: Theory, Research, Practice, and Policy*, *8*(2), 149–156. doi:10.1037/tra0000041

D'Andrea, W., Chiu, P. H., Casas, B. R., & Deldin, P. (2012). Linguistic predictors of post-traumatic stress disorder symptoms following 11 September 2001. *Applied Cognitive Psychology*, *26*(2), 316–323. doi:10.1002/acp.1830

Ehlers, A., & Clark, D. M. (2000). A cognitive model of posttraumatic stress disorder. *Behaviour Research and Therapy*, *38*(4), 319–345. doi:10.1016/S0005-7967(99)00123-0

Fink, L. A., Bernstein, D., Handelsman, L., Foote, J., & Lovejoy, M. (1995). Initial reliability and validity of the childhood trauma interview: A new multidimensional measure of childhood interpersonal trauma. *American Journal of Psychiatry*, *152*(9), 1329–1335. doi:10.1176/ajp.152.9.1329

Finkelhor, D., Turner, H., Shattuck, A., Hamby, S., & Kracke, K. (2015). *Children's exposure to violence, crime, and abuse: An update*. Rockville, MD: Office of Juvenile Justice and Delinquency Prevention, U.S. Department of Justice.

Fonagy, P. (1991). Thinking about thinking: Some clinical and theoretical considerations in the treatment of a borderline patient. *The International Journal of Psycho-Analysis*, *72*(4), 639.

Fricker, A. E., & Smith, D. W. (2001). Trauma specific versus generic measurement of distress and the validity of self-reported symptoms in sexually abused children. *Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders*, *10*(4), 51–66. doi:10.1300/J070v10n04_04

Ganellen, R. J. (2007). Assessing normal and abnormal personality functioning: Strengths and weakness of self-report, observer, performance-based methods. *Journal of Personality Assessment*, *89*(1), 30–40. doi:10.1080/00223890701356987

Garb, H. N. (2005). Clinical judgment and decision making. *Annual Review of Clinical Psychology*, *1*(1), 67–89. doi:10.1146/annurev.clinpsy.1.102803.143810

Gomez, R., Vance, A., & Gomez, R. M. (2014). Analysis of the convergent and discriminant validity of the CBCL, TRF, and YSR in a clinic-referred sample. *Journal of Abnormal Child Psychology*, *42*(8), 1413–1425. doi:10.1007/s10802-014-9879-4

Gray, M. J., & Lombardo, T. W. (2001). Complexity of trauma narratives as an index of fragmented memory in PTSD: A critical analysis. *Applied Cognitive Psychology*, *15*(7), S171–S186. doi:10.1002/acp.840

Greenhoot, A. F., Sun, S., Bunnell, S. L., & Lindboe, K. (2013). Making sense of traumatic memories: Memory qualities and psychological symptoms in emerging adults with and without abuse histories. *Memory*, *21*(1), 125–142. doi:10.1080/09658211.2012.712975

Guy, L. S. (2008). *Performance indicators of the structured professional judgment approach for assessing risk for violence to others: A meta-analytic survey* (doctoral dissertation, Simon Fraser University).

Hayes, S. C., Wilson, K. G., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology*, *64*(6), 1152–1168. doi:10.1037/0022-006X.64.6.1152

Jaeger, J., Lindblom, K. M., Parker-Guilbert, K., & Zoellner, L. A. (2014). Trauma narratives: It's what you say, not how you say it. *Psychological Trauma: Theory, Research, Practice, and Policy*, *6*(5), 473–481. doi:10.1037/a0035239

Jardin, C., Venta, A., Newlin, E., Ibarra, S., & Sharp, C. (2015). Secure attachment moderates the relation of sexual trauma with trauma symptoms among adolescents from an inpatient psychiatric facility. *Journal of Interpersonal Violence*, *1*(21). doi:10.1177/0886260515589928

Jensen, A. L., & Weisz, J. R. (2002). Assessing match and mismatch between practitioner-generated and standardized interview-generated diagnoses for clinic-referred children and adolescents. *Journal of Consulting and Clinical Psychology, 70*(1), 158.

Keenan, M., McGlinchey, A., Fairhurst, C., & Dillenburger, K. (2000). Accuracy of disclosure and contextual control in child abuse: Developing procedures within the stimulus equivalence paradigm. *Behavior and Social Issues*, *10*(1–2), 1–17. doi:10.5210/bsi.v10i0.131

Lipschitz, D. S., Winegar, R. K., Hartnick, E., Foote, B., & Southwick, S. M. (1999). Posttraumatic stress disorder in hospitalized adolescents: Psychiatric comorbidity and clinical correlates. *Journal of the American Academy of Child & Adolescent Psychiatry*, *38*(4), 385–392. doi:10.1097/00004583-199904000-00010

Miller, T. W., & Veltkamp, L. J. (1995). Assessment of sexual abuse and trauma: Clinical measures. *Child Psychiatry and Human Development*, *26*(1), 3–10. doi:10.1007/BF02353225

Ng, L. C., Ahishakiye, N., Miller, D. E., & Meyerowitz, B. E. (2015). Narrative characteristics of genocide testimonies predict posttraumatic stress disorder symptoms years later. *Psychological Trauma: Theory, Research, Practice, and Policy*, *7*(3), 303–311. doi:10.1037/tra0000024

Papini, S., Yoon, P., Rubin, M., Lopez-Castro, T., & Hien, D. A. (2015). Linguistic characteristics in a non-trauma-related narrative task are associated with PTSD diagnosis and symptom severity. *Psychological Trauma: Theory, Research, Practice, and Policy*, *7*(3), 295–302. doi:10.1037/tra0000019

Paulhus, D. L. (2002). Socially desirable responding: The evolution of a construct. In H. I. Braun, & D. N. Jackson (Eds.), *The role of constructs in psychological and educational measurement* (pp. 49–69). Mahwah, NJ: Lawrence Erlbaum.

Pennebaker Conglomerates Incorporated. (2015). Discover LIWC2015. Retrieved from http://liwc.wpengine.com/

Pennebaker, J. W., Booth, R. J., & Francis, M. E. (2007). Linguistic inquiry and word count: LIWC [Computer software]. Austin, TX: LIWC.net.

Roesler, T. A. (2000). Discovery of childhood sexual abuse in adults. In R. M. Reece, R. F. Hanson, & J. Sargent (Eds.), *Treatment of child abuse: Common ground for mental health, medical, and legal practitioners* (pp. 65–78). Baltimore, MD: Johns Hopkins University Press.

Shaffer, D., Fisher, P., Lucas, C. P., Dulcan, M. K., & Schwab-Stone, M. E. (2000). NIMH Diagnostic Interview Schedule for Children Version IV (NIMH DISC-IV): Description, differences from previous versions, and reliability of some common diagnoses. *Journal of the American Academy of Child & Adolescent Psychiatry*, *39*(1), 28–38. doi:10.1097/00004583-200001000-00014

Sharp, C., Williams, L. L., Ha, C., Baumgardner, J., Michonski, J., Seals, R., Patel, A. B., Bleiberg, E. and Fonagy, P. (2009). The development of a mentalization-based outcomes and research protocol for an adolescent inpatient unit. *Bulletin of the Menninger Clinic*, *73*(4), 311–338. doi:10.1521/bumc.2009.73.4.311

Shmueli-Goetz, Y., Target, M., Fonagy, P., & Datta, A. (2008). The child attachment interview: A psychometric study of reliability and discriminant validity. *Developmental Psychology*, *44*(4), 939–956. doi:10.1037/0012-1649.44.4.939

Sim, L., Friedrich, W. N., Davies, W. H., Trentham, B., Lengua, L., & Pithers, W. (2005). The child behavior checklist as an indicator of posttraumatic stress disorder and dissociation in normative, psychiatric, and sexually abused children. *Journal of Traumatic Stress*, *18*(6), 697–705. doi:10.1002/jts.20078

Springman, R. E., Wherry, J. N., & Notaro, P. C. (2006). The effects of interviewer race and child race on sexual abuse disclosures in forensic interviews. *Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders*, *15*(3), 99–116. doi:10.1300/J070v15n03_06

Target, M., Fonagy, P., & Shmueli-Goetz, Y. (2003). Attachment representations in school-age children: The development of the Child Attachment Interview (CAI). *Journal of Child Psychotherapy, 29*(2), 171–186.

Target, M., Fonagy, P., Shmueli-Goetz, Y., Datta, A., & Schneider, T. (2007). *The Child Attachment Interview (CAI) Protocol*. Unpublished, University College London.

Tausczik, Y. R., & Pennebaker, J. W. (2010). The psychological meaning of words: LIWC and computerized text analysis methods. *Journal of Language and Social Psychology*, *29*(1), 24–54. doi:10.1177/0261927X09351676

U.S. Department of Human and Health Services (2013). *Child maltreatment 2013*. Retrieved from http://www.acf.hhs.gov/programs/cb/stats_research/index.htm#can

Venta, A., Hatkevich, C., Mellick, W., Vanwoerden, S., & Sharp, C. (2016). Social cognition mediates the relation between attachment schemas and post-traumatic stress disorder. *Psychological Trauma: Theory, Research, Practice, and Policy*. Advance onlinepublication. doi:10.1037/tra0000165

Venta, A., Shmueli-Goetz, Y., & Sharp, C. (2014). Assessing attachment in adolescence: A psychometric study of the child attachment interview. *Psychological Assessment*, *26*(1), 238–255. doi:10.1037/a0034712

Walsh, C., Jamieson, E., MacMillan, H., & Trocmé, N. (2004). Measuring child sexual abuse in children and youth. *Journal of Child Sexual Abuse: Research, Treatment, & Program Innovations for Victims, Survivors, & Offenders*, *13*(1), 39–68. doi:10.1300/J070v13n01_03

Zimmerman, M., & Mattia, J. I. (1999). Is posttraumatic stress disorder underdiagnosed in routine clinical settings? *Journal of Nervous and Mental Disease*, *187*(7), 420–428. doi:10.1097/00005053-199907000-00005