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Relation between aggression exposure in adolescence and adult posttraumatic stress symptoms: Moderating role of the parasympathetic nervous system

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HIGHLIGHTS

- Participants reported aggression exposure during adolescence.
- Resting RSA and current PTSD symptoms were measured.
- RSA moderates the effects of multiple forms of aggression on PTSD symptoms.
- Among females, high RSA is associated with PTSD symptoms under conditions of adversity.
- Among females, high RSA is associated with less PTSD symptoms under conditions of support.

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ABSTRACT

The present study examines the impact of the parasympathetic nervous system (PNS), as measured by respiratory sinus arrhythmia (RSA), on the link between family aggression experienced during adolescence and posttraumatic stress symptoms during young adulthood. Participants completed retrospective self-report measures of interparental aggression and harsh parenting exposure during adolescence and measures of current posttraumatic stress symptoms. RSA indexed PNS activity. Among females, the three-way interaction between harsh parenting, interparental aggression, and resting RSA was significant in accounting for young adulthood PTSD symptoms. At higher values of resting RSA and higher levels of interparental aggression exposure, harsh parenting experienced during adolescence was positively associated with adulthood PTSD symptoms. Among males, adolescent aggression exposure and resting RSA did not significantly account for variation in adulthood PTSD symptoms. Thus, this study suggests that resting PNS activity may play an important role in the relationship between stressors during adolescence and later PTSD in females.

1. Introduction

Exposure to family aggression during youth is associated with numerous negative, often enduring mental health problems (e.g., [4,33,38]), including posttraumatic stress disorder symptoms (e.g. [34]) in youth and adults. Exposure to multiple forms of violence, including harsh parenting and interparental aggression, may be especially problematic [32,36]. Nevertheless, not all youth exposed to aggression develop subsequent emotional symptoms [33].

Recent efforts to understand the effects of trauma and stress during youth have focused on the role of the autonomic nervous system (ANS). The parasympathetic nervous system (PNS), one component of the ANS, promotes the restoration of health following stressful states and may play an important role in the effects of stress. However, the literature regarding the role of PNS activity in the development of mental health problems is inconsistent [13]. The present study improves the current literature by examining how the PNS moderates the relation between aggression exposure during adolescence and PTSD symptoms in young adulthood.

1.1. Exposure to aggression and negative outcomes

1.1.1. Harsh parenting

Maltreated youth are at increased risk for psychopathology during childhood, including depression [38,39] and anxiety [39].

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Furthermore, harsh parenting is one of the most reliable predictors of PTSD symptoms in youth populations [9,11,48]. Negative outcomes persist, as maltreated youth are 5–10 times more likely to meet PTSD diagnostic criteria as young adults than are nonmaltreated comparisons [43]. Females may be particularly vulnerable, as girls' negative relationships with parents tend to be significantly associated with psychopathology [29].

1.1.2. Interparental aggression

Children are also indirect victims of interparental aggression, which has similarly been linked to PTSD [34]. Girls exposed to interparental aggression may be at increased risk for symptoms associated with PTSD, as females may be more reactive to interpersonal stressful events than are males [14,28].

Although exposure to interparental aggression alone may place children at increased risk for psychopathology, Wolfe et al. [50] found that children who are exposed to both harsh parenting and interparental aggression have higher levels of emotional problems than children exposed to only interparental aggression. Recent literature has generally supported this finding, showing that exposure to multiple forms of maltreatment may lead to worse childhood outcomes than exposure to a single form [20,32,36]. An increased number of childhood adversities related to family functioning (including both harsh parenting and interparental aggression) may also predict negative mental health outcomes that persist into adulthood [21]. Thus, children victimized by both harsh parenting and interparental aggression may be particularly vulnerable to developing PTSD symptoms.

1.2. The parasympathetic nervous system

Although it is clear that aggression exposure during youth poses a risk for subsequent PTSD symptoms, not everyone exposed to childhood maltreatment develops PTSD. Recent efforts to understand the relationship between stress during youth and harmful outcomes during adulthood have focused on the role of the PNS, which facilitates states of visceral calm and social engagement [40]. The polyvagal theory suggests that RSA, a well-validated indicator of PNS activity [22], is a marker of the brain's ability to regulate emotional responses through the PNS (e.g., [2,51]). High resting RSA may be adaptive in the short and long term [15,16,40], whereas low resting RSA is associated with poor emotion regulation, negative affect, and affective disorders (e.g., [12,47]). Literature also suggests that lower resting RSA is associated with PTSD [3,25]. This may be because lower RSA is associated with hyperaroused physiological states, an important symptom cluster of PTSD.

Research also suggests that stressful childhood experiences (e.g. child maltreatment) are associated with lower RSA in adolescent females at rest [37]. Additionally, among those with high exposure to stressful life events, higher resting RSA may predict fewer psychopathology symptoms than does lower RSA [7]. Thus, PNS activity may predict mental health outcomes *depending* upon the environmental context.

1.3. Biological sensitivity to context

The biological sensitivity to context (BSC; [6,17]) model suggests that individual and sex differences may exist across patterns of physiological responsivity to stress. This may help explain inconsistencies in the RSA literature, which have suggested that high resting RSA can be a risk or protective factor. According to the BSC theory, some children have biological and/or genetic predispositions towards high biological stress response system activity (e.g., PNS) that may have negative or protective effects, contingent on environmental factors. High RSA may reflect increased sensitivity to context, with increased potential for negative mental health outcomes under conditions of adversity. Under conditions of support, high RSA may be associated with less negative psychological outcomes [17].

1.4. Aims of the present study

The present study investigates the relationship between exposure to aggression across multiple interpersonal domains (i.e., harsh parenting and interparental aggression), and later PTSD symptoms, as moderated by PNS activity. Adolescence is considered a vulnerable developmental period during which aggression exposure is associated with later PTSD symptoms [27]. However, limited information exists about the extent to which PNS activity impacts this relationship. Consistent with the BSC theory, we hypothesize that chronic aggression exposure during adolescence will be associated with PTSD symptoms among individuals who exhibit higher PNS activity during rest, as indicated by higher values of resting RSA. Furthermore, we hypothesize that low levels of aggression exposure during adolescence will be associated with fewer PTSD symptoms among individuals who exhibit higher values of resting RSA. Additionally, based on the research of Maikovich et al. [32] and Margolin et al. [36], we hypothesize that cumulative chronic stressors of more than one domain will be associated with deleterious outcomes. Finally, we hypothesize that gender differences in these relationships will emerge.

2. Methods

2.1. Participants

As part of a larger study examining family violence, responses to stress, and ANS activity, 200 college students were recruited from the human subject research pool at a major university in New York. The current study examined data from 147 adults. The remaining participants were excluded from analysis due to missing data (i.e., equipment malfunctions, failure to complete study measures). Young adults excluded from analysis were more likely to be older than those included, $F(1,191) = 31.27$, $p < .001$. Average age of participants included in the analysis was 19.02 years (range = 18–25, SD = 1.25) and approximately half (52.5%) were female. Ethnic and racial composition was 74.5% Caucasian, 9.0% Hispanic or Latino, 10.3% African-American, 2.8% biracial, and 3.4% mixed race or "other" ethnic background.

2.2. Procedures

All procedures were approved by the institutional review board. After consent procedures, participants self-applied a disposable electrocardiography (ECG) electrode to each side of the torso (axially). The examiner placed one grounding electrode behind the participant's left ear and a respiration bellows around the participant's torso and then asked the participant to relax while a three-minute resting response was collected.

2.3. Measures

2.3.1. PNS activity

A three-minute period of RSA calculated from ECG and respiration indicated resting PNS activity. We sampled and digitized electrocardiography data at 1 kHz, extracted R-wave times from the ECG channel, and manually edited data using ECGRWAVE software [26]. Respiration bellows connected to the psychophysiological recording equipment for transduction, amplification, and digitization. A computerized RSA program calculated RSA as the difference between the minimum interbeat interval (IBI) during inspiration and the maximum IBI during expiration (James Long Company, Caroga Lake, NY). The program computed the difference in IBI twice for each respiration cycle, assigning midpoint times for inspiration and expiration, and calculating the arrhythmia. The peak-to-valley method used for the present study is comparable to spectral analysis (i.e., [23]). Resting RSA was log transformed to address positive skew.