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Co-remiscing with a Caregiver about a Devastating Tornado: Association with Adolescent Anxiety Symptoms

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Abstract

This study explores the association between caregivers' style of co-remiscing with their adolescents about an EF4 tornado and youth anxiety symptoms several years following the disaster. Caregiver reward of their children's emotional expression, defined as attending to and validating emotionally salient content, is generally associated with adaptive youth psychosocial outcomes. However, caregiver reward of youth recollections that are centered around the youth's negative emotional expression could be an indicator that both caregivers and adolescents are engaged in co-rumination regarding negative emotional experiences. This process may contribute to relatively higher levels of anxiety over time. Adolescents (N=169) drawn from an ongoing study for aggressive youth (ages 12 to 17; 82% African American) provided individual recollections about their experiences during a devastating tornado four to five years following the disaster. Caregivers and youth then co-remisced about their tornado-related experiences. Individual youth recollections were coded for negative personal impact and use of negative emotion words; caregiver-adolescent conversations were coded for caregiver reward of negative emotional expression. Youth who noted more negative personal impacts and used more negative emotion words were higher in parent-rated youth anxiety and these associations were moderated by caregiver reward of negative emotional expression. The associations between youth recollection qualities and anxiety emerged only when caregivers exhibited high levels of reward of negative emotional expression. These patterns were generally stronger for girls compared to boys. Findings suggest that excessively discussing and rehashing negative experiences, especially several years after the disaster, may be a risk factor for anxiety among disaster-exposed adolescents.

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Informed Consent: Informed consent was obtained from all individual participants included in the study.

Keywords

Natural disaster; adolescents; emotion socialization; anxiety

Extant literature suggests that the ways in which youth remember and make meaning out of traumatic events are associated with youth mental health (e.g., Sales & Fivush, 2005). For example, some qualities of youth recollections, particularly about stressful events, have been linked to enduring post-traumatic stress and internalizing symptoms (Cunningham, Kliwer, & Garner, 2009; Hendrickson, Abel, Vernberg, McDonald, & Lochman, 2020). Caregivers likely also influence the ways in which their children make meaning out of traumatic or distressing experiences. That is, the ways in which youth and caregivers process a traumatic event together may influence the adolescents' appraisals of the situation, including making them more susceptible to anxiety. The current study explores two pathways associated with youth anxiety several years following exposure to a natural disaster. First, caregiver emotion socialization (ES; Eisenberg et al., 2001), including talking about emotions and responding to youth's emotion expression, have been shown to contribute to youth's adjustment (Miller-Slough & Dunsmore, 2016). Second, emerging literature has begun to assess caregiver ES during co-remembering with adolescents about trauma and how these processes influence the qualities of youth's trauma recollections (e.g., Hendrickson et al., 2020). The current study extends this literature and explores a particular style of co-remembering, in which caregivers and adolescents jointly over-focus on negative emotional experiences while recalling their experiences during and after a devastating tornado. We also explored whether these patterns differed for boys and girls.

Youth Recollection Qualities and Anxiety Symptoms

Evidence of youth's processing of traumatic events has been found in the language that youth use when recalling trauma (Hambrick et al., 2018). Some literature suggests that expressing thoughts and feelings in recollections is associated with positive adjustment. Yet other studies demonstrate that select recollection qualities may be associated with elevated mental health symptoms in youth (Hambrick et al., 2018; Hendrickson et al., 2020). Personal impact, in particular, is considered to be an important element of meaning making that contributes to both adaptive and maladaptive adjustment (Greenhoot, Sun, Bunnell, & Lindboe, 2013). Discussion of how an event has personally influenced the individual provides clues about how youth are making sense out of, and remembering, their experiences (Greenhoot et al., 2013). Personal impacts can also reference the extent to which memories influence current adjustment and provide evidence regarding whether memories are pervasive or repeated over time.

Expression of emotion in trauma recollections is another indicator of processing. Using emotion words in speech may help the child to make sense of the traumatic event and to communicate emotion with others. However, repeated use of negative emotion words may indicate that the child is over-focused on their negative experiences. In one study of 7 to 12-year old children exposed to Hurricane Andrew (Legerski et al., 2015), the use of negative emotion words was correlated with elevated post-traumatic stress symptoms up to

7 months following the hurricane. In another study of youth exposed to an EF-5 tornado in Missouri, children's use of emotion terms was positively associated with internalizing symptoms when children discussed the "bad" things that happened during the tornado (Hambrick et al., 2018).

Overall, the specific details that emerge in recollections may provide insight into whether or not the individual is over-focused on negative emotional content. Recollection styles that are characterized by rumination, or the tendency to focus on one's own negative affect without engaging in active coping or problem solving have been associated with both depressive symptoms and anxiety among youth (McLaughlin & Nolen-Hoeksema, 2011). This occurs, in part, because ruminating youth may be more likely to focus on negative aspects of events, interpret ambiguous stimuli as threatening, and have difficulty generating and implementing solutions to problems (McLaughlin & Nolen-Hoeksema, 2011).

The Role of Caregiver Emotion Socialization on Youth Recollection Qualities and Anxiety

The benefit of disclosing thoughts and feelings about past experiences may depend on how caregivers respond to their adolescents' attempts to express thoughts and emotions, such as through caregiver emotion socialization (ES; Eisenberg et al., 2001). In general, ES practices fall into two categories: supportive and unsupportive (Gottman, Katz, & Hooven, 1996). Caregivers who use supportive strategies tend to encourage and validate emotion expression and help build emotion-based coping skills (Castro & Nelson, 2018). In contrast, unsupportive strategies may involve minimizing emotion expression or becoming overly focused on their own emotions. Caregivers who engage in supportive ES tend to have youth with fewer mental health concerns (Klimes-Dougan et al., 2007); although it should be noted that over-engaging in some of the supportive ES strategies, such as validation of emotion, may be associated with maladjustment under some circumstances (e.g., Miller-Sough & Dunsmore, 2016). For example, a pattern of over-focusing on negative experiences has been shown to increase risk for psychopathology (Brand & Klimes-Dougan, 2010). Notably, caregivers' also socialize their youth's emotion during discussions about past events. For example, caregivers demonstrate more elaborative and emotion language during co-remembering about traumatic past events (e.g., Bauer et al., 2005).

One adaptive ES practice is caregiver reward of youth emotional expression. Rewarding the expression of emotion includes asking open-ended questions, reflecting, empathizing, and problem-solving coping strategies. Reward of emotion expression, particularly negative emotions, is generally associated with adaptive youth psychosocial outcomes (Miller-Slough & Dunsmore, 2016). However, caregiver reward of negative emotion expression in some situations may also be an indicator that the caregiver is playing a role in developing a pattern of rumination about negative experiences. Several studies have found that caregivers who respond to their adolescents' distress by showing their own distress or repeating their youth's worries, may actually prolong their adolescents' emotional reactivity and distress (Moed et al., 2015). This type of process, in which the parent is focused on negative emotional experiences, may disrupt caregiver modeling and teaching of appropriate

regulation strategies and may contribute to adolescents' negative attributional biases about their own experiences.

Potential Links Between Caregiver-Adolescent Emotion Socialization and Co-Rumination

The literature on co-rumination may provide another way to conceptualize how caregivers shape adolescents' emotions when discussing past emotionally-charged events. Limited research, however, has examined how the concept of co-rumination may relate to caregivers' supportive and unsupportive ES patterns. One possibility is that ES qualities that appear similar to co-rumination may socialize a negative style of thinking that leads to excessive or repetitive focus on negative emotion (Rose, 2002). When discussions are too focused on negative experiences and problems are rehashed repeatedly, adolescents may develop a style of thinking that is ruminative. This style of thinking may contribute to cognitive biases, or the tendency to make negative attributions about the self and the world and to perceive stressors as threatening. In other words, the caregiver may model talking about negative topics in an excessive and repetitive manner when something upsetting happens.

Theoretically, ES and co-rumination are linked by their level of emotional engagement and guidance (Miller-Slough & Dunsmore, 2016). Co-rumination and supportive ES strategies both contain high levels of emotional engagement. Caregivers who engage in both of these processes are likely to validate and encourage negative emotions. However, co-rumination, unlike supportive ES, is low on emotion guidance; caregivers and youth may not actively seek out coping strategies during co-rumination experiences (Miller-Slough & Dunsmore, 2016). Joint over-involvement and focus on negative recollections, from both caregivers and youth, may make it difficult for adolescents to receive help processing the event from their caregiver. In fact, prior literature has shown that repeatedly rehashing, speculating about, and dwelling on negative emotional experiences with others (including friends and parents) when recalling past events and problems is associated with youth anxiety and depressive symptoms (e.g., Rose, Schwartz-Mette, Glick, Smith, & Luebke, 2014). According to this framework, dwelling on negative affect appears to be the element of co-rumination that is most closely linked to ES processes that focus on caregivers' responses to expressions of negative emotion.

The Role of Gender

Child gender appears to uniquely influence the ways in which caregivers engage in ES processes. For example, some literature suggests that caregivers are more likely to discuss negative emotions with girls compared to boys (e.g., Fivush, Brotman, Buckner, & Goodman, 2000). The higher frequency of emotion-based conversations with girls compared to boys may increase the likelihood that girls are more comfortable discussing their emotions, particularly the negative ones. Boys are also more likely to be socialized to inhibit negative emotions of sadness and fear (Garside & Klimes-Dougan, 2002). In regards to co-rumination, previous studies have found that mothers tend to engage in more frequent co-rumination with their adolescent daughters compared to sons (Waller & Rose, 2010).

Cultural Influences on Emotion Socialization

Ethnicity and culture can influence beliefs about emotions and the practices caregivers use to socialize their children's emotions (Dunbar, Leerkes, Coard, Supple, & Calkins, 2017). Studies evaluating ES practices in diverse groups have identified racial and ethnic differences in the use of nonsupportive strategies and their effect on psychological outcomes. For example, African American mothers, are more likely to dismiss or minimize their children's (especially sons') display of negative emotion (Nelson, Leerkes, O'Brien, Calkins, & Marcovitch, 2012). One explanation is that displays of negative emotions are believed to be less acceptable because they may be associated with more negative social consequences, particularly for African American male youth. Thus, for African American families, traditionally unsupportive ES practices may actually be supportive, protective, and culturally adaptive (Cole & Tan, 2007). Taken together, these findings suggest that ethnic and racial factors play a nuanced role in caregivers' use of ES and that the label of supportive versus nonsupportive may be too simplistic. The current sample is predominantly African American and will allow for examination of how ES processes operate within this group.

Current Study

The literature reviewed above provides emerging evidence that style of caregiver-adolescent co-remiscing is associated with youth psychosocial functioning. However, the mechanisms explaining this association, particularly following disaster exposure, warrant further assessment in order to better understand the ways in which caregivers and youth process shared traumatic events together. Natural disasters provide a unique context in which to examine co-remiscing because they are a form of shared trauma in which both caregivers and youth were exposed to potentially traumatic experiences and may face the challenge of managing their own ongoing distress. Distressing negative emotions experienced by either member of the dyad, in turn, may influence how they talk to each other about their trauma experiences. Further, these associations between patterns of co-remiscing about trauma and youth mental health symptoms may be of particular concern in an at-risk sample of youth, identified prior to the tornado because of their poor regulation of aggression. Children with elevated levels of aggression often have problems with both behavioral and emotional regulation. Youth with a pre-existing vulnerability involving behavioral and emotional dysregulation may be more likely to have difficulties coping with tornado-related experiences and regulating negative emotions associated with disaster exposure. Based on the above patterns, the aim of this study was to assess whether caregiver reward of negative emotion moderates the link between two youth recollection qualities and youth anxiety symptoms several years following a devastating tornado.

In April of 2011, a series of devastating tornadoes struck the areas of Tuscaloosa and Birmingham, Alabama. The largest of these tornadoes was classified as a category EF-4, the second highest severity category on the tornado ranking scale. Many residents in Tuscaloosa and Birmingham were exposed to tornado-related traumatic events, including destruction of homes, both during and many months after the disaster. The storm caused nearly 1,500 injuries, 65 deaths, and damage to 2,500 residential homes. Given the breadth of destruction,

the Tuscaloosa-Birmingham tornado was classified, at the time, as one of the deadliest natural disasters in the state of Alabama (National Centers for Environmental Information, 2017).

To examine how caregivers' reward of negative emotion may affect how youth recollection qualities about the tornado are related to their anxiety, we evaluated the degree to which adolescents discussed the *negative personal impact* of the disaster and used *negative emotion words* in their recollections. It was hypothesized that youth negative personal impact and use of negative emotion words would both be positively associated with anxiety symptoms, both assessed 4–5 years post-tornado. Further, caregivers' reward of negative emotions would moderate the association between (1) negative personal impact and anxiety, and (2) negative emotions words and anxiety, such that these links would be stronger for youth whose caregivers exhibited high reward of their youth's negative emotional expressions. A second aim of the current study was to evaluate gender differences. We expected that the moderating role of caregivers' reward of negative emotion on the association between youth recollection qualities and anxiety symptoms would emerge for girls, but not for boys. Also of note is that all youth in this study participated in a preventive intervention for aggression and may have acquired new skills to regulate strong, negative emotions. Thus, youth in this study may be better at regulating emotions compared to at-risk aggressive youth who have not participated in a preventive intervention such as this. If the hypotheses are supported, even among at-risk aggressive youth who participated in an intervention program, this may suggest robust associations between extensive discussion of negative emotional experiences and anxiety symptoms.

Method

Participants

This study builds on an ongoing, prospective study examining youth social and emotional functioning before and after a devastating category EF-4 tornado. All procedures were conducted in compliance with the University of Alabama Institutional Review Board. Youth were initially recruited into a preventive intervention study for aggression in their 4th grade year between 2009 and 2011 (Lochman, Dishion, Powell, Boxmeyer, Qu, & Sallee, 2015) through a two gate screening process. Participants were recruited from 20 elementary schools in a metropolitan area in the southern United States. In order to meet eligibility for the intervention program, youth first screened at risk on a teacher-report measure of aggression (Proactive-Reactive Aggression Questionnaire; Dodge & Coie, 1987). All children who scored at or above the 25th percentile were contacted in a randomized order and invited to participate in the program. Caregivers then completed a parent-report measure of aggression (Behavioral Assessment System for Children, Aggression Subscale; Reynolds & Kamphaus, 1992) and this served as the second screening gate. All children whose caregiver-report of aggression were in the above average or elevated range were eligible for inclusion in the intervention program. Six children from each school who received above average or elevated scores on the parent aggression assessment were then randomly selected to participate in the program ($n=120$ per year of recruitment for a total of 360 children). More details about the intervention procedures can be found in Lochman et al., 2015. This

study received approval from the University Institutional Review Board and all participants provided informed consent.

Due to research constraints (e.g. inability to locate participants who had moved; inability to schedule assessments within given time periods), recollections were only collected from 283 caregiver-adolescent dyads (79% of the original sample). Of those 283 dyads, 66 were excluded due to interviewer deviation from the standardized protocol, 10 were excluded because they had a male caregiver, and 38 were missing some data from measures included in the current study, resulting in a final sample of 169 youth. The youth with and without recollection data were comparable in terms of gender ($\chi^2=.125, p=.72$), family income ($t=.793, p=.43$), primary caregiver relationship to child ($\chi^2=4.39, p=.62$), severity of tornado exposure (TORTE; $t=-.587, p=.56$), and youth anxiety symptoms at Wave 5 ($t=-.904, p=.37$). However, youth who completed the recollections were more likely to be African American ($\chi^2=211.33, p<.001$) and older age ($t=1.30, p<.001$) compared to those who did not complete recollections.

In total, one-hundred and sixty-nine adolescents provided individual recollections about their experiences during the tornado four to five years following the disaster. Female caregivers (87% biological mother, 3% adoptive mother, 5% grandmother, 5% other female caregiver) and adolescents then co-reminded about the tornado. Caregivers also completed several parent-report measures of their adolescent's psychological adjustment. Youth were between the ages of 12 and 17 years old ($M_{\text{age}}=14.45$) when tornado interviews were conducted; 67% were male ($n=113$), and 82% were African American ($n=139$). The sample was also predominantly low income with 44% of families making less than \$20,000 per year.

Previous studies using this dataset have evaluated youth outcomes following the intervention (e.g., Lochman et al., 2015) and one study has examined youth functioning from before to after the tornado (Lochman, Vernberg, Powell, Boxmeyer, Jarrett, McDonald, & Kassing, 2017). In addition, one other study examined the link between caregiver egocentrism and enduring youth post-traumatic stress symptoms (Hendrickson et al., 2020). However, the current study is the first to explore elements of co-reminding and the link to youth anxiety.

Procedures

Data were collected in six waves as part of the larger, longitudinal study. In this study, we only used data from Wave 1 and Waves 3–6. However, we describe the other Waves below in order to give context for the larger project. Wave 1 data were collected prior to the tornado; Wave 2 data were collected within the first 6 months following the tornado; Wave 3 data were collected approximately 1 year post-tornado; and Waves 4–6 data were collected approximately 3, 4, and 5 years post-tornado, respectively. Caregiver-adolescent joint recollections and adolescent individual recollections were collected at either Wave 4, 5, or 6 depending on research staff availability to conduct the interviews (8% of interviews were collected at Wave 4, 63% of interviews were collected at Wave 5, and 29% were collected at Wave 6). Recollections were completed at the family residence or in a research office according to participant preference. Caregivers and adolescents first met individually with a researcher to complete assessment measures and the adolescent individual recollection. Then

caregivers and adolescents met together to complete a co-remiscing exercise in which participants were asked to speak to each other about their experiences during the tornado. All recollections were audio-recorded.

During both the individual and joint recollections, trained upper-level undergraduate research assistants read a series of five open-ended prompts intended to elicit recollections of experiences during and after the tornado event. The same prompts were given during the individual and joint recollections. Although the research assistant remained in the room during the recollections, they were instructed not to speak except to give the prompts. Additionally, the research assistants were instructed to emphasize that the caregiver-adolescent joint recollection task was meant for caregivers and adolescents to “talk to each other” and to physically turn away from participants during the task. Prompt 1 was “Tell me/talk to each other about some things that happened to you or your family because of the tornado”; Prompt 2 was “Tell me/talk to each other about what were some challenging or difficult things that happened to you or your family because of the tornado”; Prompt 3 was “Tell me/talk to each other about what were some positive things, if any, that happened to you or your family because of the tornado”; Prompt 4 was “Tell me/talk to each other about how have things been different for you or your family since the tornado?”; and Prompt 5 was “Is there anything else you would like to say/tell each other about the tornado?” Participants were allowed to speak about each prompt for as long as they wanted before receiving the next prompt; the average lengths of time for the adolescent individual and joint recollections were 129 and 230 seconds, respectively.

Interviews were transcribed verbatim and coded according to the schemas detailed below. Research assistants were trained in the coding and reliability was assessed by first coding 25% of the interviews. Discrepancies in coding were discussed among coders until arriving at agreement.

Measures

Caregiver reward of negative emotion.—The coding scheme utilized to assess for caregiver reward of negative emotion expression was adapted from a qualitative method intended to capture ES during emotionally-salient conversations with youth (Emotion Discussion Coding System (EDCS; Hastings, Klimes-Dougan, Kendziora, Brand, & Zahn-Waxler, 2014). Caregiver speech was divided into segments for coding. A new segment was demarcated when the caregiver was (a) interrupted; (b) switched topics; or (c) completed a thought (Legerski et al., 2015). The reward of negative emotion construct was coded as present (1) or absent (0) for each segment of caregiver speech. A reward of negative emotion code reflected a caregiver’s positive response to an adolescent’s negative emotion expression, including encouraging adolescent expression, helping them understand their emotional experiences, empathizing, reflecting emotion, validating emotion, and asking questions about emotions. In order to code for reward of negative emotion, what the caregiver said had to be directly related to what the adolescent said. That is, the adolescent must first express an emotion to which the caregiver then responded. Example reward of negative emotion statements were: “You looked pretty shook up” or “How did that make you feel?”. Number of times reward of negative emotion was present was summed to

generate total reward of negative emotion per recollection. The reward of negative emotion variable was non-normally distributed and was therefore recoded as 0=0, 1=1, 2=2, 3=3, 4=4, and 5=5 or more to improve skewness (.17) and kurtosis (.34). The reward construct has demonstrated acceptable convergent (Magai, 1996) and divergent validity (Brand, 2009). In the current study, inter-rater reliability for reward of negative emotion code was within the moderate range ($\alpha=.78$).

Youth personal impact.—All adolescent individual interviews were first separated into units for coding, defined as a sentence that contained a subject and verb pairing (Sales & Fivush, 2005). Individual adolescent interviews were then coded for *Personal Impact*, a meaning-making code based on a scheme created by Greenhoot and colleagues (2013). Personal impact was coded for content that was positive (impact of the event was perceived to be good, beneficial, or neutral) and negative (impact of the event perceived as harmful, bad, and/or distressing). Specifically, personal impact was coded when there were references to the psychological or relational influence that the tornado event had on the speaker. Example positive personal impacts were “I got new neighbors” or “I made new friends at my new schools” whereas example negative personal impacts were “my friend died”. Notably, a personal impact was coded when consequences of the event extended into the present. For example, a personal impact was coded when the narrator described the effect that the event has on present emotions (e.g., “thinking about the event makes me feel scared”). A code of present (1) or absent (0) was assigned to each unit and counts were summed to generate total negative and positive personal impacts per individual recollection. Negative and positive personal impact were transformed using square root transformation to improve skewness and kurtosis values. Intra-class correlations between two raters was .88 for positive personal impact and .94 for negative personal impact. Positive personal impact variable was included as a covariate in analyses.

Emotion words.—Language content of the adolescent individual interviews were evaluated using the Linguistic Inquiry and Word Count Program (LIWC; Pennebaker, Booth, & Francis, 2007). The narratives were coded for negative emotion terms such as sad, tired, and scared and positive emotion terms such as happy and excited. Prior to analysis with LIWC, interviewer speech was removed, misspellings corrected, and filler terms (such as *you know* and *well*) were flagged to avoid misidentification as a positive emotion word. Similar processes with LIWC have been used in other published words (e.g., Greenhoot et al., 2013; Hambrick et al., 2018; Legerski et al., 2015). Final variables are a percentage of total word count (e.g., 5% of the words in the transcript are negative emotion words) rather than a frequency. The negative and positive emotion word variables were transformed using square root transformation to improve skewness and kurtosis. Positive emotion terms were included as a covariate in analyses.

Tornado exposure.—Severity of tornado exposure was assessed through the child-report version of the Tornado-Related Traumatic Experiences questionnaire (TORTE; Vernberg & Jacobs, 2005), collected at Wave 3. The TORTE is adapted from the Hurricane-Related Traumatic Experiences (HURTE) questionnaire which was originally developed to assess the severity of children’s hurricane-related exposure and distress following Hurricane Andrew

in 1992 (Vernberg et al., 1996). Exposure is assessed by summing 6 categorical yes/no exposure items of traumatic events during the tornado (e.g., windows or doors broke, saw someone get hurt), 1 yes/no of perceived life threat (“At any time, did you think you might die during the tornado?”), and 10 categorical yes/no items assessing traumatic events, loss, and disruption in the months after the tornado (e.g., home damaged or destroyed). Severity of exposure was measured by summing these 17 items endorsed as occurring during or after the tornado.

Youth anxiety.—Youth anxiety symptoms were assessed using the anxiety subscale on the Behavior Assessment System for Children (BASC; Reynolds & Kamphaus, 1992), a parent-report questionnaire of youth behavioral, emotional, and social problems. Caregivers completed this measure at Wave 5. Caregivers also completed this measure at Wave 1 prior to the tornado and this was used as a covariate in all analyses to control for pre-tornado levels of youth anxiety. The BASC is divided into several specific subscales and only the Anxiety Subscale was utilized in the current study. The BASC Anxiety Subscale has shown good reliability and validity in prior studies (see manual; Reynolds & Kamphaus, 1992). Items are scored on a 4-point Likert scale (1 = *Never* to 4 = *Almost Always*). Items are summed to create subscale scores and higher scores indicate greater symptom severity. Scores were transformed into t-score values, with values of 60–70 reflecting at-risk levels of anxiety and values of 70 or greater reflecting clinically significant levels of anxiety. Internal reliability for the anxiety subscale in this study was $\alpha=.84$.

Data Analytic Plan

Zero-order correlations (or point-biserial correlations, where indicated) among all study variables were first conducted to evaluate associations among primary variables of interest. We ran hierarchical linear regression models to examine associations between youth anxiety symptoms and (1) youth negative personal impact and (2) negative emotion words, and to evaluate whether caregiver reward of negative emotion moderated these associations. In Step 1, youth anxiety symptoms was regressed on negative personal impact and negative emotion words in order to determine unique effects of the predictors. In Step 2, an interaction term between these select recollection qualities and caregiver reward of negative emotion was added to determine whether caregiver reward of negative emotion moderated the association between youth anxiety symptoms and (1) youth negative personal impact and (2) youth negative emotion words. Child gender, severity of tornado exposure, wave of data collection, pre-tornado anxiety, and the amount that caregivers spoke (parent word count) were included in all models as covariates. We then conducted a model with a three-way interaction of gender by negative personal impact by reward in order to assess the potential moderating influence of gender in these pathways. A parallel three-way interaction model was conducted for gender by negative emotion words by reward. All independent variables were mean centered prior to analyses. For significant interactions, we calculated simple slopes at high (+1 standard deviation) and low (–1 standard deviation) levels of caregiver reward of negative emotion using the PROCESS macro for SPSS version 26 to determine the nature of the interaction effect. As noted, we conducted parallel models for negative personal impact and negative emotion words and results are presented for each predictor separately.

Results

Descriptive Statistics and Correlations

Means, standard deviations, and correlations for caregiver reward of emotion expression, youth recollection qualities, youth anxiety, and tornado exposure are presented for the total sample in Supplement 1. Correlations were generally in the expected directions. There was a positive association between youth negative emotion words, but not positive emotion words, and youth anxiety, such that high levels of youth negative emotion words were associated with high levels of youth anxiety at both Waves 1 ($r = .16, p < .01$) and 5 ($r = .18, p < .01$). In addition, higher levels of negative personal impact were linked to higher levels of negative emotion words ($r = .30, p < .001$). Caregiver reward of emotion expression was not significantly correlated with any youth narrative quality variables. However, caregiver reward of negative and positive emotion were positively correlated, such that higher levels of reward of negative emotion was associated with higher levels of reward positive ($r = .47, p < .001$). Youth narrative qualities and co-reminiscing patterns did not significantly differ by gender. That is, boys and girls demonstrated similar levels of negative personal impact ($t = .05, p = .96$) and negative emotion words ($t = -.18, p = .86$). Similarly, caregivers of boys and girls demonstrated similar levels of reward of negative ($t = .77, p = .44$) and positive ($t = 1.11, p = .27$) emotion. In addition, girls and boys demonstrated similar levels of anxiety at Wave 1 ($t = -.78, p = .75$), however, girls demonstrated higher levels of anxiety at Wave 5 than boys ($t = -2.64, p = .03$). Finally, although the majority of caregiver's reported youth anxiety symptoms in the average range, 11% endorsed at-risk and clinically significant levels of anxiety (t-score ≥ 60).

Regression Analyses: Moderation by Caregiver Reward of Negative Emotion

Negative personal impact.—In the first model, youth anxiety was regressed on negative personal impact, caregiver reward of negative emotion, gender, TORTE, parent word count, wave of data collection, positive personal impact, and pre-tornado youth anxiety (see Table 1 for full regression results). In the first step, there was a trend-level association between youth negative personal impact and youth anxiety after controlling for all covariates ($B = 1.99, SE = 1.02, p = .052$). In the second step, the interaction of negative personal impact and caregiver reward of negative emotion was added to the model and explained a significant amount of additional variance ($R^2 = .02, p = .04$). A statistically significant effect emerged for this interaction ($B = 1.71, SE = .83, p = .04$), suggesting that caregiver reward of negative emotion significantly moderated the association between negative personal impact and youth anxiety (see Table 1, Model 2). Simple slope analyses at 1 SD above and below the mean were then estimated using the PROCESS macro for SPSS version 26 (see Figure 1). Higher youth negative personal impact was associated with higher anxiety symptoms at high levels of caregivers' reward of negative emotion ($B = 4.39, SE = 1.54, p = .005, 95\% \text{ CI } [1.35, 7.43]$). In contrast, youth negative personal impact and anxiety were unrelated at low levels of caregiver reward of negative emotion ($B = 1.03, SE = 1.11, p = .35, 95\% \text{ CI } [-1.15, 3.22]$).

In the third step, the three-way interaction of youth negative personal impact, caregiver reward of negative emotion, and gender was added to the model. However, as presented in

Table 1, Model 3, there was nonsignificant interaction of negative personal impact, caregiver reward of negative emotion, and youth gender ($B = 2.12$, $SE = 1.75$, $p = .23$).

Negative emotion words.—In the second model, youth anxiety was regressed on negative emotion words, caregiver reward of negative emotion, gender, TORTE, parent word count, wave of data collection, positive personal impact, and pre-tornado youth anxiety (see Table 2 for full regression results). In the first step, youth negative emotion words were not significantly associated with youth anxiety symptoms after controlling for all covariates ($B = .96$, $SE = .80$, $p = .24$). However, in the second step, the interaction of youth negative emotion words and caregiver reward of negative emotion was added to the model and explained a significant amount of additional variance ($R^2 = .02$, $p = .03$). A statistically significant effect emerged for this interaction ($B = 1.12$, $SE = .51$, $p = .03$) and simple slope analyses at 1 SD above and below the mean were then estimated using the PROCESS macro for SPSS version 26. Youth's use of negative emotion words was associated with higher anxiety symptoms at high levels of caregiver reward of negative emotion ($B = 2.18$, $SE = .97$, $p = .03$, 95% CI [.26, 4.10]) and unrelated at low levels of caregiver reward of negative emotion ($B = -.01$, $SE = .91$, $p = .99$, 95% CI [-1.81, 1.79]).

In the third step, the three-way interaction of youth negative emotion words, caregiver reward of negative emotion, and gender was added to the model and explained a significant amount of additional variance ($R^2 = .02$, $p = .03$). The three-way interaction of negative emotion words, caregiver reward of negative emotion, and youth gender was significant (see Figure 2; $B = 2.70$, $SE = 1.21$, $p = .03$). Caregiver reward of negative emotion moderated the association between youth negative emotion words and anxiety for girls ($B = 3.34$, $p = .002$), but not for boys ($B = .64$, $p = .26$). For girls, simple slope analyses at 1 SD above and below the mean indicated that girls' use of negative emotion words was associated with anxiety symptoms at high levels of caregiver reward of negative emotion ($B = 6.94$, $SE = 2.00$, $p < .001$, 95% CI [3.00, 10.89]) and unrelated at low levels of caregiver reward of negative emotion ($B = .40$, $SE = 1.52$, $p = .79$, 95% CI [-2.60, 3.40]).

Discussion

The goal of the current study was to examine select youth recollection qualities and ES processes that may be associated with anxiety several years following exposure to a devastating natural disaster. Specifically, we hypothesized that caregiver reward of negative emotion while co-remembering about their experiences during the tornado would moderate the association between current youth anxiety symptoms and youths' focus on (1) the negative personal impact and (2) their use of negative emotion words during an individual interview. We expected that youth whose caregivers exhibited high levels of rewarding negative emotions would be more likely to report elevated youth anxiety symptoms. In support of this hypothesis, we found that both negative personal impact and negative emotion words were significantly, and positively, associated with youth anxiety symptoms when caregivers frequently rewarded negative emotional expression. These effects were found among an at-risk sample of youth, initially selected into the study because of their aggressive behaviors, suggesting that extensive discussion of negative emotions may be a salient risk factor for anxiety among dysregulated, aggressive youth. Further, results

emerged even after controlling for pre-tornado youth anxiety, indicating that extensive discussion of negative emotional experiences appears to be linked to long-term anxiety symptoms after accounting for pre-disaster anxiety levels. Overall, caregiver reward of negative emotion, in combination with high levels of youth use of negative emotion words, may be important indicators of vulnerability for anxiety symptoms among disaster-exposed adolescents. This pattern of co-remembering may reflect a way that the family manages negative emotions that is associated with elevated anxiety symptoms even years after the event.

The Moderating Role of Caregiver Reward of Negative Emotion

We found that youth focus on negative personal impact and use of negative emotion words were positively associated with anxiety symptoms. These findings are consistent with emerging literature documenting an association between youth use of negative emotion terms and psychological outcomes following trauma exposure (e.g., Hambrick et al., 2018). However, it is noteworthy that the expression of feelings in trauma recollections has been associated with both positive adjustment and elevated mental health symptoms (e.g., Fivush et al., 2005). One possible explanation for this mixed pattern of results is that the benefit of disclosing emotions may depend on how caregivers respond to their adolescents' attempts to express emotion. The current study provides emerging support of this pattern: the association between youth use of negative emotion words and anxiety was moderated by caregiver reward of negative emotion expression. This pattern may reflect a joint over-engagement with negative emotional content.

Further, it may be that discussion of negative emotions with a caregiver may be even more of a problem among less well regulated at-risk youth who may be prone to ruminating about stressors on their own. For example, dysregulated youth may be more likely to extensively rehash problems, speculate about problems, and dwell on negative affect (Rose et al., 2014). Thus, youth with a pre-existing mental health vulnerability, such as the youth in this sample, may be more likely to have difficulties coping with, and identifying and implementing solutions about, their tornado-related experiences with a caregiver.

Our findings are also consistent with extant literature on caregiver co-remembering and adolescent adjustment. That is, caregivers who repeatedly discuss a specific negative experience with their children may have a difficult time processing the trauma in an adaptive way with their children (Miller-Slough & Dunsmore, 2016). In the context of a natural disaster, in which both parents and children have been exposed to the same trauma, caregivers may also be managing their own distress. As a result, they may model for their children methods of processing trauma that include repeated rehashing of the negative emotions and experiences. The combination of caregiver and youth focus on negative experiences appears to be associated with enduring elevated anxiety for these youth. Extensive discussion of negative emotional experiences with a caregiver may not be an adaptive method of processing a shared trauma. Instead, this type of co-remembering pattern may reinforce excessive focus on negative experiences during the trauma and may exacerbate symptoms of anxiety, even years after the event. Excessive discussion about negative experiences may interfere with more adaptive processing.

Gender Differences

The combination of high levels of caregiver reward of negative emotion and youth use of negative emotion words when discussing their tornado experience appears to be more of a risk factor for girls than boys. This pattern well matches the existing literature in which caregivers are more likely to engage in discussion of negative emotions with girls as compared to boys (Fivush et al., 2000; Klimes-Dougan et al., 2007). Girls, compared to boys, are also more likely to use negative emotion words (O’Kearney & Dadds, 2004) and to co-ruminate about negative emotional experiences with their mothers (Waller & Rose, 2010). In fact, mother-adolescent co-rumination, even about normative life events, has been linked to youth anxiety and depressive symptoms (Waller & Rose, 2010). Thus, although discussion of negative experiences may, in some situations, be beneficial for emotional processing, over-focus on negative experiences from both caregivers and youth perspectives appears to be associated with maladjustment for girls.

Clinical Implications for Talking to Adolescents about Disaster Experiences

Overall, the findings from the current study highlight several indicators of emotion processing that may be associated with anxiety. It may be that youth who emphasize only the negative impact of trauma events are less able to modulate their distress and may be more likely to perseverate and dwell on negative emotional experiences, especially years after the event. As a result, their anxiety symptoms stay high over time. For these youth, caregiver reward of their negative emotional expression may reinforce their negative rumination. This may create an environment in which both parents and youth are excessively engaging in, and reflecting on, stressful experiences following the disaster. Further, it is possible that this pattern of discussing negative emotional experiences could represent a more general way that the family deals with, and discusses, emotions. That is, the recollections collected in the current study could represent a slice of what “typical” conversation looks like in the family. For example, some caregivers may more broadly reward, validate, or reflect their adolescent’s emotion talk, regardless of the valence of that emotion. In fact, in the current study, reward of positive and negative emotion were significantly correlated ($r = .47, p < .001$). Although we cannot confirm that conversation about non-tornado related events looks similar, we can hypothesize that caregivers and adolescents who tend to fixate on negative emotions may do so outside of the tornado context as well.

These findings may have implications for the ways in which post-disaster intervention strategies are structured for youth and their families. Although previous literature has found that some elements of co-rumination, such as self-disclosure, are associated with high relational closeness (e.g., Rose et al., 2014), focus on negative emotion during co-remembering appears to be linked to increased youth anxiety. Thus, youth and their caregivers may benefit from discussing together both positive and negative experiences during and after a disaster or focusing on positive outcomes from the event. In fact, one review of trauma-focused treatments for children and adolescents found that one effective treatment for trauma-exposed youth is to teach them positive emotion expression (Black, Woodworth, Tremblay, & Carpenter, 2012). Focus on positive emotion may be protective under some circumstances, particularly when that discussion is focused on finding solutions to problems

with a caregiver. For example, many caregivers and adolescents in this sample discussed feeling closer, safer, and happy that they got to spend time with family. Thus, caregivers may also be encouraged to problem solve or finding resolutions to stressors when talking with adolescents about trauma experiences. Finally, caregiver-adolescent match could also be considered when structuring interventions. That is, it may be useful to limit caregiver reward of negative emotion only for those youth who present with high negative emotionality or have a strong sense of negative personal impact from the event.

Limitations and Future Directions

This study has certain limitations that may suggest directions for future research. First, child reports of anxiety were not included in the original assessment protocol and, thus, anxiety symptoms were measured through a parent-report measure of anxiety. Caregivers who are more likely to co-reminisce about negative emotional experiences may also be more likely to perceive their youth as having high levels of anxiety. It is possible that the measure of parent-reported youth anxiety may reflect caregivers' own anxiety sensitivity, rather than simply a marker of the adolescent's level of anxiety. However, we did not have a measure of caregiver anxiety and thus were not able to assess caregiver pre-disaster anxiety symptoms directly. Second, the combination of caregiver reward of negative emotion expression and youth focus on negative personal impact may be a proxy for elements of co-rumination. Future research should directly assess co-rumination using coding systems designed to assess the co-rumination construct. Third, it is notable that youth in this study received a preventive intervention for aggressive behaviors prior to the tornado and youth may have learned emotion regulation skills from the intervention. Fourth, caregiver ES and adolescent recollection qualities were collected at the same time point. As a result of the cross-sectional design of this study, we are not able to assess causal implications for the relation between styles of co-reminiscing and anxiety symptoms.

Despite these limitations, the current study also has several strengths that are important to highlight. First, this study is one of the few that has explored ES constructs among a predominantly low income, African American sample of adolescents. The examination of these patterns among this sample is an important contribution to the literature given the dearth of studies that have been conducted with this population. Second, this is one of the few studies to assess caregiver-adolescent co-rumination tendencies using observational measures. Third, the majority of the literature on ES processes have examined school-age populations and this study evaluated a pattern of caregiver ES during adolescence. Future research should continue to consider how other ES processes operate during this developmental stage, particularly in a trauma context. This is particularly important given that limited research has examined how ES processes operate during or after natural disasters.

Summary

Using a sample of adolescents and a primary caregiver exposed to a devastating natural disaster, this study examined whether caregiver reward of negative emotion expression moderated the link between select youth recollection qualities and anxiety symptoms several years following a destructive tornado. We also examined whether these patterns may differ

for girls and boys. Caregiver reward of negative emotion moderated the link between negative emotion words and anxiety symptoms, such that both negative personal impact and negative emotion words were associated with higher anxiety symptoms at high levels of caregiver reward of negative emotion. This pattern was stronger for girls, suggesting that caregiver reward of negative emotion during co-reminiscing may be more strongly associated with long-term anxiety for female, compared to male, adolescents. Gender-specific patterns of caregiver ES and its relation to youth recollections and psychological adjustment are highlighted in regard to how adolescent boys and girls engage with their parents during discussion of traumatic events. These findings are particularly important given that youth in this sample were already less well regulated because they were already at-risk for aggression prior to the tornado. The findings may help clarify developmentally appropriate interventions for helping caregivers and adolescents communicate following traumatic events, such as finding resolutions rather than repeatedly rehashing negative emotional content, so as to promote optimal psychological recovery and later adjustment.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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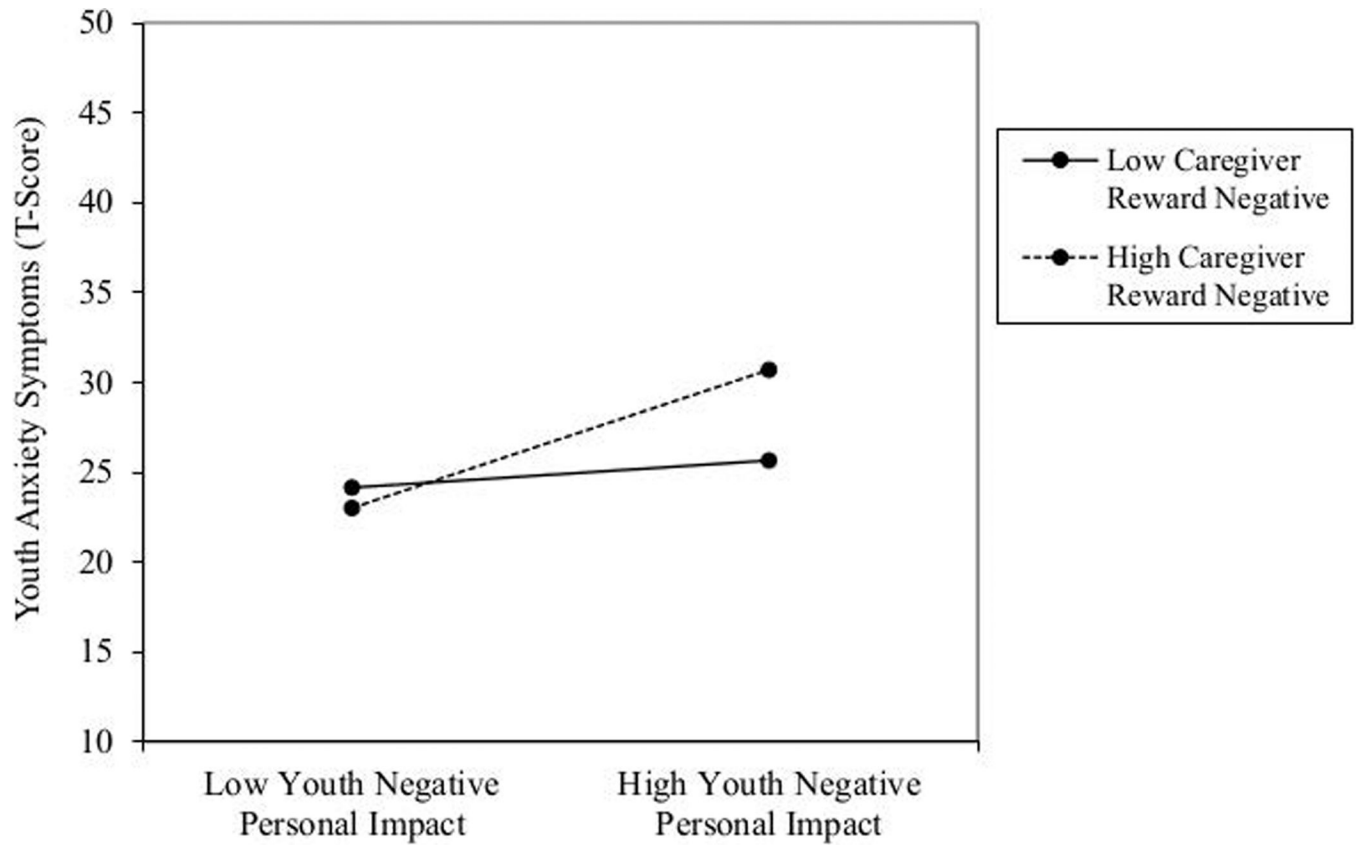


Figure 1. Association between youth negative personal impact and youth anxiety symptoms at high and low levels of caregiver reward negative.

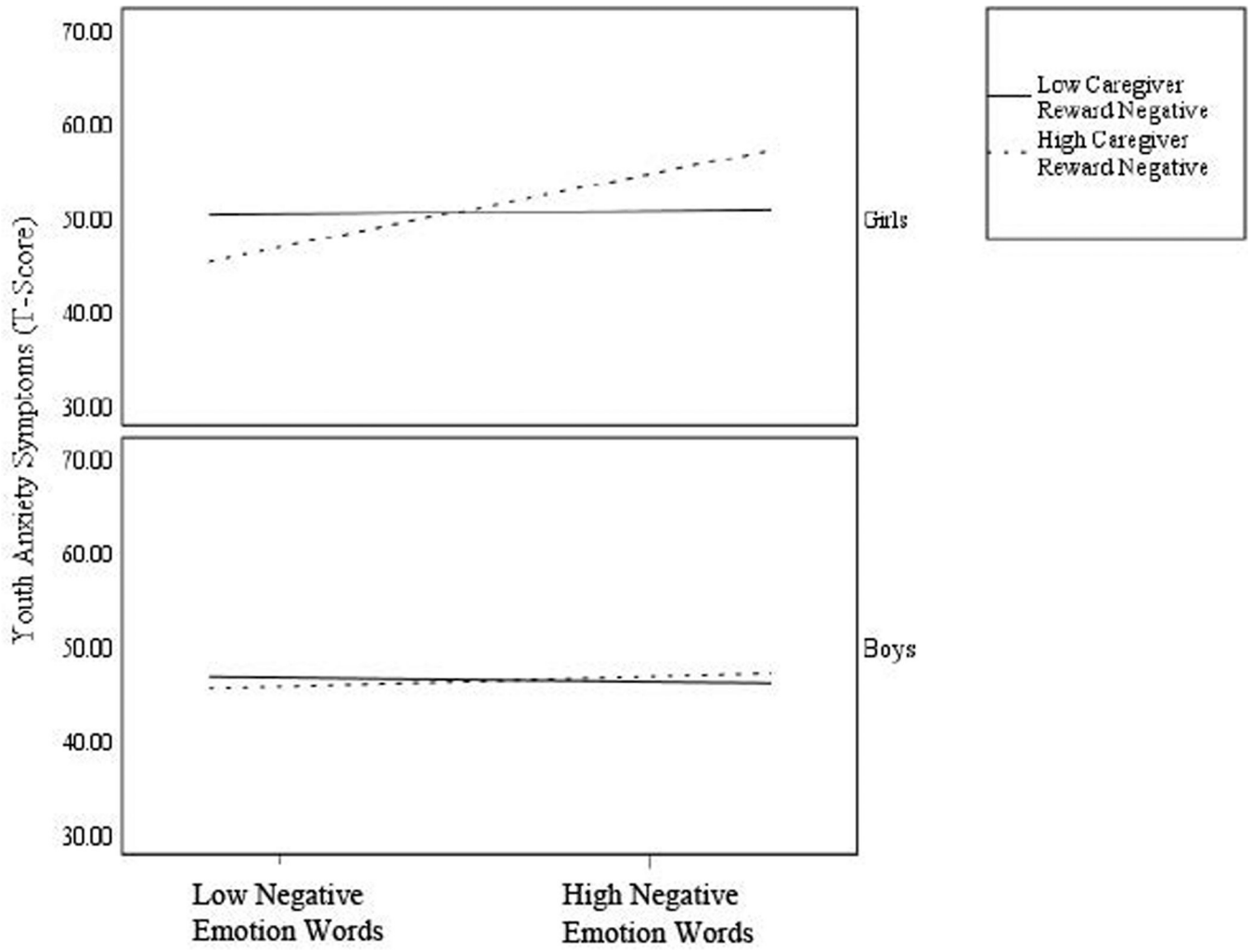


Figure 2. Association between negative emotion words and anxiety at high and low levels of caregiver reward negative for boys and girls.

Full Regression Results for Negative Personal Impact Predicting Youth Anxiety Symptoms

Table 1

	Model 1: first-order effects model			Model 2: interaction model			Model 3: three-way interaction model		
	B	SE	R ²	B	SE	R ²	B	SE	R ²
Gender	4.06**	1.45	.40***	3.69*	1.44	.02*	3.63*	1.44	.005
TORTE	<.001	.33		.004	.32		.09	.33	
Parent word count	.004	.004		.003	.004		.005	.004	
Wave	-1.30	1.21		-1.22	1.20		-.45	1.25	
Positive personal impact	-.60	1.02		-.48	1.01		-.60	1.01	
Youth anxiety (Wave 1)	.58***	.07		.56***	.07		.54***	.07	
Negative personal impact	1.99#	1.02		2.17*	1.01		.81	1.23	
Caregiver reward negative	-.20	.56		-.15	.55		.01	.65	
Caregiver reward negative x negative personal impact	-	-		1.71*	.83		1.18	1.06	
Caregiver reward negative x negative personal impact x gender	-	-		-	-		2.12	1.75	

NB: All independent variables were mean centered prior to analyses; SE = standard error; Wave 1 = pre-tomado anxiety; reward negative = reward of negative emotion;

$p < .10$;

* $p < .05$;

** $p < .01$;

*** $p < .001$

Full Regression Results for Negative Emotion Words Predicting Youth Anxiety Symptoms

Table 2

	Model 1: first-order effects model			Model 2: interaction model			Model 3: three-way interaction model		
	B	SE	R ²	B	SE	R ²	B	SE	R ²
Gender	3.95**	1.45	.39***	4.05**	1.43	.02*	4.36**	1.42	.02*
TORTE	-.04	.33		-.04	.33		.03	.32	
Parent word count	.005	.003		.005	.004		.006	.004	
Wave	-1.07	1.23		-1.07	1.21		-.88	1.22	
Youth anxiety (Wave 1)	.58***	.07		.56***	.07		.53***	.07	
Positive emotion words	-.22	.69		-.05	.69		-.07	.68	
Negative emotion words	.96	.80		.73	.80		.05	.96	
Caregiver reward negative	-.16	.55		-.01	.55		-.05	.63	
Caregiver reward negative x negative emotion words	-	-		1.12*	.51		.64	.57	
Caregiver reward negative x negative emotion words x gender	-	-		-	-		2.70*	1.21	

NB: All independent variables were mean centered prior to analyses; SE = standard error; Wave 1 = pre-tornado anxiety; reward negative = reward of negative emotion;

* $p < .05$;

** $p < .01$;

*** $p < .001$