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Disrupted physiological reactivity among children with a history of suicidal ideation: Moderation by parental expressed emotion-criticism

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ABSTRACT

Objective: The goal of this study was to examine physiological reactivity during parent-child interactions in children with and without a history of suicidal ideation (SI), a group known to be at increased risk for suicidal thoughts and behaviors in the future. We also examined the potential moderating role of parental expressed emotion-criticism (EE-Crit) to determine whether the presence of parental criticism may help to identify a subgroup of children with a history of SI most at risk for physiological dysregulation.

Method: Participants were 396 children (age 7–11; 54% male, 71.7% Caucasian) and their biological parent. Children's levels of high frequency heart rate variability (HF-HRV) were assessed during a resting baseline period followed by a positive and negative discussion with their parent. Additionally, parents completed the Five-Minute Speech Sample to determine levels of EE-Crit toward their child, and children completed an interview assessing their history of SI.

Results: Consistent with our hypothesis, we found that exposure to parental criticism moderated the relation between a child's history of SI and their HF-HRV reactivity to the discussions. Specifically, while most children exhibited the typical pattern of HF-HRV suppression from baseline to both interactions, the highest risk children (i.e., children with a history of SI who also had highly critical parents) did not display any change in HF-HRV across the tasks, suggesting a failure to engage a typical psychophysiological response during emotional contexts.

Conclusions: These results suggest a specific physiological mechanism that may place these children at risk for suicidal thoughts and behaviors in the future.

Suicide is the third leading cause of death among 10–14 year olds (Centers for Disease Control and Prevention, National Center for Injury Prevention and Control, 2015) and rates of suicide have increased over the last couple of decades. Indeed, the 2014 suicide rate for 10–14 year old non-Hispanic white females is more than three times higher than the rate in 1999, and suicide rates for non-Hispanic white males increased by 57% between 1999 and 2014 (Curtin, Warner, & Hedegaard, 2016). In addition, a large survey of high school students found that, in the last year, 17% had seriously considered suicide, 14% had made a suicide plan, and 8% had attempted suicide at least once (Kann et al., 2016). Another large study examining rates of suicidality in 13–18 year olds found lifetime prevalence rates of 12.1% for suicidal ideation (Nock et al., 2013). Although the prevalence of suicidal thoughts and behaviors among adolescents has been well established, research examining suicidal thoughts and behaviors in younger children has been more limited. However, one study examining suicidal ideation (SI) in a community sample of 6–12 year old children found that rates of current SI across European countries ranged from 9.9% to 26.84 (Kovess-Masfety et al., 2015). Indeed, there is evidence that children as young as three years old report SI (Whalen, Dixon-Gordon, Belden, Barch, & Luby, 2015) and, though rare, death by suicide does occur in children younger than 10 years old (for a review, see Durand & McGuinness, 2016). Understanding factors associated with SI in children is of great importance because there is evidence that individuals (including children and adolescents) with a history of SI are at increased risk for future SI and suicide attempts (Nock et al., 2013; Shaffer et al., 1996; Whalen et al., 2015).

One potentially important factor in the development of SI is the ability to regulate affective and physiological responses in emotional or stressful contexts (cf. Coryell & Schlesser, 2001; Jokinen & Nordström, 2009; Wilson et al., 2016). Indeed, there is growing evidence for the link between difficulties in emotion regulation and suicidality in adults and adolescents (Kudinova et al., 2015; Pisani et al., 2013; Rajappa, Gallagher, & Miranda, 2012; Rodriguez & Kendall, 2014). However, relatively little is known about this relation in children. In addition, the majority of prior research has focused on self-report assessments of

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emotion regulation, which may be subject to response bias. More recent research, therefore, has focused on more objective measures of emotion regulation. One of these measures is respiratory sinus arrhythmia (RSA), which is thought to index one's capacity for emotion regulation (Beauchaine, 2001; Beauchaine, 2012; Porges, Doussard-Roosevelt, Portales, & Greenspan, 1996). Specifically, RSA is a marker of autonomic nervous system functioning, accounting for the impact of both parasympathetic and sympathetic activity on cardiac rhythm. Accordingly, RSA reflects parasympathetic cardiac vagal control (e.g., Berntson et al., 1997; Porges, 2007; Porges et al., 1996). According to the Polyvagal theory's concept (Porges, 1995; Porges, 2007; Porges et al., 1996), the vagal system is integral to the maintenance of physiological homeostasis so that an individual can preserve resources at rest and respond flexibly and appropriately to external stressors. The theory distinguishes resting RSA from RSA reactivity in response to demanding or stressful experiences by suggesting that resting RSA reflects an individual's capacity for maintaining homeostasis while RSA reactivity reflects an individual's vagal regulation in response to a stressor. Indeed, RSA suppression (i.e., decreases in RSA from baseline) during difficult circumstances, such as experiences of interpersonal stress or a sad mood induction, is considered a normal, adaptive physiological response (Lovallo, 2015), and is associated with better capacity for emotion regulation (Gentzler, Santucci, Kovacs, & Fox, 2009; Porges et al., 1996).

Consistent with this research, a recent meta-analysis examining RSA in children found that greater RSA suppression was associated with fewer internalizing problems and that children from clinical/at-risk samples exhibited less RSA suppression in response to challenging tasks (e.g., negative mood inductions, cognitive tasks, social tasks) than children from community samples (Graziano & Derefinko, 2013; but see also Beauchaine, 2015). Similarly, another meta-analysis found that, during dyadic social interactions, whereas children without psychopathology exhibited RSA suppression during social disengagement, children at risk for psychopathology and those currently exhibiting high levels of psychopathology did not exhibit this RSA suppression (Shahrestani, Stewart, & Quintana, 2014). These results suggest that failure to exhibit RSA suppression in challenging contexts is a marker of risk in youth, perhaps due to problems with emotional dysregulation. Indeed, there is research examining physiological reactivity during a conflict discussion via changes in RSA as an index of capacity for emotion regulation in adolescents with depression (e.g., Crowell et al., 2014); however, to our knowledge, no study has examined changes in physiological reactivity during a conflict discussion of children who are suicidal or have a history of SI.

To date, however, only a handful of studies have examined the specific relation between RSA and suicidality. Further, the findings from these studies are mixed. For example, in terms of resting RSA, there is evidence that the presence of suicidal ideation in adults with major depression is associated with lower levels of resting RSA (Chang et al., 2012; Rottenberg et al., 2002). In terms of RSA reactivity, there is evidence that adults with a history of suicide attempt exhibit less RSA suppression in response to a stressor than non-suicidal controls (Wilson et al., 2016). In contrast, one study examining RSA reactivity in adolescents found that adolescents ages 14–18 with a history of either SI or non-suicidal self-injury (NSSI) had greater RSA suppression following a negative mood induction than adolescents without a history of either SI or NSSI (Crowell et al., 2005). Therefore, although these studies provide preliminary evidence for a relation between RSA reactivity and suicidality, the direction of this relation remains unclear. Given the mixed results of the extant literature, it is possible that there are contextual moderators of RSA reactivity for those individuals with a history of suicidal ideation or attempt.

One potentially important moderator, particularly for children, is the presence of parental criticism. Indeed, theories of the development of emotion regulation highlight the role of negative family environments suggesting that such environments may impact the development of children's ability to effectively regulate their response to stressful situations. For example, Repetti, Taylor, and Seeman (2002) proposed that chronic exposure to the stress of a negative family environment may result in increased activation of the sympathetic adrenal medulla system, which may, in turn, have a lasting impact on sympathetic and parasympathetic functioning, both of which are reflected by RSA. Focusing more specifically on the role of parental criticism, theorists have suggested that the development of dysfunctional emotion regulation may mediate the link between parental criticism and later negative mental and physical health outcomes (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Supporting these theories, there is evidence that exposure to negative parenting behaviors, including parental criticism, disapproval, and derision, is associated with autonomic indices of emotion dysregulation, including lower levels of RSA suppression among 2–5 year old children (Hastings, Nuselovici, Utendale, & Coutya, 2008). Further, research in children ages 3–4 years of age suggests that negative parenting behaviors in early childhood may shape the development of a child's biological systems that are involved in self-regulation (Rothbart, Sheese, Rueda, & Posner, 2011). In particular, the experience of negative parenting behaviors during infancy is linked to lower RSA and greater emotion dysregulation in children ages 5–12 (Williams & Woodruff-Borden, 2015). To date, however, no study, of which we are aware, has examined whether parental criticism moderates the link between SI and RSA in children.

The current study, therefore, had two primary goals. The first was to examine levels of physiological reactivity in children with and without a history of SI. Second, we examined the potential moderating role of exposure to parental criticism with the goal of determining whether contextual factors, such as the presence of parental criticism, may help to explain the mixed findings in the RSA literature. In examining the potential moderating role of parental criticism, our goal was to determine whether we could identify a subgroup of children with a history of SI who is at greatest risk for exhibiting physiological dysregulation. Also, because parental criticism is a modifiable risk factor, such research might help to identify a promising target for reducing physiological dysregulation in youth with a history of suicidality. In our study, we focused interviewer-coded levels of expressed emotion-criticism rather than parent or child self-reports of parental criticism to minimize any potential response bias associated with self-report. In addition, to provide a stronger evaluation of contextual influences on children's RSA, we assessed RSA levels during three tasks: (i) a resting, baseline period, (ii) a positive parent-child discussion, and (iii) a negative discussion. Specifically, because there is heterogeneity in what might be experienced as a stressor, particularly for children with a critical parent, we considered the potential moderating influence of the context in which RSA was measured (i.e., during a resting state task versus during a parent-child interaction task). Indeed, children with a critical parent may experience any interaction with their parent as a challenging social engagement, regardless of the nature of the interaction, whereas children without a critical parent may not experience simply interacting with their parent as demanding or stressful, and instead be more affected by the nature of the interaction (i.e., positive versus negative). Despite the limited and mixed literature on RSA reactivity and suicidality and the lack of any previous research on RSA reactivity and SI in children, the broader literature strongly suggests that lack of RSA suppression during challenge is associated with psychopathology in children. Thus, we predicted that children with a history of SI would exhibit less RSA suppression than other children while interacting with their parents. Moreover, we hypothesized that parental criticism would moderate this relation, such that children with a history of SI who are also exposed to parental criticism would exhibit less RSA suppression than children with a history of SI, but no parental criticism. Because the present study is the first to examine RSA reactivity in children with SI during multiple types of parent-child interactions, we did not make hypotheses about differences in RSA levels between the two discussion tasks.