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## Narrative Characteristics of Genocide Testimonies Predict Posttraumatic Stress Disorder Symptoms Years Later

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### Abstract

Cognitive theories of posttraumatic stress disorder (PTSD) suggest that trauma narratives that make greater use of somatosensory, perceptual, and negative emotion words may be indicators of greater risk of PTSD symptoms (Ehlers & Clark, 2000). The purpose of this study was to analyze whether the way that survivors of the 1994 Rwandan Genocide against the Tutsi naturally construct genocide testimonies predicts PTSD symptoms six years later. One hundred orphaned heads of household (OHH) who were members of a community association gave testimonies about their genocide experiences in 2002. In 2008, PTSD symptoms of 61 of the original OHH were assessed using a genocide specific version of the Impact of Events Scale-Revised (Weiss & Marmar, 2004). Experienced genocide events were coded from the genocide testimonies, and the types of words used in the testimonies were analyzed using the Linguistic Inquiry and Word Count program (Pennebaker, Chung, Ireland, Gonzales, & Booth, 2007). Pearson correlations and path analyses assessed the relationships between variables. After accounting for genocide events, touching positively predicted avoidance, and sadness negatively predicted hyperarousal. Sensory descriptions of traumatic experiences in trauma narratives may signify higher risk for mental health problems, while expressions of sadness may indicate emotional processing and better mental health. Analyzing genocide testimonies may help identify survivors at the highest risk of developing PTSD symptoms, even among a group of survivors who have arguably suffered some of the most severe genocide experiences.

### Keywords

Genocide testimony; PTSD; Cognitive and emotional processing; linguistic components; Orphaned survivors

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In 1994, over the course of 100 days, approximately one million people were brutally killed in the 1994 Rwandan Genocide against the Tutsi. Death was inflicted by decapitation,

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stabbing, clubbing, drowning, starvation, and other horrific methods (Human Rights Watch, 1999). The perpetrators of the violence were not only military and paramilitary groups, but also neighbors, former friends, and even family members (Staub, Pearlman, Gubin, & Hagenimana, 2005). Most people were killed in their local communities by people who were known to them (Dyregrov et al., 2000).

Survivors were exposed to extreme levels of physical and psychological violence including rape, torture, mutilation, and witnessing their family members and loved ones being brutally attacked and murdered (Human Rights Watch, 1999). Studies have reported that 94% of people in Rwanda during the genocide experienced at least one genocide event including witnessing the murder of family members, having their property and homes destroyed, and having their lives threatened (Pham, Weinstein & Longman, 2004). Virtually every child survivor witnessed violence and believed they would die during the genocide (Dyregrov et al. 2000). Orphaned survivors of the genocide were not only exposed to extraordinarily severe forms of violence, but their parents were killed, sometimes in their presence. After the genocide, many of these children took on the responsibility of caring and providing for other child survivors (Schaal & Elbert, 2006). As a result of these experiences, survivors of the 1994 Rwandan Genocide against the Tutsi are at high risk of mental health concerns, with estimates of probable posttraumatic stress disorder (PTSD) diagnoses ranging from 29% to 79% (Dyregrov, Gupta, Gjestad, & Mukanoheli, 2000; Neugebauer et al., 2009; Schaal, Dusingizemungu, Jacob, & Elbert, 2011).

Following the genocide, many survivors gave written and oral accounts of their genocide experiences. Genocide testimonies are often seen as a means of bearing witness to the realities of mass violence, with the goal of education, advocacy, and justice, and often the hope that the experiences of genocide would become part of collective knowledge and contribute to society's acknowledgement of survivors' suffering and survival (Weine, Kulenovic, Pavkovic, & Gibbons, 1998). Although testimonies are often seen primarily as a way to preserve history and help societies and communities, it is possible that their content could be used to provide insight into the ways that survivors conceptualize their genocide experience and whether these conceptualizations contribute to the development and maintenance of PTSD symptoms.

Research on trauma-focused treatments has found that interventions that involve asking individuals with PTSD to describe traumatic incidents from their past in narrative form are effective at reducing PTSD symptoms (Bisson & Andrew, 2007; Van Etten & Taylor, 1998). In addition, some studies have found that participants who wrote about distressing experiences have better physical and mental health outcomes months later compared to participants who wrote about neutral events (Frattaroli, 2006). These interventions and research studies typically used "narrative reliving" approaches to help elicit traumatic memories, which asks participants to describe the traumatizing events as vividly and with as much detail as possible, including how they felt, what they thought, what they saw, and everything about their surroundings that they could remember, as if it were happening in the present (Foa, Molnar, & Cashman, 1995; Jones, Harvey, & Brewin, 2007; O'Kearney & Perrott, 2006). These prompts may influence the way that participants construct their trauma narratives, and indeed it is theorized that specifically eliciting details of traumatic events that

survivors may otherwise avoid enhances emotional processing of trauma memories, thereby reducing PTSD symptoms (Foa, Hembree, & Rothbaum, 2007).

In contrast to trauma narratives, individuals who give genocide testimony (not as part of a legal trial) are typically not encouraged to describe their experience in particular ways. Instead it is thought that survivors describe their genocide experiences in more naturalistic ways, highlighting details they are comfortable sharing, with the primary purpose of documentation rather than solace (Weine et al., 1998). Despite these differences, trauma narratives and genocide testimonies are both detailed descriptions of distressing past events, and therefore it may be possible to learn about survivors' psychological states and mental health through analysis of their genocide testimonies, both in terms of the experiences that survivors report and the way that they construct their testimonies. This information may provide insight into how survivors process their traumatic experiences, which may predict their PTSD symptoms years later.

Cognitive models of PTSD suggest that trauma narratives may provide clues about the way people process distressing events and make sense out of senseless situations (Pennebaker & Seagal, 1999; Siegel, 1997). One such model states that PTSD persists because of negative appraisals of trauma and its sequelae (Ehlers & Clark, 2000). The model suggests that memories of distressing events have poor contextualization and elaboration, strong perceptual priming, and strong associations, which can lead to intrusive thoughts and persistent PTSD. In addition, disrupted autobiographical memory leads to difficulty retrieving complete memories, thus resulting in disjointed and poorly detailed accounts of traumatic events (Amir, Stafford, Freshman, & Foa, 1998; Foa & Riggs, 1993; Van der Kolk & Fislser, 1995). The inability to remember details of a traumatic event is thought to maintain the sense of threat and can lead to inaccurate and erroneous appraisals that exacerbate negative emotions (Ehlers & Clark, 2000). Although individuals with PTSD may have difficulty intentionally accessing memories of the traumatic event, they often experience involuntary intrusive memories that are very emotional and vivid, and consist of sensory impressions rather than thoughts. These sensory impressions include heightened awareness of physical body states and sensations such as awareness of sounds, tactile experiences, and smells. The theory further predicts that negative appraisals result in strong and persistent negative emotions such as anxiety, depression and anger (Ehlers & Clark, 2000).

Due to potential increased awareness of somatosensory/perceptual experiences and negative emotion when recalling traumatizing memories, it is possible that narratives that use a greater percentage of these types of words may be indicators of the presence of, or increased risk for, PTSD symptoms (Brewin, Dalgleish, & Joseph, 1996; Hellowell & Brewin, 2004; O'Kearney & Perrott, 2006). Using the text analysis program Linguistic Inquiry and Word Count (LIWC: (Pennebaker et al., 2007) researchers have found some support for the hypothesis that individuals who produce trauma narratives with proportionally more negative emotional expression and more body state and sensory/perceptual words are more likely to report PTSD symptoms (Alvarez?Conrad, Zoellner, & Foa, 2001; Beaudreau, 2007; Eid, Johnsen, & Saus, 2005; Jones et al., 2007). Overall word use was mixed, with one study finding that participants who used more words in their trauma narratives reported fewer PTSD symptoms (Beaudreau, 2007), and another study finding no association between the

number of words used and PTSD symptoms (Alvarez-Conrad et al., 2001). One limitation of these existing studies is that most were cross-sectional, and the two that investigated these relationships longitudinally had relatively short follow-up periods of three (Jones et al., 2007) to four months (Eid et al., 2005), making it difficult to discern the temporal relationship between narrative characteristics in trauma narratives and PTSD symptoms.

Moreover, while the existing literature suggests that trauma narrative characteristics are associated with PTSD symptoms, it may be the case that the primary predictors of PTSD symptoms are the traumatic events themselves, rather than the narrative characteristics used to describe those events, and that inclusion of characteristics of the traumatic events as predictors of PTSD would eliminate the significant effect of the narrative characteristics. Conversely, narrative characteristics may predict PTSD symptoms after including traumatic events, and may actually mediate the association between genocide events and PTSD symptoms. There are limited data analyzing this question, and results are equivocal. To our knowledge, only one study has tested the association between narrative characteristics and PTSD symptoms after accounting for the characteristics of the traumatic events themselves, and the only characteristic that was included was injury during the event. The researchers found that after controlling for injury, narrative characteristics including cognitive words, negative emotion words, and total word count no longer predicted PTSD symptoms, but death words continued to predict symptoms (Alvarez-Conrad et al., 2001).

Finally, cognitive models of PTSD suggest that compared to avoidance and hyperarousal PTSD symptoms, intrusion symptoms may be more associated with trauma narratives characterized by increased use of somatosensory/perceptual and negative emotion words. One study has investigated whether narrative characteristics differentially predict intrusion, hyperarousal, and avoidance symptoms, and found that negative emotion positively predicted intrusion but not avoidance symptoms (Eid et al., 2005). However, the analyses were bivariate correlations that did not take into account the likely overlapping variance between intrusion and avoidance symptoms.

The goal of this study is to describe the narrative characteristics of genocide testimonies of orphaned survivors of the 1994 Rwandan Genocide against the Tutsi and to analyze whether the use of somatosensory/perceptual and negative emotion words predicts PTSD symptoms six years later, after accounting for the genocide events that they experienced. The study seeks to improve upon the current literature by using a data set with a six year gap between the genocide testimonies and assessment of PTSD symptoms, assessing the differential prediction of intrusion, hyperarousal, and avoidance symptoms, and including the genocide events themselves as primary predictors. We hypothesized that 1) survivors who produced genocide testimonies with more negative emotional expression, sensory and perceptual words, and a higher word count would report more PTSD symptoms six years later, 2) the association between narrative characteristics and intrusion symptoms would be stronger than the association between narrative characteristics and avoidance or hyperarousal symptoms, and 3) after including genocide events as additional predictors of PTSD symptoms, narrative characteristics would continue to predict PTSD and might mediate the association between genocide events and PTSD symptoms.

## Method

### Participants and Procedure

Participants in this study were 100 (58 male) orphaned survivors of the 1994 Rwandan Genocide against the Tutsi who were members of the Rwandan Association des Orphelins Chefs de Ménages (AOCM) (i.e. the Association of Orphans Chiefs of Household). During the 1994 genocide they were between 5 and 27 years old, with a mean age of 14.

In 2002, AOCM researchers, who had been trained in interview techniques and strategies by researchers from the University of Southern California (USC), conducted semi-structured interviews to collect and record self-reported demographic information and genocide testimonies of the participants. Participants were selected by the AOCM board to represent a wide range of their members, with approximately equal numbers of males and females, from each of Rwanda's provinces in both rural and urban environments. Interviews were conducted in Kinyarwanda in participants' homes, in locations in villages that were selected by participants, or in the AOCM headquarters in Kigali City. The interviews were audio recorded and translated and transcribed into English by native Kinyarwanda speakers. Interviewers and transcribers were blind to the study hypotheses.

In order to obtain quantitative measurements of genocide events, four blinded US undergraduate research assistants coded the English transcripts using content analysis (Neuendorf, 2002). In order to code the transcripts efficiently, sequential overlapping coding, also known as a "not fully crossed" coding design, was used (Hallgren, 2012; Neuendorf, 2002). Therefore, every interview was randomly assigned to two coders, with six possible combinations of coders. In cases where discrepancies or missing information remained even after coders independently checked their own coding, items were reviewed and final decisions were made based on a close reading of the interview. For each pair of coders, interrater reliability of a continuous measure of genocide events was calculated using two-way mixed average-measures Intraclass Correlation Coefficients (ICC). ICC consistency was calculated as consistency. Three of the genocide testimonies could not be located, and so 2002 information for these three participants is limited to demographic information.

In 2008 a follow-up study was conducted to assess risk and resiliency factors and mental health in 99 of the original 100 participants (one participant asked to remain anonymous and was therefore not included in the follow-up) (Ng, Ahishakiye, Miller, & Meyerowitz, Under Review). Interviewers sought out participants at their last known village or address. If the original participants could not be located, interviewers asked neighbors or friends for information about their possible whereabouts, and attempted to locate them. Once located, the purpose and procedures of the follow-up study were explained and participants gave informed consent. Sixty-three of the original participants were located and 61 agreed to participate in the follow-up study. Of the 36 people from the 2002 sample who could not be located for the follow-up, information was available about the presumed whereabouts of 12: one had joined the military, two were away at jobs and school in other countries, seven had relocated and could not be found, and two were under psychiatric care.

Assessment measures used in the 2008 study were evaluated for cultural appropriateness by focus groups of orphaned survivors. Measures were revised and approved by the AOCM board members. After approval by the board, all measures and interview protocols were forward- and back-translated between English and Kinyarwanda by native Kinyarwanda speakers to ensure accuracy. Six AOCM members were selected as interviewers by the AOCM board, and participated in a week-long training on semi-structured interviewing by USC researchers and the AOCM project director. The study was approved by AOCM, Ibuka, a non-governmental umbrella organization of Rwandan genocide survivor associations, and the USC Institutional Review Board.

## Measures

**Gender and Age**—Participant gender and age were recorded in 2002. Age was only available for 88 participants because 12 participants did not report their age. ANOVAs were used to assess whether there were significant differences between the mean scores of the study variables (genocide events, words used in testimonies, and PTSD symptoms) of the 64 (72.73%) participants who were children (under 18) and the 24 (27.27%) who were adults at the time of the genocide. Results indicated that there were no significant differences in these variables between children and adults (all  $ps < .05$ ). Age was therefore used as a continuous variable.

**Genocide Events**—Genocide events were coded from the translated 2002 genocide testimonies using the procedure described above. Codes were developed from the Rwandese Children's Exposure to War Scenes Measure (Dyregrov et al., 2000), which assesses exposure to events that were common during the Rwanda Genocide. In order to ensure that the codes were comprehensive and specific to the population in this study (Layne et al., 2010; Netland, 2005), additional items were added that were relevant to the AOCM sample. Example genocide events include reports of having your home destroyed, being attacked, being beaten, being raped, witnessing people being killed, and seeing dead bodies. In total, 41 different genocide experiences were coded 1=yes it happened, and 0=no, it did not happen. The scale score was the sum of experienced genocide events. The mean ICC of genocide events, weighted by the number of transcripts coded by each pair, was .97.

**Narrative Characteristics of Genocide Testimonies**—In order to quantify how participants talked about their genocide experiences, a content-analysis computer program, LIWC (Pennebaker et al., 2007), analyzed the words used in the last portion of the 2002 interview transcripts in which participants described their genocide experiences. After asking participants about their family life and history prior to the genocide, participants were asked “can you tell me in detail your experiences of the genocide?” with prompts to elicit more information such as “Can you tell me the difficulties you encountered during the genocide?” and “What are the last memories of your parents?” If information about the participant's genocide experience was described in earlier portions of the interview, this information was also coded. Interviewer statements were removed from the transcripts prior to linguistic analysis.



With the exception of total word count, for each piece of text, LIWC computes the percentage of total words that are represented by each linguistic category. This study used eight linguistic categories that represented perceptual, sensory, negative emotion words, or have been found to be associated with PTSD symptoms in the literature. The categories were 1) seeing (e.g., view, saw, seen), 2) hearing (e.g. listen, heard), 3) touching (called “feeling” in the LIWC program) (e.g. feels, touch), 4) body states (e.g. cheek, hands, spit), 5) anxiety (e.g. worried, fearful, nervous), 6) anger (e.g. hate, kill, annoyed), 7) sadness (e.g. crying, grief, sad), and 8) word count (Pennebaker et al., 2007).

**PTSD Symptoms**—PTSD symptoms were assessed in 2008 using the Impact of Events Scale-Revised (IES-R: (Weiss & Marmar, 2004). The IES-R is a 22 item self-report questionnaire that assesses intrusion, avoidance and hyperarousal symptoms consistent with the PTSD symptoms defined by the Diagnostic and Statistical Manual of the American Psychiatric Association Version IV-TR (American Psychiatric Association, 2000) that has been used in post-genocide Rwandan samples (Dyregrov et al., 2000). The IES-R asked participants to rate the distress of each item “with respect to the genocide” over the past two months. Items are scored from 0 (“not at all”) to 4 (“extremely”). The three subscales of the IES-R were used in these analyses.

**Intrusion:** Intrusion was the mean of seven of the eight IES-R items that compose the intrusion subscale. Item 2 (“I had trouble staying asleep”) was dropped from the scale because in Kinyarwanda it could not be distinguished from item 15 (“I had trouble falling asleep”), which is on the hyperarousal scale. Item 15 was also not included on the hyperarousal scale. In the current sample the internal consistency was excellent ( $\alpha=.87$ ).

**Hyperarousal:** Hyperarousal was the mean of five of the six IES-R items that compose the hyperarousal subscale. As noted above, item 15 was dropped from the scale since it could not be distinguished from an item that typically loads on the intrusion subscale. The internal consistency in this sample was good ( $\alpha=.78$ ).

**Avoidance:** Avoidance was the mean of seven of the eight IES-R items that compose the avoidance subscale. There was disagreement between translators over the translation of Item 17, which was intended to ask whether participants endorsed “I tried to remove the genocide from my memory,” and so this item was dropped from the scale. The internal consistency of the avoidance scale was poor ( $\alpha=.63$ ), however factor analysis indicated only one factor had an eigenvalue greater than one, and that this factor accounted for 81.73% of the variance of the avoidance items. Therefore, despite the low Cronbach’s alpha, avoidance was retained as a variable in the models.

## Data Analysis

To assess hypotheses one and two, Pearson correlations were run. Pearson correlations for age and t-tests for sex were also run to see whether these variables were correlated with outcomes, and if so they were included as covariates in regressions models. To assess hypothesis three, first one multivariate regression was run to assess whether genocide events simultaneously predicted intrusion, hyperarousal, and avoidance. Second, the hypothesized

model was tested for each narrative characteristic using single-step path analysis, in which all path coefficients were analyzed simultaneously. Mediation analyses were conducted using the product of coefficients approach with bootstrapped (20,000 repetitions) bias-corrected confidence intervals. The models were saturated and used only observed variables, and so model fit statistics were not analyzed (Hayes, Preacher, & Myers, 2011). In order to improve estimates using variables with some non-normality and to address missingness, the analyses used full information maximum likelihood estimation (FIML). Even for small sample sizes, FIML has been found to perform reasonably well (Hoyle, 1995). Analyses were conducted in Mplus version 6.12 (Muthén & Muthén, 2010). Two-sided tests of significance using  $p < .05$  were used for all analyses.

## Results

Participants reported experiencing an average of 11.05 ( $SD=4.26$ ) of the 41 possible genocide events with a range of 3 to 20 events. The most commonly reported events were having your home destroyed or damaged (94.85%), witnessing people being killed (93.81%), witnessing people being attacked (88.54%) and being threatened with death (83.51%). In addition 42.11% of participants reported being injured during the genocide, 41.24% reported witnessing others being raped, and 7.22% reported being raped.

The Genocide testimonies contained between 350 and 2,091 words (mean=870.12,  $SD=402.97$ ). The most frequently used word category was anger words, which accounted for a mean of 2.48% ( $SD=.75$ ) of the total words used in the genocide testimonies, or an average of 20.77 ( $SD=9.88$ ) words in the entire narrative. Words expressing sadness (mean percent of words=.24,  $SD=.20$ ; mean number of words=2.02,  $SD=1.78$ ) and anxiety/fear (mean percent of words =.14,  $SD=.15$ ; mean number of words=1.16,  $SD=1.20$ ) were far less common, with many participants using no words that expressed these emotions. Somatosensory words were somewhat more common, although each category still accounted for fewer than 1% of the total words used. Words describing seeing accounted for .97% ( $SD=.50$ ; mean number of words=8.07,  $SD=4.96$ ) of words on average, hearing accounted for .55% ( $SD=.31$ , mean number of words=5.05,  $SD=4.07$ ), touching accounted for .14% ( $SD=.15$ , mean number of words=1.23,  $SD=1.30$ ), and body words accounted for .35% ( $SD=.28$ , mean number of words=3.22,  $SD=3.05$ ). See Table 1 for descriptive statistics of all study variables.

PTSD symptoms were highly prevalent in this sample (Ng et al., Under Review), with an overall mean score on the IES-R of 2.29 ( $SD=.85$ ) out of 4, with 81.97% of the sample having IES-R scores above 1.5, which has been determined to be the threshold with the best diagnostic accuracy for assessing PTSD in Vietnam Veterans (Creamer, Bell, & Failla, 2003). All of the subscale scores were also highly elevated, with mean scores of 2.51 ( $SD=1.01$ ) for intrusion, 2.11 (1.11) for hyperarousal and 2.18 (.80) for avoidance. On average participants endorsed experiencing symptoms “somewhat” to “a lot.”

To assess whether any 2002 variables predicted attrition, logistic analyses were run in which all 2002 variables were included as predictors of the 2008 study. Results of logistic regressions indicated that none of the 2002 variables predicted follow-up completion (all



$p > .25$ ) (see Table 1). Results of Pearson correlations found that neither sex nor age predicted narrative characteristics or PTSD symptoms (see Table 2) and further assessment of the relationship between sex and study variables using t-tests also found no significant relationships, and therefore neither sex nor age were included as covariates in any regression models.

Results of Pearson correlations indicated that hypotheses one and two were partially supported, as some narrative characteristics predicted PTSD symptoms, and intrusion, hyperarousal, and avoidance were also differentially predicted (see Table 2). Results indicated that word count was positively associated with hyperarousal, body state words were positively associated with intrusion, hyperarousal, and avoidance, hearing was positively associated with hyperarousal and touching was positively associated with avoidance. Additionally, narrative characteristics were predicted by genocide events. Specifically, number of genocide events was positively associated with word count and body state words. Genocide events were also positively associated with intrusion and hyperarousal symptoms but were not associated with avoidance symptoms.

To assess whether narrative characteristics would predict PTSD after controlling for genocide events, and whether narrative characteristics might mediate the association between genocide events and PTSD symptoms, first a multivariate regression was run to assess whether genocide events simultaneously predicted intrusion, hyperarousal, and avoidance. Results of the multivariate regression indicated that genocide events positively predicted intrusion ( $B=2.80$ ,  $\beta=.29$ ,  $p=.009$ ) and hyperarousal symptoms ( $B=4.70$ ,  $\beta=.44$ ,  $p<.001$ ) and trended towards predicting avoidance symptoms ( $B=1.79$ ,  $\beta=.23$ ,  $p=.053$ ). Second, the hypothesized mediation path model for each narrative characteristic was tested. Results of the path analyses (see Table 3) found that when word count ( $B=2.27$ ,  $\beta=.23$ ,  $p=.054$ ) and body states ( $B=1.78$ ,  $\beta=.18$ ,  $p=.22$ ) were included as predictors of PTSD symptoms, genocide events no longer predicted intrusion symptoms, but genocide events continued to predict hyperarousal symptoms. Moreover, genocide events positively predicted word count ( $B=1593.34$ ,  $\beta=.41$ ,  $p<.001$ ) and body state words ( $B=1.11$ ,  $\beta=.42$ ,  $p<.001$ ). However, when genocide events were included as predictors of PTSD symptoms, neither word count nor body states predicted intrusion symptoms or any of the other PTSD outcomes. Therefore, there was no evidence of mediation.

However, hypothesis three was partially supported, as after accounting for genocide events, touching remained a significant predictor of avoidance ( $B=1.89$ ,  $\beta=.35$ ,  $p=.007$ ), indicating that the more words expressing touch that were used in genocide narratives in 2002, the more avoidance PTSD symptoms participants reported in 2008. Moreover, after accounting for genocide events, sadness words negatively predicted hyperarousal symptoms ( $B=-1.24$ ,  $\beta=-.23$ ,  $p=.006$ ), indicating that the more participants expressed sadness in their 2002 genocide testimonies, the fewer hyperarousal symptoms they reported in 2008. Although touch and sadness words predicted PTSD symptoms after controlling for genocide events, they did not mediate the association between genocide events and PTSD symptoms (see Table 3).

## Discussion

Participants in this study reported experiencing and witnessing extreme violence during the genocide, and six years later they reported highly elevated PTSD symptoms, with over 80% having scores on a PTSD measure that are typically associated with diagnosable PTSD (Ng et al., Under Review). While there was a positive dose-response relation between genocide events and PTSD symptoms, the amount of exposure to genocide events did not wholly explain the distribution of PTSD symptoms. Indeed, the percent of variance explained by genocide events was only 18.49% for hyperarousal and 7.29% for intrusion, while genocide events did not significantly predict avoidance. Given the somewhat modest prediction of PTSD symptoms from genocide events, researchers have suggested that the way participants conceptualize and understand their genocide experience may contribute to PTSD symptoms above and beyond the genocide events themselves.

The primary purpose of this study was to assess whether expressions of negative emotion and sensory/perceptual descriptions in genocide testimonies would predict genocide related PTSD symptoms years later, even after accounting for the number of genocide events. Results were somewhat supportive of the hypotheses. Consistent with results of previous studies (Alvarez-Conrad et al., 2001; Beaudreau, 2007; Eid et al., 2005; Jones et al., 2007), use of sensory/perceptual words and the word count of genocide testimonies given in 2002 predicted PTSD symptoms in 2008. Specifically, use of body state words was positively associated with intrusion, hyperarousal, and avoidance, hearing was positively associated with hyperarousal, touching was positively associated with avoidance, and word count was positively associated with hyperarousal.

However, after accounting for genocide events, only touching remained a significant predictor of avoidance symptoms. It may be that body state, hearing words, and word count were acting more as proxies for genocide events rather than unique indicators of cognitive or emotional processing. In contrast, it is notable that the use of tactile words predicted PTSD symptoms six years later, particularly since participants used relatively few tactile words (range of 0 to 6 tactile words per testimony), and that genocide events did not predict the use of tactile words. As suggested by cognitive processing theories, the differences in the use of tactile words may be the result of differences in internal processing of the genocide events that contribute to differences in PTSD symptoms years later, with participants who express more details regarding tactile experiences at greater risk of PTSD. Further understanding of these internal processes may assist with identification of at risk individuals and the development of interventions.

Results also indicated that sadness, which was not originally correlated with PTSD symptoms, negatively predicted hyperarousal symptoms after genocide events were included as predictors. Although cognitive models of PTSD suggest that negative emotional expressions in trauma narratives may be a sign of negative appraisals that can exacerbate and sustain PTSD symptoms (Ehlers & Clark, 2000), researchers have also suggested that emotional expression in trauma narratives may be a sign of emotional processing that has been associated with improved health (Pennebaker, 1993). Indeed, one of the critical components of PTSD interventions that use a narrative approach is to elicit emotional

expressions that may otherwise be suppressed or avoided, thereby promoting emotional processing (Foa et al., 1995; O'Kearney & Perrott, 2006). It may be that participants who expressed more sadness in their genocide testimonies were actively engaged in emotional processing of the experience, or had already engaged in emotional processing which allowed them to express more sadness in their testimonies.

### Strengths and Limitations

This study has several limitations. PTSD symptoms were not assessed in 2002, and so information is not available to assess the association between words used in genocide testimonies and PTSD symptoms in 2002, or to estimate the change in PTSD symptoms over time. It may be that the association between words used in genocide testimonies in 2002 and PTSD symptoms in 2008 is an artifact of the association between existing PTSD symptoms in 2002 and 2008. Despite this limitation, this study did demonstrate a relation between the way participants constructed genocide testimonies and PTSD symptoms, which was a primary aim of the study.

Additionally, accurate measurement of the study variables was difficult. For example, the measurement of the LIWC-derived variables was dependent on the accuracy of the translations of the genocide testimonies from Kinyarwanda to English. However, the error introduced into the accuracy of the genocide testimonies would be expected to reduce the significant effects in the model. Despite this expected error, the words used in the translated genocide testimonies still predicted PTSD outcomes and were also predicted by genocide testimonies. Genocide events and narrative characteristics of genocide testimonies were also derived from the same narratives, and therefore the associations between them may be inflated. Use of an independent report of genocide experiences may lead to a different pattern of relations. The nature of the genocide testimonies also required a coding system that may have underestimated the true genocide experiences of the participants. Although coding of the genocide testimonies may have resulted in the reporting of genocide exposure in a more naturalistic and personal way than a checklist approach, the genocide experiences were reported retrospectively in an unstructured manner, and are therefore limited to information participants chose to share with limited prompting, and are not necessarily representative of their full genocide experiences.

The present study also had statistical limitations due to the small sample size which was further exacerbated by moderate retention rates and a sizable amount of missing data, which might have resulted in limited power to detect differences. Finally, findings may be limited in their generalizability to other OHH in Rwanda, as the participants themselves were not a random sample of OHH, but rather were all members of the AOCM organization who were selected for participation by the AOCM leadership. Moreover, the individuals who participated in the study were all willing to provide their genocide testimonies, and 99% were willing to have their identities connected to their testimonies, and may therefore be a unique self-selected group, that may further limit the generalizability of the results.

Despite these limitations, this study had a number of strengths including having two time points six years apart that allowed for the long-term prediction of PTSD symptoms from reported genocide exposure and LIWC variables, and the inclusion of all three aspects of

PTSD. In addition, by analyzing genocide testimony rather than trauma narratives that prompt participants to engage in “narrative reliving,” the study was able to identify the lexicon used when describing genocide experiences in a more naturalistic manner.

Finally, this study was conducted by, for, and with the full collaboration and participation of AOCM, a grass-roots community organization of OHH. AOCM’s participation helped increase the cultural relevance and sensitivity of the study and ensured that the questions being asked were meeting the specific needs of their membership. Indeed, some of the limitations described above such as use of a non-random sample and not assessing PTSD symptoms in 2002 were due in part to prioritizing the needs of AOCM and their beneficiaries. The primary purpose of the data collection in 2002 was to help the AOCM leadership document the genocide testimonies of some of their members, and the primary purpose of data collection in 2008 was to identify existing needs and daily hardships including financial, educational, social, and mental health concerns (Ng et al., Under Review). While many other variables, including post-genocide potentially traumatic events, may be contributing to observed PTSD rates in 2008, these constructs were not of primary importance to AOCM, and so they were not assessed. Although the collaboration necessitated limiting the scope of the constructs that could be assessed, we believe that the collaboration with AOCM is a major strength of the paper, as the variables that were assessed in the study were contextually relevant and useful for the needs of the community association.

## Conclusion

As genocide and ethnic conflict continue to spread around the world, survivors may be increasingly called upon to give testimony as a way of documenting the atrocities they experienced. Although survivors may give testimony for reasons beyond themselves, such as honoring those who were killed and ensuring that the world remembers the horrors they experienced, the results of the present study suggest that their efforts to help others may also be used to help them. Overall this study suggests that patterns of word usage in genocide testimony may predict PTSD symptoms over and above the variance predicted by genocide experiences. With further understanding, refinement, and replication, it may be possible to use linguistic analysis of genocide testimonies to help identify genocide survivors who are at risk of long-term PTSD symptoms, even years after they provide their testimonies. Moreover, analyzing testimonies given years ago may still provide insight into current PTSD symptoms.

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**Table 1**  
 Descriptives of Study Variables and Results of Logistic Regressions of Study Variables Measured in 2002 Predicting Completion of 2008 Follow-up (FU)

Measure	Total Sample (N=100)		Completed FU (n=61)		Did Not Complete FU (n=39)		OR	Test of Prediction of FU Completion	p
	Mean	SD	Mean	SD	Mean	SD			
<b>2002 Sociodemographics</b>									
Male	58.00%	---	56.00%	---	62.00%	---	1.27		.57
Age <sup>a</sup>	22.25	5.06	21.81	5.31	22.91	4.64	1.04		.31
<b>1994 Genocide experiences<sup>b</sup></b>	11.05	4.26	11.43	4.27	10.49	4.25	.95		.29
<b>Words Used in 2002 Genocide Testimonies</b>									
Seeing (View, saw, seen)									
Percent of total words in narrative	0.97	0.50	.95	.49	.99	.53	1.16		.72
Absolute number of seeing words	8.07	4.96	---	---	---	---	---		---
Hearing (Listen, heard)									
Percent of total words in narrative	0.55	0.31	.57	.32	.52	.30	.61		.47
Absolute number of hearing words	5.05	4.07	---	---	---	---	---		---
Touching (Feels, touch)									
Percent of total words in narrative	0.14	0.15	.15	.14	.12	.17	.29		.38
Absolute number of touching words	1.23	1.30	---	---	---	---	---		---
Body (Cheek, hands, spit)									
Percent of total words in narrative	0.35	0.28	.37	.25	.31	.30	.42		.28
Absolute number of body words	3.22	3.05	---	---	---	---	---		---
Anxiety (Worried, fearful, nervous)									
Percent of total words in narrative	0.14	0.15	.12	.13	.16	.19	4.78		.25
Absolute number of anxiety words	1.16	1.20	---	---	---	---	---		---
Anger (Hate, annoyed)									
Percent of total words in narrative	2.48	0.75	2.50	.73	2.44	.79	.90		.70
Absolute number of anger words	20.77	9.88	---	---	---	---	---		---
Sadness (Crying, grief, sad)									

Measure	Total Sample (N=100)		Completed FU (n=61)		Did Not Complete FU (n=39)		OR	p
	Mean	SD	Mean	SD	Mean	SD		
Percent of total words in narrative	0.24	0.20	.25	.23	.22	.16	.39	.39
Absolute number of sadness words	2.02	1.78	---	---	---	---	---	---
Word Count	870.12	402.97	871.62	383.42	867.90	435.56	1.00	.96
<b>2008/2009 PTSD Symptoms</b>								
Intrusion	---	---	2.51	1.01	---	---	N/A	N/A
Avoidance	---	---	2.18	0.80	---	---	N/A	N/A
Hyperarousal	---	---	2.12	1.11	---	---	N/A	N/A

<sup>a</sup> n=88 for the total sample since 12 people did not report their age in 2002.

<sup>b</sup> n=97 since genocide testimonies were not available for 3 people.

OR = Odds ratio

N/A=Not applicable, since variables were only assessed in 2008.

**Table 2**

Correlations among Genocide Events, Narrative Characteristics, and PTSD

Variable	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. Male	---												
2. Age	.07	---											
3. Genocide events	-.17	-.06	---										
4. Seeing	-.10	-.14	-.07	---									
5. Hearing	-.09	-.15	.13	-.02	---								
6. Touching	-.02	-.02	.12	.13	-.14	---							
7. Body states	-.03	-.04	.42****	.06	-.02	.35****	---						
8. Anger	-.08	.02	.15	.03	-.11	-.07	-.10	---					
9. Sadness	-.11	-.20	.10	-.04	.05	-.00	.01	.19	---				
10. Anxiety	.15	-.15	-.11	.08	.05	-.04	-.14	-.03	-.01	---			
11. Word count	-.08	.04	.41****	-.17	.21*	.01	.18	-.27**	-.08	-.04	---		
12. Intrusion	-.12	.13	.27*	-.16	-.03	.20	.30*	.16	-.18	-.02	.24	---	
13. Hyperarousal	-.07	-.00	.43****	-.14	.27*	.21	.27*	.12	-.21	.07	.31*	.72****	---
14. Avoidance	-.23	-.01	.24	.03	.07	.36**	.30*	.15	-.13	-.15	.08	.50****	.67****

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$ .

Note. Correlations based on complete cases. For correlations with variables three to 11,  $n = 97$ . For correlations with variables 11–14,  $n = 61$ .

**Table 3**

Path Coefficients and Indirect Effects for Mediation Models, B(SE),  $\beta$

	to Narrative Characteristic	to Intrusion	to Hyperarousal	to Avoidance
<b>Word Count</b>				
from Genocide Events	1593.34 (361.32), .41***	2.27 (1.18), .23	4.07(1.18), .38***	1.76 (1.80), .23
from Word Count	---	.001 (<.001), .21	.001 (<.001), .23	<.001 (<.001), .01
Indirect Effect, B [95% CI]	---	1.11 [-.17, 2.36]	1.30 [-.007, 2.58]	.12, [-1.00, .93]
<b>Body States</b>				
from Genocide Events	1.11 (.19), .42***	1.78 (1.45), .18	4.42 (1.54), .42**	.87 (1.16), .11
from Body States	---	.80 (.59), .22	.22 (.66), .06	.72 (.45), .25
Indirect Effect B [95% CI]	---	.89 [-.22, 2.36]	.56 [-1.04, 1.88]	.93 [-.007, 2.06]
<b>Hearing</b>				
from Genocide Events	.40 (.30), .13	2.93 (1.12), .30**	4.29 (1.17), .41***	1.75 (.95), .23
from Hearing	---	-.23 (.43), -.07	.68 (.43), .19	.06 (.34), .02
Indirect Effect B [95% CI]	---	-.09 [-.91, .17]	.27 [-.09, 1.18]	.02 [-.27, .47]
<b>Touching</b>				
from Genocide Events	.18 (.12), .12	2.62 (1.13), .27*	4.51 (1.14), .42***	1.50 (.94), .19
from Touching	---	1.16 (.87), .17	1.20 (.95), .16	1.89 (.70), .35**
Indirect Effect B [95% CI]	---	.20 [-.07, .93]	.21 [-.08, .99]	.33 [-.04, 1.05]
<b>Seeing</b>				
from Genocide Events	-.36 (.53), -.07	2.85 (1.03), .29**	4.74 (1.13), .44***	1.78 (.94), .23
from Seeing	---	-.38 (.31), -.19	-.37 (.27), -.17	.05 (.24), .03
Indirect Effect B [95% CI]	---	.14 [-.17, 1.08]	.13 [-.17, 1.00]	-.02 [-.48, .21]

	to Narrative Characteristic	to Intrusion	to Hyperarousal	to Avoidance
<b>Anger</b>				
from Genocide Events	1.07 (.63), .15	2.60 (1.18), .27*	4.62 (1.20), .44***	1.63 (.97), .21
from Anger	---	.14 (.25), .11	.05 (.20), .04	.11 (.18), .11
Indirect Effect B [95% CI]	---	.15 [-.58, 1.07]	.06 [-.33, .78]	.12 [-.17, .87]
<b>Anxiety</b>				
from Genocide Events	-.16 (.16), -.11	2.78 (1.06), .28**	4.64 (1.14), .44***	1.87 (.93), .24*
from Anxiety	---	-.10 (1.10), -.02	.52 (1.01), .07	-1.04 (.73), -.20
Indirect Effect B [95% CI]	---	.02 [-.38, .77]	-.08 [-1.08, .16]	.16 [-.09, 1.05]
<b>Sadness</b>				
from Genocide Events	.18 (.19), .09	3.02 (1.14), .31**	4.99 (1.13), .47***	1.91 (.93), .25*
from Sadness	---	-.95 (.69), -.19	-1.24 (.46), -.23**	-.55 (.45), -.14
Indirect Effect B [95% CI]	---	-.18 [-.95, .11]	-.23 [-.85, .21]	-.10 [-.59, .08]

\*  $p < .05$ .

\*\*  $p < .01$ .

\*\*\*  $p < .001$

*Note.* For indirect effects, the 95% bias-corrected confidence interval is presented in parentheses.