Brief Report

Dismissing Child Attachment and Discordance for Subjective and Neuroendocrine Responses to Vulnerability

ABSTRACT: Emerging evidence suggests that as with adults, dismissing children underreport their psychological distress relative to physiological indicators of their experience (startle response, neural signals). In this report, we extend these observations to neuroendocrine reactivity. One hundred and six 8–12-year-old children completed the Child Attachment Interview and a computer-based paradigm comprised of vignettes reflecting vulnerability in interpersonal contexts. Dismissing children's cortisol responses remained comparable from pre-to-post paradigm, while secure children's cortisol responses decreased from pre-to-post paradigm. Furthermore, compared to secure children, dismissing children reported less distress than their cortisol response would suggest. Implications for dismissing children's coping and self-regulation are discussed.

INTRODUCTION

Attachment theorists posit that variations in caregiver sensitivity lead to differences in the quality of children's internal working models (IWMs), more specifically, their set of beliefs about their caregivers' and others' responsiveness (Bowlby, 1980). Consistent, sensitive caregiving is associated with secure attachment, whereas inconsistent or insensitive caregiving is associated with insecure attachment (Ainsworth, Blehar, Waters, & Wall, 1978; van IJzendoorn, 1995). Infant attachment predicts the quality of the individual's IWM throughout development (e.g., Waters, Merrick, Treboux, Crowell, & Albersheim, 2000). Further, interactions between attachment figures and infants are thought to provide the foundation for the development of emotion regulation, initially occurring dyadically and then transitioning to an intra-individual process (Fonagy, Gergely, Jurist, & Target, 2002). The IWM is thought to influence emotion regulation throughout life (Cassidy, 1994).

According to theory, avoidant attachment,¹ the most common form of insecure attachment, results when caregivers ignore, reject, or fail to respond to the infant's distress (Ainsworth et al., 1978). Infants classified as avoidant appear affectless following brief separations from caregivers (Ainsworth et al., 1978; Main, 2000), yet display physiological signs of distress (Sangkaner & Grossmann, 1993; Sroufe & Waters, 1977). This observed divergence between behavioral and physiological response is perplexing—if these infants are stressed by the caregiver’s absence, why do they avoid the caregiver upon his/her return? Researchers argue that avoidant infants’ suppression of distress preserves the rejecting attachment figure’s availability (Ainsworth et al., 1978; Main, 1981). Though putatively adaptive in the short term, across development this type of response may confer risk, as emotion suppression strategies tend to paradoxically prolong and intensify

¹Referred to as avoidant during infancy and early childhood and as dismissing in middle childhood and beyond.
negative affective experiences (Bowlby, 1980; Fraley & Bonanno, 2004; Gross & Levenson, 1997). Successful regulation of a stress response, particularly one utilizing reappraisal strategies, likely necessitates some awareness that an emotional response has occurred (Gross, 1998).

After early childhood, IWMs are often measured using semi-structured interviews. Interviewees describe the quality of their childhood relationships with caregivers, providing specific examples substantiating these descriptions (e.g., Adult Attachment Interview, AAI; Child Attachment Interview, CAI; George, Kaplan, & Main, 1996; Shmueli-Goetz, Target, Datta, & Fonagy, 2004). On attachment interviews, dismissing individuals can restrict their attention to attachment-related themes in multiple ways. They may characterize their childhood relationships with caregivers in positive terms, yet fail to adequately support these statements. They may also report limited memory for their childhood or deny experiences of vulnerability (e.g., being rejected, hurt, or sick; Hesse, 2008).

Consistent with infancy research, dismissing adults show greater physiological arousal than do secure adults during the AAI, an in-depth interview that probes attachment themes (Dozier & Kobak, 1992; Roisman, Tsai & Chiang, 2004). Extending this work to school-aged children, White et al. (2012) observed that dismissal was associated with greater divergence of subjective and neural responses to simulated peer rejection. By placing a neural measure (event-related potential response) and subjective distress on the same common metric (z-score), White et al. (2012) were able to evaluate the divergence of subjective and neural response using the individual difference between the two scores. White et al. (2012) observed that the greater the dismissal, the more the child’s subjective response underestimated his/her neural response. Drawing on the same sample assessed 3 years prior, David, Crowley, Snavely, & Mayes (2013) observed that compared to secure children, dismissing children reported less distress than indicated by their startle response during threat.

Physiological stress reactivity involves multiple systems, both physiological (e.g., autonomic nervous system; ANS) and psychological (e.g., perception of emotion and cognitive interpretations). Because stress reactivity is multidetermined, it may best be assessed with multiple indices. For example, the hypothalamic–pituitary–adrenal (HPA) axis is part of the neuroendocrine system, which helps to regulate individuals’ responses to stress by producing hormones that have downstream effects on the ANS. Cortisol, the primary output of the HPA axis, is a widely studied biomarker indexing the stress response to specific challenging events (Pollard, 1995), but also varies diurnally, with values highest in the morning, declining during waking hours and reaching their lowest values in the late evening (Kirschbaum & Hellhammer, 1994; Shirtcliff et al., 2012). Thus both reactive and diurnal changes can be significant sources of individual difference. Cortisol can be derived from blood (serum cortisol) or saliva (Levine, Zagoory-Sharon, Feldman, Lewis, & Weller, 2007), but these measures do not always correspond highly (Levine et al., 2007). When using cortisol change as an index of stress reactivity, it is important to consider diurnal variation (Adam, Hawkley, Kudielka, & Caccioppo, 2006). In particular, because cortisol values normally decline across the day, not only an increase, but also a failure to decline, may indicate that the HPA system has been activated.

Central to the present report, HPA axis activation holds promise as a sensitive indicator of reactivity to stressors that can distinguish among stress responses of secure versus insecure individuals. For instance, cortisol reactivity differs as a function of attachment classification for infants (e.g., Gunnar, Colton, & Stansbury, 1992), school-aged children (Borelli et al., 2010), and adults (Rifkin-Graboi, 2008; Adam & Gunnar, 2001).

Individual differences in cortisol reactivity vary by attachment classification in response to an attachment assessment itself (such as an attachment interview, Borelli et al., 2010, or a separation from the primary caregiver, Gunnar, Mangelsdorf, Larson, & Hertsgaard, 1989, 1991; Hertsgaard, Gunnar, Erickson, & Nachmias, 1995; Spangler & Grossmann, 1993) as well as in response to other laboratory tasks (Nachmias, Gunnar, Mangelsdorf, Parritz, & Buss, 1996; Rifkin-Graboi, 2008). Infant attachment predicts diurnal decreases across a day spent in childcare (Badanes, Dimitrieva, & Watamura, 2012).

Here we extend work on cortisol and attachment to divergent subjective-neuroendocrine reactivity in dismissing children. Because reactions to vulnerability are central to attachment theory (Bowlby, 1980), we examined children’s subjective and neuroendocrine reactions to stressful scenarios involving emotional (sadness and fear) and physical (illness and injury) vulnerability. We hypothesized that compared to secure children, dismissing children would show greater neuroendocrine reactivity to the stressful scenarios (Hypothesis One) while reporting less distress than their physiological response would suggest (Hypothesis Two).

METHODS

Participants

One hundred-six 8–12 year-olds participated in two sessions 2 weeks or less apart. Children (53% girls, $M_{age} = 9.83$, $SD_{age} = 1.09$)
and their primary caregivers (81% female, $M_{\text{age}} = 37.91$, $SD_{\text{age}} = 6.28$) were recruited via internet postings and flyers. The sample was ethnically (39% Hispanic, 34% Caucasian, 18% African American, 5% Other, 3% Asian, and 1% Native American) and socioeconomically diverse (49% reported annual income < $50,000). Experimenters informed children that they could refuse to participate in any part of the study if they wished. The Pomona College IRB approved this research.

Procedure

During the first session, children provided written assent and parents provided written informed consent. Parents reported on family demographics and child participants completed the CAI. The mean length of time between the first session (CAI visit) and the second session (VVP visit) was 5.78 days ($SD = 4.48$). Most second sessions (76.3%) occurred between noon and 6 pm and on a non-school day; 67% occurred on a non-school day (weekend, holiday, or summer/winter vacation). Children provided a salivary cortisol sample 30 min after arriving, completed the vulnerability vignettes paradigm (VVP; with subjective response assessment), and then provided a second salivary cortisol sample post-VVP. Length of time elapsing between first and second sessions was unrelated to child age, gender, attachment security, and self-reported negative emotion, $r^2 = -.10-.08$.

Measures

Attachment Interview. The CAI (Shmueli-Goetz et al., 2004), a 19-question semi-structured interview for 8–13 year-olds, assesses school-aged children’s attachment quality with respect to each of their primary caregivers. Children respond to questions probing current and past experiences with primary caregivers, as well as their overall assessment of the qualities of these relationships. CAI coders rate videotapes and verbatim transcripts on eight 9-point scales (e.g., Idealization, Balance of positive/negative references to attachment figures). Based on interview ratings on these eight scales as well as the children’s non-verbal behavior during the interview, raters classify children into one of four categories with respect to each caregiver: secure, dismissing, preoccupied, and disorganized.

The CAI has established reliability and validity in both clinical and normative samples (Shmueli-Goetz, Target, Fonagy, & Datta, 2008; Target, Fonagy, & Shmueli-Goetz, 2003). CAI classification is not associated with age, gender, socioeconomic status, ethnicity, verbal IQ, expressive language ability, or whether the child lives with one or two parents (Target et al., 2003). In this study, a non-experimenter coder certified as reliable on the CAI coded all interviews with reliability performed on 16 cases coded by a second non-experimenter certified coder (the study PI) (4-way: $\kappa = .91$, $p < .001$, Intraclass correlation coefficient for narrative coherence scale = .83, $p < .001$).

Vulnerability Vignettes Paradigm (VVP). The VVP was created expressly for this study (see Borelli, 2009). Children were presented with brief (two sentence) written vignettes that appeared on a computer screen. Vignettes were presented both visually and aurally (if the child desired it) to children. Vignettes depicted vulnerability (physical hurt, sickness, sadness, and fear); a set of neutral vignettes was included as a manipulation check. Children responded to 15 total vignettes (12 vulnerability and 3 neutral), each of which involved gender-matched hypothetical other children. The names of the hypothetical children described in the vignettes were drawn from the Social Security Administration’s database of the most popular names for children born in 2000 (the mean birth year for children participating in the study). Vignettes were administered in one of two quasi-random orders to which children were randomly assigned.

Children completed the VVP on a computer while seated in a comfortable chair. Experimental stimuli (vignettes and follow-up probes) were presented using E-Prime 2.0 on a computer screen (Psychology Software Tools, 2002; Schneider, Eschman, & Zuccolotto 2002). After an acclimation period (290-second nature video), children were given instructions and an example vignette before beginning the VVP. Children completed five blocks of vignettes, each containing three scenarios regarding one vulnerability category (e.g., sadness): one vignette described the experience of vulnerability (e.g., “Taylor did not get picked to be on a sports team at school and he felt sad”), one described opting out of an activity because of the vulnerability (e.g., “Bill got a bad grade on a test. He felt really sad, started crying, and went to the bathroom”), and the third described the child asking a parent for assistance with it (e.g., “While at a party, someone said something mean to Brandon and he felt really sad. He called his parent and asked to get picked up early.”) The VVP took 45 min in total.

Self-Reported Subjective Distress. Subjective distress was assessed with the Self Assessment Manikin (SAM; Bradley & Lang, 1994; Lang, 1980), a pictorial rating system featuring human-like figures that assess affective valence (unpleasant–pleasant). Children were presented with the figures and asked to select how they feel right now. Figures were augmented with the words “very happy, pleased, good” next to the happiest looking figure and “very unhappy, scared, sad” next to the saddest looking figure. Higher scores indicated more negative emotion. The SAM has documented reliability and validity in adults and children (McManis, Bradley, Berg, Cuthbert, & Lang, Bradley & Lang, 1994; 2001). Some participants’ responses were not recorded due to computer malfunction ($n = 2$).

Cortisol Reactivity. We collected samples before and after the VVP and recorded time of day for each. Prior to the first collection, participants rinsed their mouths with water. Five minutes later, saliva was collected using Salivette collection devices (Sarstedt, Newton, NC). Experimenters placed cotton swabs in the child’s mouth for 2 min and then extracted them using a gloved hand. The second collection occurred 15 min after the VVP. Caregivers reported on the child’s eating and physical activity over the past day as well as current
medication use, variables later used as covariates. This strategy allowed us to address some of the measurement issues inherent in the use of salivary cortisol as an index of stress reactivity. Cortisol samples were frozen at -20°C. Cortisol concentrations were determined in duplicate using a fluorescent enzyme-linked immunosorbent assay (ELISA) technique, with a 96-well plate coated with monoclonal cortisol antibodies (Salimetrics, State College, PA), and expressed as micrograms per deciliter (dl = 100 ml). High (1.52 μg/dl) and low (0.50 μg/dl) concentration quality assessment samples were determined with interassay coefficients of variation of 2.9 and 13.5%, respectively. Some samples were excluded from statistical analyses due to insufficient saliva (n = 14) or inconsistent assay results (n = 6).

RESULTS

Table 1 reports means and standard deviations for all primary study variables by attachment classification. In this sample, 21 children (20%) were classified as dismissing, 67 children (63%) as secure, 10 children (9%) as preoccupied, and eight children (8%) as disorganized. Attachment classification was non-significantly related to child age, t(88) = -4.52, p = .66, or gender, χ²(1) = 2.76, p = .10. We restricted all subsequent analyses to the children classified as secure or dismissing (n = 88; cf. Borelli et al., 2012). The raw cortisol data were positively skewed—herein we report the results of statistical analyses using raw data but analyses using log-transformed values revealed an identical pattern of results. In contrast to our expectation, the sample as a whole significantly decreased in salivary cortisol from pre-to-post VVP, paired samples t-test, t(88) = 3.48, p < .001 (pretest M = 0.11, SD = 0.06; posttest M = 0.09, SD = 0.05). Cortisol levels did not differ among children who participated on a school day versus a holiday/weekend (t(pre,VVP cortisol = -.47, p = .63; t(post,VVP cortisol = -.19, p = .85). Children with missing cortisol data did not differ from other children in terms of their age, self-reported negative emotion, subjective emotional response, or attachment security.

Children’s self-reported distress was significantly higher in response to the vulnerability vignettes as opposed to the neutral vignettes, t(88) = -6.61, p < .001 (neutral M = 2.28, SD = 0.92; posttest M = 2.96, SD = 0.81), suggesting that in terms of subjective emotional response, the vulnerability vignettes induced negative emotion.

Attachment and Cortisol Reactivity to Stressor

We conducted a repeated measures ANCOVA with pre- and post-stressor cortisol as the dependent variable: controlling for time of day of cortisol sampling, F(1, 66) = 0.14, p = .76, and VVP condition, F(1, 66) = 2.22, p = .16, attachment classification was significantly associated with change in cortisol values, F(1, 66) = 6.44, p < .05, ƞ² = 0.09. Paired samples t-tests revealed that while secure children’s cortisol levels decreased from pre- to post-stressor, t(46) = 4.98, p < .001 dismissing children’s cortisol levels remained stable from pre- to post-stressor, t(20) = 0.46, p = .65 (Fig. 1). Dismissing and secure children’s pre-stressor cortisol levels were comparable, t(66) = 0.28, p = .78. Moreover, including potential confounds in the model did not change the results (having exercised that day, taking medication, hours elapsed since having eaten, having eaten meat that day), F(1, 66) = 5.33, p < .05, ƞ² = 0.13.

Table 1. Means (Standard Deviations) of Attachment and Emotion Related Variables by Attachment Classification

<table>
<thead>
<tr>
<th>Measures</th>
<th>Total</th>
<th>Ds</th>
<th>S</th>
</tr>
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<tbody>
<tr>
<td>Age</td>
<td>9.79 (1.54)</td>
<td>9.83 (1.58)</td>
<td>9.67 (1.44)</td>
</tr>
<tr>
<td>CAI narrative coh</td>
<td>5.73 (1.31)</td>
<td>6.26 (0.90)</td>
<td>5.94 (0.83)</td>
</tr>
<tr>
<td>Subjective distress</td>
<td>2.96 (0.81)</td>
<td>3.03 (0.81)</td>
<td>2.75 (0.77)</td>
</tr>
<tr>
<td>Pre-stressor Cortisol&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.11 (0.06)</td>
<td>0.10 (0.06)</td>
<td>0.11 (0.06)</td>
</tr>
<tr>
<td>Post-stressor Cortisol&lt;sup&gt;b&lt;/sup&gt;</td>
<td>0.09 (0.05)</td>
<td>0.10 (0.06)</td>
<td>0.08 (0.04)</td>
</tr>
<tr>
<td>Divergence score</td>
<td>-.09 (1.44)</td>
<td>.59 (1.43)</td>
<td>-.34 (1.37)</td>
</tr>
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<sup>a</sup>Ds, dismissing, S, secure.

<sup>b</sup>Cortisol expressed as μg/dl; participants missing data for either cortisol assessment (n = 22) excluded from all subsequent analyses.

FIGURE 1 Secure and dismissing children’s pre- and post-VVP salivary cortisol levels.
Attachment and Divergence of Subjective-Neuroendocrine Response

We hypothesized that dismissing children would report less distress than suggested by their physiological response. Following our previous work, we created a variable signifying the divergence of subjective-neuroendocrine response (see White et al., 2012, e.g., and descriptions of this methodology). A measure of divergence reflects the extent to which two measures put on the same metric (z-score) differ from one another. Because we were interested in cortisol reactivity, we first computed a cortisol change score by subtracting participants’ post-stressor cortisol levels from their pre-stressor cortisol levels (neuroendocrine response). We also computed a mean subjective distress score by averaging participants’ self-reported emotion to all vulnerability vignettes (subjective response). Next we confirmed that our two variables were not significantly associated with one another, \( r = -0.13, p = .31 \). Then we computed a measure of divergence of neuroendocrine response and self-reported negative emotion by \( z \)-standardizing each dimension before subtracting the latter from the former. Higher positive scores reflect greater divergence, or the tendency to have stress-induced cortisol changes suggesting higher distress than indicated by self-report (“underreporting distress”); more negative scores imply the converse.

After controlling for time of day of cortisol sampling, \( F(1, 66) = 0.17, p = .92 \), child age, \( F(1, 66) = 2.15, p = .15 \), and child gender, \( F(1, 66) = 1.12, p = .29 \), attachment classification was significantly associated with divergence, \( F(1, 66) = 5.87, p < .05, \eta^2_p = 0.08 \). Dismissing attachment was associated with greater divergence scores (i.e., more underreporting of distress).

**DISCUSSION**

We examined neuroendocrine reactivity to a social provocation (VVP) and evaluated the divergence of neuroendocrine response and subjective report among children classified as secure or dismissing in attachment. Similar to other studies in children examining cortisol reactivity (Gunnar, Talge, & Herrera, 2009), across all subjects, mean cortisol response decreased from pre- to post-stressor. That the VVP did not yield increases in salivary cortisol constrains the conclusions we can draw from our investigation, as discussed below. However, we observed differing patterns of cortisol response across groups. While the groups were comparable in cortisol levels at pre-assessment, secure children showed a significant decrease in cortisol response to the VVP, whereas dismissing children maintained their cortisol level across the visit.

Two explanations for these effects seem plausible. First, it may be that coming to the laboratory was more stressful than the stressor paradigm itself. In this case, the decrease in cortisol levels shown by secure children might represent habituation to the laboratory context, whereas the lack of cortisol decrease in dismissing children might reflect their failure to habituate to the laboratory context. Alternatively, the findings could reflect a typical diurnal decline in cortisol values among secure children, and attenuation of such a decline among dismissing children due to a predicted re-action to the VVP stressor. The current study cannot differentiate between these two explanations. Studies employing stressors that reliably elicit a stress response will be better positioned to adjudicate between these two possibilities. Finally, it bears repeating that eliciting an elevated cortisol response is notoriously difficult in this age range (cf., Borelli et al., 2010; Gunnar, Wewerka, Frenn, Long, & Griggs, 2009; Klimes-Dougan, Hastings, Granger, Usher, & Zahn-Waxler, 2001; Stroud et al., 2009). Clearly we can say that the secure and dismissing children showed differential cortisol responding across the two time points of our laboratory visit.

Our findings also extend work on divergence of subjective-physiological response in children with different attachment classifications (Borelli et al., 2013; White et al., 2012) to HPA axis function. Again acknowledging the lack of expected increase in cortisol across the VVP, relative to secure children, dismissing children’s subjective reports of distress underestimated their cortisol response. Evidence continues to accumulate suggesting that dismissing children, like their adult counterparts (e.g., Planta, Egeland, & Adam, 1996), underreport their distress in a variety of contexts. Dismissing children may be unaware of their emotional state, or though aware, they may be unable or unwilling to express these feelings. Underreporting may translate into a lesser likelihood of getting noticed when distressed, which, while purportedly adaptive within the dismissing parent–child relationship, may deny the child helpful responses from other people in his or her life (Bowlby, 1973). Moreover, if a dismissing child fails to elicit a response from others in his/her environment when upset, this could ironically confirm a core assumption of his/her IWM—that others will not respond when he/she is distressed. As well, lack of awareness of one’s emotional state may impede active emotion regulation processes (Gross, 1998), which may lead to more erratic behavior or even feelings of helplessness and anxiety.
Though we suspect that attachment patterns emerging early in life guide reactions to later psychosocial stressors, we cannot impute this in a cross-sectional study. Notably, the sample utilized in similar previous work was predominantly White and middle class (Borelli et al., 2013; White et al., 2012). The present sample comprised ethnically and socioeconomically diverse participants, enhancing the generalizability of our findings. Future studies could use stressors that evoke a more robust stress response in this age range, such as a stressful speech task (Dickerson & Kemeny, 2004), to evaluate whether dismissing children exhibit this stress reactivity pattern to more potent stressors. Moreover, it will be valuable to examine whether dismissing attachment prospectively predicts greater reactivity and divergence. Here we assessed salivary cortisol as our dependent variable and comparison point for children’s subjective response. Given that salivary cortisol assessments, as with other physiological stress measures, are not without limitation (Levine et al., 2007), it will be important to provide evidence of discordance of response within the same sample across multiple psychological domains. Finally, future work should aim to understand the lack of increase in cortisol values in response to a stressor paradigm. This pattern has been observed repeatedly among children in this age group (Gunnar, Tagle, & Herrera, 2009). Comparison of psychological, cardiovascular and cortisol stress measures could shed some light here. For instance, a habituation model might predict congruence between the multiple measures (i.e., as subjects acclimate, all three stress indicators would attenuate), whereas a diurnal model would apply only to cortisol and therefore would lead to incongruence across the different measures.

In summary, we document differential cortisol responding and divergence of subjective and neuroendocrine response as a function of interview-based attachment group status in middle childhood. The lack of change from pre-to-post stressor among the dismissing group may reflect a regulation failure in the dismissing group, or perhaps reliance on emotion suppression as a regulating strategy (Gross, 1998). A growing body of socio-emotional and health-related work highlights the central role of mind–body connections for well-being (Kabat-Zinn, 1990). The subjective-physiological response divergence among dismissing children may prove to be causally related to future risk for these youth, but also suggests a potential point of intervention.

NOTE

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REFERENCES


Fraley, R. C., & Bonanno, G. A. (2004). Attachment and loss: A test of three competing models on the association between attachment-related avoidance and adaptation to


